



ಸಹ್ಯಾದ್ರಿ ವಿಜ್ಞಾನ ಕಾಲೇಜು, ಶಿವಮೊಗ್ಗ-577 203  
(ಕುವೆಂಪು ವಿಶ್ವವಿದ್ಯಾನಿಲಯದ ಘಟಕ ಕಾಲೇಜು)

**SAHYADRI SCIENCE COLLEGE, SHIMOGA-577 203**

(A Constituent College of Kuvempu University)



Phone:08182-240435

Fax:08182-240138

E-mail:sahyadriscience@gmail.com

Web : [www.kussc.ac.in](http://www.kussc.ac.in)

## Criteria -03

### 3.3.1. RESEARCH PAPERS PUBLISHED

**DURING THE YEAR -2020**

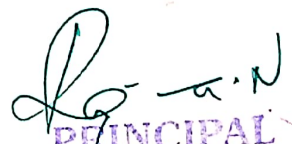
3.3.1 Number of research papers published per teacher in the Journals notified on UGC CARE list during the years 2020

| Sl. No. | Title of paper                                                                                                                                                                                                                               | Name of the author/s                                       | Department of the teacher | Name of Journal                                    | Calendar Year of publication | ISSN number | Link to the recognition in UGC enlistment of the Journal /Digital Object Identifier (doi) number                                                                      |                                                                                                                                                                                                                                                                                                               |                               |
|---------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|---------------------------|----------------------------------------------------|------------------------------|-------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|         |                                                                                                                                                                                                                                              |                                                            |                           |                                                    |                              |             | Link to website of the Journal                                                                                                                                        | Link to article / paper / abstract of the article                                                                                                                                                                                                                                                             | Is it listed in UGC Care list |
| 2020    |                                                                                                                                                                                                                                              |                                                            |                           |                                                    |                              |             |                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                               |                               |
| 1       | Dehydroabietylamine, a diterpene from <i>Carthamus tinctorius</i> L. showing antibacterial and anthelmintic effects with computational evidence                                                                                              | Sj. Aditya R., and Ramesh C K.                             | Biotechnology             | Current Computer-Aided Drug Design                 | 2020                         | 1573-4099   | <a href="https://benhamscience.com/publicjournals/current-computer-aided-drug-design">https://benhamscience.com/publicjournals/current-computer-aided-drug-design</a> | <a href="https://pubmed.ncbi.nlm.nih.gov/30827256/">https://pubmed.ncbi.nlm.nih.gov/30827256/</a>                                                                                                                                                                                                             | YES(Scopus)                   |
| 2       | Expression of drug-metabolizing genes and Acetaminophen drug toxicity studies on 3D scaffold culture of Huh-7 cell line                                                                                                                      | Suma, M. S., K. S. Jamuna, C. K. Ramesh, and Riaz Mahmood. | Biotechnology             | Research Journal of Pharmacy and Technology (RJPT) | 2020                         | 0974-360X   | <a href="https://www.rjptonline.org/">https://www.rjptonline.org/</a>                                                                                                 | <a href="https://rjptonline.org/AbstractView.aspx?PID=2020-13-5-61">https://rjptonline.org/AbstractView.aspx?PID=2020-13-5-61</a>                                                                                                                                                                             | YES (Scopus)                  |
| 3       | Novel 1, 3, 4-oxadiazole Targets STAT3 Signaling to Induce Antitumor Effect in Lung Cancer                                                                                                                                                   | BT Prabhakar et al.                                        | Biotechnology             | Biomedicine                                        | 2020                         | 0970-2067   | <a href="https://biomedicineonline.org/">https://biomedicineonline.org/</a>                                                                                           | <a href="https://www.mdpi.com/833928">https://www.mdpi.com/833928</a>                                                                                                                                                                                                                                         | YES                           |
| 4       | Potential antimicrobial activity of (amischophaeclusavillaris L.) (commelinaceae) against certain bacterial species                                                                                                                          | Latha K P                                                  | Chemistry                 | Plant Archives                                     | 2020                         | 2581-6063   | <a href="https://www.plantarchives.org/">https://www.plantarchives.org/</a>                                                                                           | <a href="http://www.plantarchives.org/SPECIAL%20ISSUE%202020-1/2920-2922%20(215).pdf">http://www.plantarchives.org/SPECIAL%20ISSUE%202020-1/2920-2922%20(215).pdf</a>                                                                                                                                         | YES(Scopus)                   |
| 5       | Antioxidant and antitubercular activities of leaf extracts of <i>Canthiumdioecium</i> (Gaertn.) and <i>Amischophaeclusavillaris</i> (L.)                                                                                                     | Latha K P                                                  | Chemistry                 | Indian Journal of Natural Products and Resources   | 2020                         | 0976-0512   | <a href="http://op.niscair.res.in/index.php/IJNPR/index">http://op.niscair.res.in/index.php/IJNPR/index</a>                                                           | <a href="http://op.niscair.res.in/index.php/IJNPR/article/view/30454">http://op.niscair.res.in/index.php/IJNPR/article/view/30454</a>                                                                                                                                                                         | YES(Scopus)                   |
| 6       | In vitro anticancer activity of canthiumdioecium (gaertn.) Against lung cancer cell line                                                                                                                                                     | Meghashree K.S. and Latha K P                              | Chemistry                 | Plant Archives                                     | 2020                         | 2581-6063   | <a href="https://www.plantarchives.org/">https://www.plantarchives.org/</a>                                                                                           | <a href="http://plantarchives.org/20-2/3464-3466%20(6311).pdf">http://plantarchives.org/20-2/3464-3466%20(6311).pdf</a>                                                                                                                                                                                       | YES(Scopus)                   |
| 7       | Potential antibacterial activity of canthiumdioecium (gaertn.) Against certain bacterial species                                                                                                                                             | Latha K P                                                  | Chemistry                 | Plant Archives                                     | 2020                         | 0972-5210   | <a href="https://www.plantarchives.org/">https://www.plantarchives.org/</a>                                                                                           | <a href="http://plantarchives.org/20-2/8818-8820%20(6311).pdf">http://plantarchives.org/20-2/8818-8820%20(6311).pdf</a>                                                                                                                                                                                       | YES(Scopus)                   |
| 8       | Synthesis and biological evaluation of novel indolyl-dihydropyridin-3-carboxylate, dihydrol[1,2,4] triazol [1,5]pyridine-3-carboxylate and carbodrazide derivatives                                                                          | Prabhakar Walmik                                           | Chemistry                 | Indian Journal of Chemistry-Section B              | 2020                         | 0019-5103   | <a href="http://op.niscair.res.in/index.php/IJCIB">http://op.niscair.res.in/index.php/IJCIB</a>                                                                       | DOI: 10.56042/ijch.v5i8.28026                                                                                                                                                                                                                                                                                 | YES(Scopus)                   |
| 9       | Effect of solvents on structural, optical and electrical properties of ZnO nanoparticles synthesized by microwave heating route                                                                                                              | Yathish R O                                                | Chemistry                 | Inorganic Chemistry communications                 | 2020                         | 1387-7003   | <a href="https://www.sciencedirect.com/journal/inorganic-chemistry-communications">https://www.sciencedirect.com/journal/inorganic-chemistry-communications</a>       | <a href="https://www.sciencedirect.com/science/article/abs/pii/S1387700319313110">https://www.sciencedirect.com/science/article/abs/pii/S1387700319313110</a>                                                                                                                                                 | YES(Scopus)                   |
| 10      | Investigation the influence of Zn <sup>2+</sup> doping on the photovoltaic properties (DSSCs) of MgO nanoparticles                                                                                                                           | Yathish R O                                                | Chemistry                 | Journal of Molecular Structure                     | 2020                         | 1872-8014   | <a href="https://www.sciencedirect.com/journal/journal-of-molecular-structure">https://www.sciencedirect.com/journal/journal-of-molecular-structure</a>               | <a href="https://www.sciencedirect.com/science/article/pii/S0022286620307328">https://www.sciencedirect.com/science/article/pii/S0022286620307328</a>                                                                                                                                                         | YES(Scopus)                   |
| 11      | Development of Azure-B modified pencil graphite electrode as an electrochemical sensor for the investigation of ceftriaxone in pharmaceutical and biological samples                                                                         | Yathish R O                                                | Chemistry                 | Chemical data collections                          | 2020                         | 2405-8300   | <a href="https://www.sciencedirect.com/journal/chemical-data-collections">https://www.sciencedirect.com/journal/chemical-data-collections</a>                         | <a href="https://www.sciencedirect.com/science/article/abs/pii/S2405830020301506">https://www.sciencedirect.com/science/article/abs/pii/S2405830020301506</a>                                                                                                                                                 | YES(Scopus)                   |
| 12      | Development of Single Walled Carbon Nanotube-Molybdenum Disulfide Nanocomposite/Polyethylene Glycol Modified Carbon Paste Electrode as an Electrochemical Sensor for the Investigation of Sulfadiazine in Biological Samples                 | Yathish R O                                                | Chemistry                 | Analytical and Bioanalytical Electrochemistry      | 2020                         | 2008-4226   | <a href="https://www.abochem.com/">https://www.abochem.com/</a>                                                                                                       | <a href="https://www.abochem.com/article_38383.html">https://www.abochem.com/article_38383.html</a>                                                                                                                                                                                                           | YES(Scopus)                   |
| 13      | Physico-Chemical and Trace Metal Profile of Pule Tank, Shivamogga District, Karnataka                                                                                                                                                        | Ravikumar, R., Dr.Purushothama,R., Dr Kiran B R            | Geology                   | Journal of Xidian University                       | 2020                         | 1001-2400   | <a href="https://xadj.kjdx.cn/">https://xadj.kjdx.cn/</a>                                                                                                             | <a href="https://doi.org/10.37896/jxu.14.5.259">https://doi.org/10.37896/jxu.14.5.259</a><br><a href="https://drive.google.com/file/d/1OwI9rS8PFD2vMLqg4r50dVJmOgF/view">https://drive.google.com/file/d/1OwI9rS8PFD2vMLqg4r50dVJmOgF/view</a>                                                                | YES(Scopus)                   |
| 14      | Influence of weather parameters on incidence of yellow stem border, scirpophagimicrualas (walker) in rice ecosystem shivamogga, Karnataka                                                                                                    | Shulpa D, K.L.Naik and B B Hosetti                         | Zoology                   | Plant Archives                                     | 2020                         | 2581-6063   | <a href="http://www.plantarchives.org/">http://www.plantarchives.org/</a>                                                                                             | <a href="https://www.plantarchives.org/20-1/2722-2726%20(6130).pdf">https://www.plantarchives.org/20-1/2722-2726%20(6130).pdf</a>                                                                                                                                                                             | YES (Scopus)                  |
| 15      | Role Of Gut Micro Flora In Toxicity <i>Bacillus Thuringiensis</i> Subspecies Galleriae To The Larvae Of <i>Spodopteralitura</i> (Noctuidae: Lepidoptera)                                                                                     | Onkarappa R and Sanjay Yalashetti                          | Microbiology              | Plant Archives                                     | 2020                         | 2581-6063   | <a href="http://www.plantarchives.org/">http://www.plantarchives.org/</a>                                                                                             | <a href="https://www.semanticscholar.org/paper/ROLE-OF-GUT-MICROFLORA-IN-TOXICITY-OF-BACILLUS-TO-SANJAY-ONKARAPPA/e9d115503257f07a5c8b4c0d064db3f81c2e43">https://www.semanticscholar.org/paper/ROLE-OF-GUT-MICROFLORA-IN-TOXICITY-OF-BACILLUS-TO-SANJAY-ONKARAPPA/e9d115503257f07a5c8b4c0d064db3f81c2e43</a> | YES (Scopus)                  |
| 16      | Biology of Potato Tuber Moth <i>Phthoromacoperulella</i> (Zeller) under Storage at Different Seasons in Hassan District, Karnataka, India                                                                                                    | Kushala G., Ramesh Babu H.N. and Rajeshwari N.             | Botany                    | Plant Archives                                     | 2020                         | 2581-6063   | <a href="http://www.plantarchives.org/">http://www.plantarchives.org/</a>                                                                                             | <a href="http://plantarchives.org/20-2/4015-4021%20(6556).pdf">http://plantarchives.org/20-2/4015-4021%20(6556).pdf</a>                                                                                                                                                                                       | YES (Scopus)                  |
| 17      | Synthesis, characterization, and biological activity of Cu(II) and Co(II) complexes of novel N1, N2-bis(4-methyl quinolin-2-yl)benzene-1,2-diamine: CuO and CoO nanoparticles derived from their metal complexes for photocatalytic activity | Krishnamurthy G.                                           | Chemistry                 | Inorganic and Nano-Metal Chemistry                 | 2020                         | 2470-1556   | <a href="https://www.tandfonline.com/journals/lst21">https://www.tandfonline.com/journals/lst21</a>                                                                   | <a href="https://www.tandfonline.com/doi/abs/10.1080/24701556.2020.1814337">https://www.tandfonline.com/doi/abs/10.1080/24701556.2020.1814337</a>                                                                                                                                                             | YES (Scopus)                  |
| 18      | 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                   | 2020                         | 2588-5839   | <a href="https://www.ajgreenchem.com/">https://www.ajgreenchem.com/</a>                                                                                               | <a href="https://www.ajgreenchem.com/article_87468.html">https://www.ajgreenchem.com/article_87468.html</a>                                                                                                                                                                                                   | YES (Scopus)                  |
| 19      | Spectral, DFT molecular docking and antibacterial activity studies of Schiff base derived from furon-2-carbaldehyde and their metal(II) complexes                                                                                            | Yuvaraj TCM                                                | Chemistry                 | Journal of the Turkish Chemical Society Section A  | 2020                         | 2149-0120   | <a href="https://dergipark.org.tr/en/pub/jotcsa">https://dergipark.org.tr/en/pub/jotcsa</a>                                                                           | <a href="https://dergipark.org.tr/en/pub/jotcsa/issue/52506/467859">https://dergipark.org.tr/en/pub/jotcsa/issue/52506/467859</a>                                                                                                                                                                             | YES (Scopus)                  |



| Sl. No. | Title of paper                                                                                                                                                                                                                                                | Name of the author/s                                                                                                                              | Department of the teacher | Name of Journal                                                   | Calendar Year of publication | ISSN number | Link to the recognition in UGC enlistment of the Journal/Digital Object Identifier (doi) number                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                               |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------------------------------------------------------------|------------------------------|-------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
|         |                                                                                                                                                                                                                                                               |                                                                                                                                                   |                           |                                                                   |                              |             | Link to website of the Journal                                                                                                                                          | Link to article / paper / abstract of the article                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Is it listed in UGC Care list |
| 20      | Optical and electrical properties of metal free organic dye sensitized Cr-ZnO and Ni-CdO nanoparticles                                                                                                                                                        | <b>Yathish R O</b>                                                                                                                                | Chemistry                 | SN Applied Sciences                                               | 2020                         | 2521-3971   | <a href="https://link.springer.com/journal/42452">https://link.springer.com/journal/42452</a>                                                                           | <a href="https://link.springer.com/article/10.1007/s42452-020-2237-7">https://link.springer.com/article/10.1007/s42452-020-2237-7</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | YES (Scopus)                  |
| 21      | Intrinsic irreversibility of Al <sub>2</sub> O <sub>3</sub> -H <sub>2</sub> O nanofluid Poiseuille flow with variable viscosity and convective cooling                                                                                                        | <b>F Almeida, B J Giresha, P Venkatesh, G K Ramesh</b>                                                                                            | Mathematics               | International Journal of Numerical Methods for Heat & Fluid Flow  | 2020                         | 0961-5539   | <a href="https://www.emeraldgroupublishing.com/journal/hff">https://www.emeraldgroupublishing.com/journal/hff</a>                                                       | <a href="https://www.emerald.com/insight/content/doi/10.1108/IJHFF-09-2020-0575/full.html">https://www.emerald.com/insight/content/doi/10.1108/IJHFF-09-2020-0575/full.html</a>                                                                                                                                                                                                                                                                                                                                                                                                                                             | YES (Scopus)                  |
| 22      | Exploration of irreversibility and thermal motion of a nano-liquid with the Newton boundary condition by using the Nelder-Mead rule                                                                                                                           | <b>B J Giresha, P Venkatesh, D O Soumya</b>                                                                                                       | Mathematics               | Heat transfer                                                     | 2020                         | 2688-4534   | <a href="https://onlinelibrary.wiley.com/journal/26884534">https://onlinelibrary.wiley.com/journal/26884534</a>                                                         | <a href="https://onlinelibrary.wiley.com/doi/abs/10.1002/htj.23231">https://onlinelibrary.wiley.com/doi/abs/10.1002/htj.23231</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | YES (Scopus)                  |
| 23      | Investigation of irreversibilities in a microchannel by differing viscosity, including buoyancy forces and suction/injection                                                                                                                                  | <b>P Venkatesh, Girish B J, Felicitia Almeida</b>                                                                                                 | Mathematics               | Heat transfer                                                     | 2020                         | 2688-4534   | <a href="https://onlinelibrary.wiley.com/journal/26884534">https://onlinelibrary.wiley.com/journal/26884534</a>                                                         | <a href="https://onlinelibrary.wiley.com/doi/abs/10.1002/htj.23244">https://onlinelibrary.wiley.com/doi/abs/10.1002/htj.23244</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | YES (Scopus)                  |
| 24      | Amperometric determination of dopamine based on an interfacial platform comprising tetra-substituted Zn <sup>2+</sup> phthalocyanine film layer with embedding of reduced graphene oxide Sensors and Actuators A 316 (2020) 112377                            | <b>Malathesh Pari, KR Venugopala Reddy, KB Chandrakala</b>                                                                                        | chemistry                 | Sensors and Actuators A                                           | 2020                         | 1873-3069   | <a href="https://www.sciencedirect.com/journal/sensors-and-actuators-a-physical">https://www.sciencedirect.com/journal/sensors-and-actuators-a-physical</a>             | <a href="https://doi.org/10.1016/j.sna.2020.112377">https://doi.org/10.1016/j.sna.2020.112377</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | YES (Scopus)                  |
| 25      | Microwave-Assisted Green Synthesis, Characterization and Adsorption study of Metal Oxide Nanoparticles by <i>Ficus Benghalensis</i> plant leaf Extract                                                                                                        | <b>Arunkumar Lagashetty, Sangappa K Ganiger, RK Preeti, Shashidhar Reddy, Malathesh Pari</b>                                                      | chemistry                 | New J. Chem.                                                      | 2020                         | 1369-9261   | <a href="https://pubs.rsc.org/en/journals/journalissues/nj#recentarticles&amp;adv">https://pubs.rsc.org/en/journals/journalissues/nj#recentarticles&amp;adv</a>         | <a href="https://pubs.rsc.org/en/content/articlelanding/2020/nj/nj1759k">https://pubs.rsc.org/en/content/articlelanding/2020/nj/nj1759k</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | YES (Scopus)                  |
| 26      | Synthesis of CuO micro and nanoparticles as composite additives for corrosion resistant Zn composite coatings on mild steel.                                                                                                                                  | <b>Dr. Deepa K</b>                                                                                                                                | Chemistry                 | Inorganic and Nano-Metal Chemistry                                | 2020                         | 2470-1556   | <a href="https://www.tandfonline.com/journal/tstic21">https://www.tandfonline.com/journal/tstic21</a>                                                                   | <a href="https://doi.org/10.1080/24701556.2019.1711804">https://doi.org/10.1080/24701556.2019.1711804</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | YES (Scopus)                  |
| 27      | Simultaneous electroanalysis of dopamine, paracetamol and folic acid using TiO <sub>2</sub> -WO <sub>3</sub> nanoparticle modified carbon paste electrode                                                                                                     | <b>Dr. Ashok N B et al</b>                                                                                                                        | Chemistry                 | Journal of Electroanalytical Chemistry                            | 2020                         | 1572-6657   | <a href="https://www.sciencedirect.com/journal/journal-of-electroanalytical-chemistry">https://www.sciencedirect.com/journal/journal-of-electroanalytical-chemistry</a> | <a href="http://dx.doi.org/10.1016/j.jelechem.2020.113819">http://dx.doi.org/10.1016/j.jelechem.2020.113819</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | YES (Scopus)                  |
| 28      | A Facile Cobalt (II) Tetra Amino Phthalocyanine Imprinted Poly Aniline (PANI) Nano-fiber Film Layer Based Electrode Material for Amperometric Determination of Thiocyanate                                                                                    | <b>Malathesh Pari, KR Venugopala Reddy</b>                                                                                                        | chemistry                 | J Inorg Organomet Polym                                           | 2020                         | 1574-1443   | <a href="https://link.springer.com/journal/10904">https://link.springer.com/journal/10904</a>                                                                           | <a href="https://link.springer.com/article/10.1007/s10904-020-01515-8">https://link.springer.com/article/10.1007/s10904-020-01515-8</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | YES (Scopus)                  |
| 29      | Two new records of Genus <i>Agave</i> from Western Ghats forests of India                                                                                                                                                                                     | <b>Kantharaja R, Nandan Patel K J, Krishnappa M</b>                                                                                               | Botany                    | KAVAKA                                                            | 2020                         | 0379-5179   | <a href="https://www.fungiindia.co.in/index.php/kavaka">https://www.fungiindia.co.in/index.php/kavaka</a>                                                               | <a href="https://doi.org/10.1007/s10904-020-01515-8">kavaka 55-9.pdf (fungiindia.co.in)</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | YES                           |
| 30      | Indigenous storage practices for Paddy in Shimoga District, Karnataka                                                                                                                                                                                         | <b>Sunil Kumar T V., Rajeshwari N., Krishnappa M. and Ramesh Babu H.N.</b>                                                                        | Botany                    | International Journal of Botany studies                           | 2020                         | 2455-511X   | <a href="https://www.botanyjournals.com/">https://www.botanyjournals.com/</a>                                                                                           | <a href="https://www.botanyjournals.com/archives/2020/vol-15/issue5/5-5-117">https://www.botanyjournals.com/archives/2020/vol-15/issue5/5-5-117</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | YES                           |
| 31      | DNA binding, molecular docking and antimicrobial evaluation of novel azo dye ligand and their metal complexes                                                                                                                                                 | <b>N Venugopal, G Krishnamurthy, H S Bhoja Naik, J D Manohar</b>                                                                                  | Chemistry                 | Journal of Inorganic and Organometallic Polymers and Materials    | 2020                         | 1574-1451   | <a href="https://link.springer.com/journal/10904">https://link.springer.com/journal/10904</a>                                                                           | <a href="https://doi.org/10.1007/s10904-019-01394-8">https://doi.org/10.1007/s10904-019-01394-8</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | YES (Scopus)                  |
| 32      | Synthesis, Characterization, DFT Studies and Biological Activity of Ru(II), La(III) and Ce(III) Triphenylphosphine Complexes Containing 2-Aminothiazole and 2-Aminotriazole                                                                                   | <b>Satish Naik, P Parameshwara Naik, G Krishnamurthy, N Venugopal, Nagaraja Naik, T R Naik</b>                                                    | Chemistry                 | Journal of Inorganic and Organometallic Polymers and Materials    | 2020                         | 1574-1451   | <a href="https://link.springer.com/journal/10904">https://link.springer.com/journal/10904</a>                                                                           | <a href="https://doi.org/10.1007/s10904-020-01492-9">https://doi.org/10.1007/s10904-020-01492-9</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | YES (Scopus)                  |
| 33      | Synthesis, characterization, electrochemistry, biological and molecular docking studies of the novel Co(II), Ni(II) and Cu(II) complexes derived from methanethiol bridged 2-((1H-benzotriimidazol-2-yl)methylthio)-1H-benzotriimidazol-6-yl)phenyl)methanone | <b>N Sunil Kumar, G Krishnamurthy, Malathesh Pari, TR Ravikumar Naik, K S Jithendra Kumara, Satish Naik, Shivananda Kandagalla, Nagaraja Naik</b> | Chemistry                 | Journal of Molecular Structure                                    | 2020                         | 0022-2860   | <a href="https://www.sciencedirect.com/journal/journal-of-molecular-structure">https://www.sciencedirect.com/journal/journal-of-molecular-structure</a>                 | <a href="https://doi.org/10.1016/j.molstruc.2020.128586">https://doi.org/10.1016/j.molstruc.2020.128586</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | YES (Scopus)                  |
| 34      | Optical and antibacterial evaluation of biofunctionalized Cu-ZnS nanoparticles                                                                                                                                                                                | <b>G Arun Kumar, H S Naik, R Viswanath, G Krishnamurthy, Prabhakar Walimik</b>                                                                    | Chemistry                 | Emergent Materials                                                | 2020                         | 2522-574X   | <a href="https://link.springer.com/journal/42247">https://link.springer.com/journal/42247</a>                                                                           | <a href="https://doi.org/10.1007/s42247-020-00141-x">https://doi.org/10.1007/s42247-020-00141-x</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | YES (Scopus)                  |
| 35      | Synthesis, Characterization and Biological studies on 3d-metal complexes of 5-(1, 5-dimethyl-3-oxo-2-phenyl)-2, 3-dihydro-1H-pyrazol-4-yl) diazenyl)-1-ethyl-6-hydroxy-4-methyl-2-oxo-1, 2-dihydroindoline-3-carbonitrile                                     | <b>G Krishnamurthy, Shridhar P Melkeri, P Parameshwara Naik, Prabhakar Walimik, R S Priyaram</b>                                                  | Chemistry                 | Der PharmaChemica                                                 | 2020                         | 0975-413X   | <a href="https://www.derpharmachemica.com/archive.html">https://www.derpharmachemica.com/archive.html</a>                                                               | <a href="https://www.researchgate.net/publication/351978340_ISSN_0975-413X_CODEN_USA_PCHIXX_Synthesis_Characterization_and_Biological_studies_on_3d-metal_complexes_of_5-(1,5-dimethyl-3-oxo-2-phenyl-2,3-dihydro-1H-pyrazol-4-yl)-diazenyl-1-ethyl-6-hydroxy-4-methyl-2-oxo-1,2-dihydroindoline-3-carbonitrile">https://www.researchgate.net/publication/351978340_ISSN_0975-413X_CODEN_USA_PCHIXX_Synthesis_Characterization_and_Biological_studies_on_3d-metal_complexes_of_5-(1,5-dimethyl-3-oxo-2-phenyl-2,3-dihydro-1H-pyrazol-4-yl)-diazenyl-1-ethyl-6-hydroxy-4-methyl-2-oxo-1,2-dihydroindoline-3-carbonitrile</a> | No                            |
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| 38      | Determination Of Drug Toxicity Of Acetaminophen Using 3d Scaffold Cultures Of Immortal Human Hepatocarcinoma Cell Lines                                                                                                                                       | <b>Suma M S., Jamuna K S., Ramesh CK and Raz Mahmood</b>                                                                                          | Biotechnology             | International Journal of Pharmaceutical Sciences and Research     | 2020                         | 0975-8232   | <a href="https://ijpsr.com/">https://ijpsr.com/</a>                                                                                                                     | <a href="https://ijpsr.com/rt-article-determination-of-drug-toxicity-of-acetaminophen-using-3d-scaffold-cultures-of-immortal-human-hepatocarcinoma-cell-lines">https://ijpsr.com/rt-article-determination-of-drug-toxicity-of-acetaminophen-using-3d-scaffold-cultures-of-immortal-human-hepatocarcinoma-cell-lines</a>                                                                                                                                                                                                                                                                                                     | NO                            |
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| 48      | A report on infestation of root grubs                                                                                                                                                           | Shantha A R                          | Zoology                   | Indian Journal of Applied Research                                                  | 2020                         | 2249-555X   | <a href="https://www.worldwidejournals.com/indian-journal-of-applied-research-(IJAR)/">https://www.worldwidejournals.com/indian-journal-of-applied-research-(IJAR)/</a> | <a href="https://www.worldwidejournals.com/indian-journal-of-applied-research-(IJAR)/article/a-report-on-stem-cells-and-their-applications/MjY2ODMwZys1I&amp;hl=1&amp;kl=4">https://www.worldwidejournals.com/indian-journal-of-applied-research-(IJAR)/article/a-report-on-stem-cells-and-their-applications/MjY2ODMwZys1I&amp;hl=1&amp;kl=4</a>                                                                                       | NO                            |
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> Curr Comput Aided Drug Des. 2020;16(3):231-237. doi: 10.2174/1573409915666190301142811.

# Dehydroabietylamine, A Diterpene from Carthamus tinctorious L. Showing Antibacterial and Anthelmintic Effects with Computational Evidence

Aditya R Sj<sup>1 2</sup>, Ramesh Ck<sup>2</sup>, Raghavendra S<sup>2 3</sup>, Paramesha M<sup>2 4</sup>

Affiliations

## Affiliations

- 1 Department of Biotechnology, SBRR Mahajana First Grade College, Mysore, Karnataka, India.
- 2 Molecular Biomedicine Laboratory and Department of P.G. Studies and Research in Biotechnology, Sahyadri Science College, Kuvempu University, Shivamogga, Karnataka, India.
- 3 Department of Biochemistry, College of Horticulture, University of Horticultural Sciences, Bagalkot, Karnataka, India.
- 4 Plant Cell Biotechnology Department, CSIR-Central Food Technological Research Institute, Mysore, Karnataka, India.

PMID: 30827256 DOI: 10.2174/1573409915666190301142811

## Abstract

**Background:** Plant-based drugs provide an outstanding contribution to modern therapeutics, and it is well known that the presence of different phytochemicals is responsible for such pharmacological effects. Carthamus tinctorious L. is one such medicinally important plant whose different solvent extracts have been reported with several pharmacological effects like antibacterial, hepatoprotective, and wound healing. The exploration of phytoconstituents from such a medicinally important plant for different pharmacological effects could produce new and effective drugs to treat human diseases.

**Objective:** The present study attempts to explore the antibacterial and anthelmintic properties of dehydroabietylamine, a diterpene isolated from Carthamus tinctorious L. followed by the in silico elucidation of its probable mode of action.

**Methods:** The minimum inhibition concentration (MIC) and minimum bactericidal concentration (MBC) of dehydroabietylamine were assessed against Staphylococcus aureus and Pseudomonas aeruginosa, using micro- broth dilution method. The anthelmintic activity of was determined to assess the time taken for paralysis and death of Pheretima Posthuma at different concentrations. Additionally, molecular docking study was conducted to understand the interaction between dehydroabietylamine with target proteins identified for both antibacterial and anthelmintic activity viz., glucosamine-6-phosphate synthase and  $\beta$ -Tubulin, respectively.

**Results:** The dehydroabietylamine showed the significant MIC for S. aureus (12.5  $\mu$ g/ml) and P. aeruginosa (6.25  $\mu$ g/ml), respectively. The result of anthelmintics effect of dehydroabietylamine was found to be dosedependent and compared to the standard drug, albendazole.

**Conclusion:** The interactions of dehydroabietylamine with the two target proteins with high binding affinity indicated the probable inhibition of target proteins, which could be the cause for prominent antibacterial and antihelminthic effects.

**Keywords:** Carthamus tinctorious L.; bactericidal; dehydroabietylamine; docking; glucosamine-6-phosphate synthase;  $\beta$ -Tubulin

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ISSN 0974-3618 (Print)  
0974-360X (Online)

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## RESEARCH ARTICLE

# Expression of Drug-metabolizing genes and Acetaminophen drug toxicity studies on 3D scaffold culture of Huh-7 cell line

Suma M S<sup>1</sup>, Jamuna K S<sup>1</sup>, Ramesh C. K<sup>1</sup>, Riaz Mahmood<sup>2</sup>

<sup>1</sup>Molecular Biomedicine Laboratory, PG Dept. of Studies and Research in Biotechnology, Sahyadri Science College, Kuvempu University, Shivamogga - 577203, Karnataka, India

<sup>2</sup>Department of Postgraduate Studies and Research in Biotechnology and Bioinformatics, Jnana Sahyadri, Kuvempu University, Shivamogga 577451, Karnataka, India

\*Corresponding Author E-mail: ckramck@gmail.com

## ABSTRACT:

Development of *ex vivo* cell culture models that adequately recreate *in vivo* conditions is useful in improved drug screening. Acetaminophen (APAP), well-known as paracetamol. Overdoses of APAP can induce hepatotoxicity which in turn results severe liver injury. There is a constant demand for *in vitro* high-throughput hepatic experimental platforms for measuring the hepatotoxicity. The purpose of this work is to provide a simple, easy-to-fabricate 3D hexagonal, hexa-channel micromachined scaffolds for studying liver cell line (Huh-7) and to provide a 3D scaffold culture system as an *in vitro* model for APAP induced hepato-toxicity studies on Huh-7 cell line. A silicon mould based template was used to cast out polydimethylsiloxane (PDMS) hexagonal scaffolds. Cells are cultured in the scaffolds which are placed inside a well plate. RNA isolated on day 3 and day 7 of culture, gene expression on these two different time points were analyzed by qPCR. Cytoskeletal assessment is done by rhodamine-phalloidin staining and cytotoxicity was performed by MTT assay. The difference in the mRNA levels of cytochrome P450 2E1 (CYP2E1) expressions was demonstrated through qRT-PCR technique. This work shows the effects of using Polydimethylsiloxane (PDMS) hexagonal scaffolds of 50nm height as a three-dimensional model to study Huh-7.

**KEYWORDS:** Perfusion-based culture, PDMS scaffolds-based cell culture, drug metabolism gene expression, Huh-7 cell line, APAP, cytotoxicity.

## INTRODUCTION:

The proliferation of cells is the first step in establishing a tissue culture procedure. In general, a small number of cells can be obtained from a primary source. These cells need to be expanded up to a certain magnitude to make them viable for different *ex vivo* studies. The cells rapidly lose their specific function after they are isolated from their origin. This would be a limitation for drug-screening and other studies. Thus, for a wide range of biology applications, it is important to culture the cell for long periods of time<sup>[1]</sup>.

In natural conditions *in vivo* cells are surrounded by a complex three-dimensional network provided by the extracellular matrix and other neighbouring cells<sup>[2]</sup>. These cells are also well connected by a complex network of capillaries to provide nutrients and to remove the waste materials<sup>[3]</sup>. A scaffold which can mimic these *in vivo* conditions will be beneficial in maintaining the cells *ex vivo*. Scaffolds play an important role in growth and proliferation of cells, as they provide extended supports to cells compare to 2D culture. Apart from structural framework scaffolds are also plays a vital role in targeted delivery of cells, DNA, drug *etc.* into respected sites<sup>[4-5]</sup>.

Received on 11.09.2019 Modified on 26.11.2019  
Accepted on 10.01.2020 © RJPT All right reserved  
Research J. Pharm. and Tech-2020; 13(5):2399-2406.  
DOI: 10.5958/0974-360X.2020.00431.X

Dr. Vittal Rao, K.S  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

Acetaminophen (APAP, paracetamol), also commonly known as *Tylenol*, is the most commonly taken analgesic worldwide. It is also used for its antipyretic effects, helping to reduce fever<sup>[6-7]</sup>. Acute doses of APAP can induce different cytotoxic mechanisms and

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SHIMOGA, Karnataka State.





## Article

## Novel 1,3,4-oxadiazole Targets STAT3 Signaling to Induce Antitumor Effect in Lung Cancer

Vikas H. Malojirao <sup>1,†</sup>, Swamy S. Girimanchanaika <sup>2,†</sup>, Muthu K. Shanmugam <sup>3</sup>, Ankith Sherapura <sup>1</sup>, Dukanya <sup>2</sup>, Prashant K. Metri <sup>2</sup>, Vellingiri Vigneshwaran <sup>1,4</sup>, Arunachalam Chinnathambi <sup>5</sup>, Sulaiman Ali Alharbi <sup>5</sup>, Shobith Rangappa <sup>6</sup>, Chakrabhavi Dhananjaya Mohan <sup>7</sup>, Basappa <sup>2,\*</sup>, Bettadathunga T. Prabhakar <sup>1,\*</sup> and Kanchugarakoppal S. Rangappa <sup>8,\*</sup>

- <sup>1</sup> Molecular Biomedicine Laboratory, Postgraduate Department of Studies and Research in Biotechnology, Sahyadri Science College, Kuvempu University, Shivamogga, Karnataka 577203, India; vikasvicky582@gmail.com (V.H.M.); ankithsbiotech@gmail.com (A.S.); vigsbio@gmail.com (V.V.)
- <sup>2</sup> Laboratory of Chemical Biology, Department of Studies in Organic Chemistry, University of Mysore, Manasagangotri, Mysore, Karnataka 570006, India; swamynayak010@gmail.com (S.S.G.); dukanya4@gmail.com (D.); prashant.metri@gmail.com (P.K.M.)
- <sup>3</sup> Department of Pharmacology, Yong Loo Lin School of Medicine, National University of Singapore, Singapore 117597, Singapore; phcsmk@nus.edu.sg
- <sup>4</sup> Department of Pharmacology, University of Illinois at Chicago, Chicago, IL 60612, USA
- <sup>5</sup> Department of Botany and Microbiology, College of Science, King Saud University, Riyadh 11451, Saudi Arabia; carunachalam@ksu.edu.sa (A.C.); sharbi@ksu.edu.sa (S.A.A.)
- <sup>6</sup> Adichunchanagiri Institute for Molecular Medicine, AIMS Campus, B. G. Nagar, Nagamangala Taluk, Mandya District 571448, India; shobithrangappa@gmail.com
- <sup>7</sup> Department of Studies in Molecular Biology, University of Mysore, Manasagangotri, Mysore, Karnataka 570006, India; cd.mohan@yahoo.com
- <sup>8</sup> Institution of Excellence, Vijnana Bhavan, University of Mysore, Mysore 570006, India
- \* Correspondence: salundibasappa@gmail.com (B.); pbtssc@gmail.com (B.T.P.); rangappaks@gmail.com (K.S.R.); Tel.: +91-948-120-0076 (B.); +91-96-328-72467 (B.P.T.); +91-821-241-9428 (K.S.R.)
- † These authors contributed equally.

Received: 15 June 2020; Accepted: 7 August 2020; Published: 21 September 2020



**Abstract:** Lung cancer is the leading type of malignancy in terms of occurrence and mortality in the global context. STAT3 is an oncogenic transcription factor that is persistently activated in many types of human malignancies, including lung cancer. In the present report, new oxadiazole conjugated indazoles were synthesized and examined for their anticancer potential in a panel of cancer cell lines. Among the new compounds, 2-(3-(6-chloro-5-methylpyridin-3-yl)phenyl)-5-(1-methyl-1H-indazol-3-yl)-1,3,4-oxadiazole (CHK9) showed consistently good cytotoxicity towards lung cancer cells with IC<sub>50</sub> values ranging between 4.8–5.1  $\mu$ M. The proapoptotic effect of CHK9 was further demonstrated by Annexin-FITC staining and TUNEL assay. In addition, the effect of CHK9 on the activation of STAT3 in lung cancer cells was examined. CHK9 reduced the phosphorylation of STAT3<sup>Y705</sup> in a dose-dependent manner. CHK9 had no effect on the activation and expression of JAK2 and STAT5. It also reduced the STAT3-dependent luciferase reporter gene expression. CHK9 increased the expression of proapoptotic (p53 and Bax) proteins and decreased the expression of the antiapoptotic (Bcl-2, Bcl-xL, BID, and ICAM-1) proteins. CHK9 displayed a significant reduction in the number of tumor nodules in the in vivo lung cancer model with suppression of STAT3 activation in tumor tissues. CHK9 did not show substantial toxicity in the normal murine model. Overall, CHK9 inhibits the growth of lung cancer cells and tumors by interfering with the STAT3 signaling pathway.

**Keywords:** lung cancer; antitumor; STAT3; apoptosis





## POTENTIAL ANTIMICROBIAL ACTIVITY OF (*AMISCHOPHACELUS AXILLARIS* L.) (*COMMELINACEAE*) AGAINST CERTAIN BACTERIAL SPECIES

K.S. Meghashree and K.P. Latha\*

Department of Chemistry, Sahyadri Science College, Shimoga (Karnataka) India.

### Abstract

*Amischophacelus axillaris* (L.) is a species of perennial plants in the family *Commelinaceae* commonly called Negilu thare in Kannada. In India, leaves are used for the treatment of tympanites and as food for pigs. The crushed leaves were subjected to the hot method of extraction using soxhlet extractor. The extraction method was carried out using numerous solvents viz., pet ether, ethyl acetate and ethanol per their increasing polarity. All the extracts were tested against *Escherichia coli* and *Staphylococcus aureus* by disc diffusion method. In all the extracts *Escherichia coli* exhibited maximum inhibition zone when compared to *Staphylococcus aureus*.

**Key words :** Antimicrobial activity, *Amischophacelus axillaris* (L.), Bacterial species.

### Introduction

*Amischophacelus axillaris* (L.) is a species of perennial plants in the family *Commelinaceae* commonly called Negilu thare in Kannada. It is narrow to the Indian Subcontinent, southern China, South East Asia, and Northern Australia. It grows in monsoon forest, woodland, and wooded grassland. Traditionally considered febrifuge, anti-inflammatory, antiparasitic and antifungal property. In India, leaves are used for the treatment of tympanites and as food for pigs (Thorn 1977). The use of plant extracts and phytochemicals, both are very important properties for antimicrobial activity and great significance in therapeutic treatments. A number of studies have been conducted to show such efficiency (Ablele and Erdourul 2003; Reddy *et al.*, 2001; Syed Nyamath and Karthikeyan 2018 and Pinkusatnami *et al.*, 2016). However antimicrobial activities of *Amischophacelus axillaris* (L.) on leaves extract of the plant is not reported so far, therefore the present study was undertaken.

### Materials and Methods

#### Collection and identification plant material

*Amischophacelus axillaris* (L.) leaves were collected in the month of July-August in Agumbe region, Shimoga district, Karnataka. The plant were authenticated

and deposited in the department of Botany Kuvempu University, Shanakaragatta, with voucher number KUAB4688.

#### Processing and extraction

The collected plant material was shade dried and coarsely pulverized. The pulverized plant material was subjected to the hot method of extraction using soxhlet extractor. The extraction method was carried out using numerous solvents viz., pet ether, ethyl acetate and ethanol per their increasing polarity. The obtained extract was filtered and evaporated to dryness under reduced pressure in a rotary vacuum evaporator.

#### Screening for antibacterial activity

##### Agar well diffusion method

Agar well radial diffusion technique was used for the evaluation of antibacterial activity of the test samples. The sterilized nutrient agar medium was poured into fresh petri dishes. Nutrient broth containing 100 µl of 24 h old cultures of respective bacterial strains was spread separately on the agar medium. Wells was made using a stainless steel sterilized cork borer under aseptic conditions. 25, 50, 100 µg/ml of petroleum ether, ethyl acetate and ethanol crude extracts were loaded into corresponding wells. The antibiotic Ciprofloxacin was used

  
Dr. Vittal Rao. K.S  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

  
PRINCIPAL  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.



## Antioxidant and antitubercular activities of leaf extracts of *Canthium dicoccum* (Gaertn.) and *Amischophacelus axillaris* (L.)

K. S. Meghashree, K. P. Latha\* and H. M. Vagdevi

Department of PG Studies and Research in Chemistry, Sahyadri Science College, Shivamogga 577203, Karnataka, India

Received 12 December 2019; Revised 16 October 2020

Modern civilization is facing hundreds of disorders associated with free radicals. The natural antioxidants from non-edible plants are gaining importance to fight against these disorders. One such commonly seen disorder is tuberculosis, which is responsible for about 8 million deaths annually worldwide. This study intends to evaluate the ethanol extracts of *Canthium dicoccum* (Gaertn.) and ethyl acetate extracts of *Amischophacelus axillaris* (L.) for antioxidant and antitubercular activities. The antioxidant activity of the extracts has been evaluated using DPPH radical scavenging methods. The results of the study indicated that ethanol extract of *C. dicoccum* (Gaertn.) and ethyl acetate extract of *A. axillaris* (L.) possess promising DPPH radical scavenging activity. The antitubercular activity of ethanol extract of *C. dicoccum* (Gaertn.) and ethyl acetate extract of *A. axillaris* (L.) have been evaluated against *Mycobacterium tuberculosis* H73Rv strain using Microplate Alamar Blue Assay (MABA). The activity was documented within the MIC range of 0.8 to 12.5 µg/mL for *C. dicoccum* (Gaertn.) and 0.8 to 50 µg/mL for *A. axillaris* (L.). The results of MABA showed that both the plant extracts exhibited excellent antitubercular activity. The present investigation suggests that *C. dicoccum* (Gaertn.) and *A. axillaris* (L.) possess remarkable antioxidant and antitubercular activity.

**Keywords:** *Amischophacelus axillaris* (L.), Antioxidant, Antitubercular, *Canthium dicoccum* (Gaertn.), Ethanol extract, Ethyl acetate extract.

IPC code; Int. cl. (2015.01)- A61K 36/00, A61K 36/74, A61K 127/00, A61P 31/00, A61P 31/06, A61P 39/00

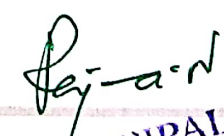
### Introduction

Oxygen is essential for aerobic metabolism<sup>1</sup>. Oxidative stress increases due to the imbalance between antioxidant systems in the organism. A metal pollutant and high energy physical radiation is the main cause of the increase of free radical. The metal ions like copper, iron and cadmium which can donate their electron are to create ROS through a common Fenton reaction<sup>2</sup>. The increase of ROS will lead the way to many oxidative damages because of the oxidation of protein, lipid and nucleic acids. This occurrence results in various diseases such as age-related neurodegenerative diseases and cancer<sup>3</sup>. An antioxidant is a substance that can scavenge the free radical by inhibiting the beginning step, thus bring down oxidative stress. Even though some synthetic antioxidants were used in plenty of food industries, antioxidant like butylated-hydroxytoluene (BHT) was demonstrated to be carcinogenic<sup>4</sup>. Alternative antioxidants derived from natural sources must be explored. Tuberculosis (TB) is one of the foremost infectious disease and a global health burden<sup>5</sup>.

It has been evaluated that, one-third of the world's population is currently infected with tuberculosis<sup>6</sup>. TB is one of the top three infectious killing diseases in the world. HIV/AIDS kills 3 million people each year, TB kills 2 million and malaria kills 1 million<sup>7</sup>. The involvement of TB with HIV infection is so prevalent that nearly two-thirds of the patients diagnosed with tuberculosis are also HIV-1 seropositive<sup>8</sup>. Antitubercular drugs such as rifampicin (RIF), ethambutol, isoniazid (INH), streptomycin, etc have been a foundation in the healing of tuberculosis<sup>9</sup>. The screening of plant extracts has been of great importance to scientists in the search for novel drugs for the helpful treatment of several diseases<sup>10</sup>. Based on the two problems foregoing, plants have been considered to possess a diverse agent of antioxidant and antitubercular substances. Currently, the use of alternative medicine starts to replace conventional medicine. *Canthium dicoccum* (Fig. 1), found in the Western Ghats of India is commonly known as Ceylon boxwood in English and as nallabalu in Telugu, belongs to the family Rubiaceae<sup>11</sup>. In India, its bark is used to cure fever and a decoction of the root is used internally for diarrhea. Bark powder with sesame oil is used in rheumatic pain<sup>12,13</sup>. The plant is proved for its

\*Correspondent author  
Email: lathakp337@gmail.com

  
**Dr. Vittal Rao, K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

  
**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.





## IN VITRO ANTICANCER ACTIVITY OF *CANTHIUM DICOCCUM* (GAERTN.) AGAINST LUNG CANCER CELL LINE

Meghashree K.S. and K.P. Latha\*

Department of P.G. Studies and Research in Chemistry, Sahyadri Science College, Kuvempu University, Shivamogga- 577203 (Karnataka), India.

### Abstract

*Canthium dicoccum* (Gaertn.) the Ceylon boxwood also known as Bellachi in Kannada belongs to the family *Rubiaceae*. The crushed leaves were subjected to the hot method of extraction using soxhlet extractor. The extraction method was carried out using numerous solvents viz., pet ether, ethyl acetate and ethanol per their increasing polarity. The ethanol extracts were tested against A549 cell line with maximum reduction in cell viability were chosen for further staining experimentation. Cytotoxic activity was studied using MTT assay the isolated compound have  $IC_{50}$  values lower than that standard Doxorubicin. At 50  $\mu$ g/ml. concentration there is a lesser values, i.e., 21.17 %. The results clearly revealed that the isolated pure compound from crude ethanol extract from column chromatography of *Canthium dicoccum* was more potent on A549 cell line..

**Key words :** A549 Cell line, Ethanol Extract, Anticancer activity, *Canthium dicoccum*.

### Introduction

*Canthium dicoccum* (Gaertn.) the Ceylon boxwood also known as Bellachi in Kannada belongs to the family *Rubiaceae* (Raja Rajeswari N *et al.*, 2011). In India its bark is used for fever and decoction of the root is used internally for diarrhea. Bark powder with sesame oil is used in rheumatic pain (Neelima M *et al.*, 2011; Santhan S *et al.*, 2013). The plant is proved for its antidiabetic and nephroprotective activity (Vidyanthi RD *et al.*, 2005). The use of plant extracts and phytochemicals, both are very important properties for antimicrobial activity and great significance in therapeutic treatments. A number of studies have been conducted to show such efficiency (Abtele and Erdourul 2003; Reddy *et al.*, 2001; Syed Nyamath and Karthikeyan 2018 and Pinkusatnami *et al.*, 2016).

### Materials and Methods

#### Collection and Identification plant material

The *Canthium dicoccum* (Gaertn.) leaves were collected in the month of June-July in Hosnagar (T), Shimoga district, Karnataka. The plant were authenticated

\*Author for correspondence : E-mail. lathakp337@gmail.com

and deposited in the department of Botany Kuvempu University, Shanakaragatta, with voucher number KUAB4688. A voucher specimen has been preserved in our laboratory for future reference.

#### Processing and extraction

The collected leaves were dried under shade and then powdered with a mechanical grinder and stored in airtight container. The dried powder material of the leaves was subjected to the hot method of extraction using soxhlet extractor with petroleum ether, ethyl acetate and ethanol per their increasing polarity. The obtained extract was filtered and evaporated to dryness under reduced pressure in a rotary vacuum evaporator.

#### Anticancer activity

##### Procedure

A549 cells were obtained from NCCS (Pune, India). A549 cells were cultured as monolayer in DMEM containing high glucose - 4.5 g/L, 4 mM glutamine, 3.7 g/L sodium bicarbonate, 25 mM sodium pyruvate and supplemented with 10% heat inactivated bovine serum, 100 U penicillin and 100 ig/mL streptomycin. Cell lines were maintained in a humidified atmosphere of 95% air

**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.



## POTENTIAL ANTIBACTERIAL ACTIVITY OF *CANTHIUM DICOCCUM* (GAERTN.) AGAINST CERTAIN BACTERIAL SPECIES

K.S. Meghashree and K.P. Latha\*

Department of Chemistry, Sahyadri Science College, Shimoga (Karnataka), India.

### Abstract

*Canthium dicoccum* (Gaertn.) the Ceylon boxwood also known as Bellachi in Kannada belongs to the family Rubiaceae. The crushed leaves were subjected to the hot method of extraction using soxhlet extractor. The extraction method was carried out using numerous solvents viz., pet ether, ethyl acetate and ethanol per their increasing polarity. All the extracts were tested against *Escherichia coli* and *Staphylococcus aureus* by disc diffusion method. In all the extracts *Escherichia coli* exhibited maximum inhibition zone when compared to *Staphylococcus aureus*.

**Key words :** Antimicrobial activity, *Amischophacelus axillaris* (L.), Bacterial species.

### Introduction

*Canthium dicoccum* (Gaertn.) the Ceylon boxwood also known as Bellachi in Kannada belongs to the family Rubiaceae (Raja Rajeswari N *et al.*, 2011). In India its bark is used for fever and decoction of the root is used internally for diarrhea. Bark powder with sesame oil is used in rheumatic pain (Neelima M *et al.*, 2011; Santhan S *et al.*, 2013). The plant is proved for its antidiabetic and nephroprotective activity (Vidarthi RD *et al.*, 2005).

The use of plant extracts and phytochemicals, both are very important properties for antimicrobial activity and great significance in therapeutic treatments. A number of studies have been conducted to show such efficiency (Abtele and Erdourul 2003; Reddy *et al.*, 2001; Syed Nyamath and Karthikeyan 2018 and Pinkusatnam *et al.*, 2016).

### Materials and Methods

#### Collection and identification plant material

The *Canthium dicoccum* (Gaertn.) leaves were collected in the month of June-July in Hosnagar (T), Shimoga district, Karnataka. The plant were authenticated and deposited in the department of Botany Kuvempu University, Shanakaragatta, with voucher number KUAB4688. A voucher specimen has been preserved in our laboratory for future reference.

#### Processing and extraction

The collected leaves were dried under shade and then powdered with a mechanical grinder and stored in airtight container. The dried powder material of the leaves was subjected to the hot method of extraction using soxhlet extractor with petroleum ether, ethyl acetate and ethanol per their increasing polarity. The obtained extract was filtered and evaporated to dryness under reduced pressure in a rotary vacuum evaporator.

#### Screening for antibacterial activity

##### Agar well diffusion method

Agar well radial diffusion technique was used for the evaluation of antibacterial activity of the test samples. The sterilized nutrient agar medium was poured into fresh petri dishes. Nutrient broth containing 100 µl of 24 h old cultures of respective bacterial strains was spread separately on the agar medium. Wells was made using a stainless steel sterilized cork borer under aseptic conditions. 25, 50, 100 µg/ml of petroleum ether, ethyl acetate and ethanol crude extracts were loaded into corresponding wells. The antibiotic Ciprofloxacin was used as standard (1 µg/ml of sterile water). The plates were incubated for 24 h at 37 °C and the diameter of the zone of bacterial growth inhibition was measured and the readings were recorded in millimeter (Thippeswamy *et al.*, 2011).

**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.





## Synthesis and biological evaluation of novel indolyl-dihydropyridin-3-carboxylate, dihydro[1,2,4]triazol[1,5]pyridin-3-carboxylate and carbohydrazide derivatives

Prabhakar Walmik

Department of Post-Graduate Studies and Research in Chemistry,  
Sahyadri Science College (Kuvempu University), Shivamogga 577 203, India  
E-mail: prabhakarchavan7@gmail.com

Received 5 September 2019; accepted (revised) 20 November 2019

The present study anticipates the development of novel antioxidant, antimicrobial and antitubercular drugs by using the indole scaffold. Novel indole derivatives, (4a-c), (5a-c) and (6a-l) have been prepared. The structures of all these unknown compounds have been confirmed with the help of elemental analysis, IR,  $^1\text{H}$  &  $^{13}\text{C}$  NMR and mass spectral data. All these previously unknown synthesized compounds screened for their antioxidant, antimicrobial and antitubercular activities. Compound 5a exhibited good RSA 76.58 %,  $\text{IC}_{50}$  value <25  $\mu\text{g/mL}$ . Compound 5a exhibited higher absorbance 0.691nm, at concentration 100  $\mu\text{g/mL}$ . Compound 6a showed good metal chelating activity (64.10 %) at a concentration 100  $\mu\text{g/mL}$ . Compound 6a showed potent activity against *S. aureus* and *P. aeruginosa*. Compounds 4a and 5a showed promising antitubercular activity MIC 6.25  $\mu\text{g/mL}$ . Compound 6a showed excellent activity (MIC= 3.125  $\mu\text{g/mL}$ ) against *M. tuberculosis* H37Rv, than the standards pyrazinamide (MIC= 3.125) and Streptomycin (6.25  $\mu\text{g/mL}$ ).

**Keywords:** Indole, dihydropyridine, dihydro[1,2,4]triazol[1,5]pyridine, antimicrobial, antioxidant, antitubercular activity

Antioxidants are playing a vital role because of their involvement in biological and industrial processes. In general, compounds with antioxidant activity have been found to possess anti-cardiovascular, anti-inflammatory and anticancer<sup>1-3</sup> activities. Reactive oxygen species (ROS) and antituberculosis<sup>4</sup>. Free radicals are considered to be implicated in a variety of pathological events, such as cancer and aging agents<sup>5,7</sup>.

Indole derivatives constitute an important class of therapeutic agents in medicinal chemistry such as antimicrobial<sup>8</sup>, antioxidant<sup>9</sup>, antiviral<sup>10</sup>, anti-HIV, antimalarial<sup>11</sup> and dihydropyrimidine derivatives are widely used for the variety of pharmacological activities<sup>12,13</sup>, antitubercular<sup>14</sup>, antitumor<sup>15</sup>, antiepileptic<sup>16</sup>, antimalarial<sup>17</sup>, antiviral<sup>18</sup>, anti-inflammatory<sup>19</sup>, analgesic<sup>20</sup> and antimicrobial<sup>21</sup> activity.

The treatment of infectious diseases still remains an important and challenging problem because of a combination of factors including emerging infectious diseases and the increasing number of multi-drug resistant microbial pathogens. In spite of a large number of antibiotics and chemotherapeutics available for medicinal use, at the same time the emergence of resistance developed against old and new antibiotics in the last decades revealed a substantial need for new

classes of antimicrobial agents. There is really perceived need for the discovery of new compounds endowed with antimicrobial activity, possibly acting through mechanisms of action, which are distinct from those of well-known classes of antibacterial agents to which many clinically relevant pathogens are now resistant<sup>22</sup>.

There are many marketed drugs containing the 1,2,4-triazole group e.g., triazolam, alprazolam, etizolam and furacyclin. From the literature<sup>22</sup>, it may be predicted that 1,2,4-triazole moiety represents important pharmacophore and play a vital role in medicinal agents. A degree of respectability has been bestowed upon 1,2,4-triazole derivatives due to their wide range of biological activities such as antibacterial<sup>23</sup>, antifungal<sup>24</sup>, antitubercular<sup>25</sup>, anticancer<sup>26</sup> anti-tumor<sup>27</sup> activity.

In view of the above findings and in continuation of our research on the synthesis of biologically active molecules<sup>28-32</sup> in present investigation we report the synthesis, antioxidant, antimicrobial and antitubercular activities of novel indole derivatives. In the design of new drugs, the combination of different pharmacophores frame may lead to compounds with interesting biological profile.

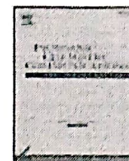
Dr. Vittal Rao. K.S  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

PRINCIPAL  
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(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.



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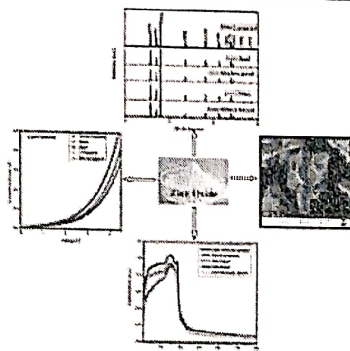
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# Effect of solvents on structural, optical and electrical properties of ZnO nanoparticles synthesized by microwave heating route

R.O. Yathisha, Y. Arthoba Nayaka\*

Department of Chemistry, School of Chemical Sciences, Kuvempu University, Jnanasahyadri, Shankaraghatta 577 451, Karnataka, India

## GRAPHICAL ABSTRACT



## ARTICLE INFO

### Keywords:

Crystal structure  
Electrical properties  
FE-SEM  
Microwave heating  
Semiconductors

## ABSTRACT

Herein, we have studied the effects of solvents on structural, optical and electrical properties of prismatic shaped zinc oxide (ZnO) nanoparticles synthesized through microwave heating method. The samples were prepared by using various solvents viz., water (WT), digol (DEG), 2-propanol (2-PL) and ethylene glycol (EG). The XRD (X-ray diffraction) and FE-SEM (Field emission scanning electron microscopy) results confirmed that the crystallite size and growth of ZnO nanoparticles depended on the solvents used. EDAX analysis evaluates the Zinc (Zn) and oxygen (O) composition in the synthesized ZnO nanoparticles. The absorbance and reflectance studies were undertaken by UV-Visible spectroscopy. The energy gap of synthesized ZnO nanostructures was calculated using Kubelka-Munk plot. I-V characterization study was performed to estimate the current intensity of ZnO films.

## 1. Introduction

Zinc oxide (ZnO) is an II-IV semiconductor (n-type) with a wide band gap of 3.37 eV at room temperature. It has a large exciton binding energy (60 eV), which provides ultraviolet (390 nm) excitonic laser action upon optical pumping at room temperature. Therefore, it is to be

a suitable material for optoelectronic applications. The breakdown strength and saturation velocity also make ZnO a potential nanomaterial for high temperature and high power electronics [1]. Moreover, ZnO is a most abundant material with the advantage of non-toxicity, low processing cost, high chemical stability and eco-friendly nature. Due to these physicochemical properties of ZnO nanoparticles finds

\* Corresponding author.

E-mail addresses: [yathisharo@yahoo.com](mailto:yathisharo@yahoo.com) (R.O. Yathisha), [drarthoba@yahoo.co.in](mailto:drarthoba@yahoo.co.in) (Y.A. Nayaka).<https://doi.org/10.1016/j.inoche.2020.107877>

Received 27 December 2019; Received in revised form 25 February 2020; Accepted 5 March 2020

Available online 11 March 2020

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**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

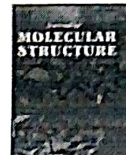
**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.





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Journal of Molecular Structure

journal homepage: <http://www.elsevier.com/locate/molstruc>

# Investigation the influence of $\text{Zn}^{2+}$ doping on the photovoltaic properties (DSSCs) of MgO nanoparticles

R.O. Yathisha, Y. Arthoba Nayaka\*, H.T. Purushothama, P. Manjunatha, K.V. Basavarajappa, M.M. Vinay

Department of Chemistry, School of Chemical Sciences, Kuvempu University, Jnanasahyadri, Shankaraghatta, 577 451, Karnataka, India

## ARTICLE INFO

### Article history:

Received 18 February 2020

Received in revised form

30 April 2020

Accepted 6 May 2020

Available online 8 May 2020

### Keywords:

Current intensity

Evans blue

Micro-strain

Photo-anode

Sensiti

s

ation

ZnO–MgO

## ABSTRACT

The present work demonstrates the synthesis of MgO and ZnO–MgO nanospheres with various concentration (2, 4, 6, 8 and 10 wt%) of  $\text{Zn}^{2+}$  through microwave combustion route using magnesium nitrate and zinc nitrate as precursors and ethylene glycol as solvent. The effect of doping was studied through powder X-ray diffraction (XRD), scanning electron microscopy (SEM), energy-dispersive analysis using X-rays (EDAX), transmission electron microscopy (TEM) and photoconductivity (I–V) technique. Trypan Blue, SPADNS and Evans Blue dyes were used for the first time as a photosensitizer on ZnO–MgO nanoparticles. Optical and electrochemical characteristics of dyes revealed that the optical bandgap, HOMO and LUMO levels of dyes are well matched with conduction band of ZnO–MgO nanoparticles. I–V characteristics of ZnO–MgO films before and after sensitisation with dyes revealed the influence of dye sensitisation on photo conductivity of ZnO–MgO nanoparticles. In addition, the better adsorption of Trypan Blue (TB), SPADNS (SPD) and Evans Blue (EB) dyes on ZnO–MgO film is due to porous nature of ZnO–MgO. This gives more transportation of electron from dye to ZnO–MgO which enhances the power conversion efficiency of solar cell.

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## 1. Introduction

Recently, dye-sensitised solar cells (DSSCs) have significant commercial interests compared to alternative conventional Si-based solar cells (due to relatively high photo conversion efficiency, low-cost, eco-friendly nature and easy fabrication procedure) [1–4]. For the improvement of the efficiency of DSSCs, there have been substantial efforts assigned to synthesize the efficient and novel structured semiconducting materials such as tin oxide ( $\text{SnO}_2$ ), copper sulphide (CuS), tungsten oxide ( $\text{WO}_3$ ), zinc oxide (ZnO) and titanium oxide ( $\text{TiO}_2$ ). These materials are more promising due to their special properties such as large surface to volume ratio, quantum size effect, optical, electrical and magnetic properties [5–7]. Out of all semiconducting materials, MgO has gained an extensive scientific interest in current years due to its unique chemical, optical and electronic properties. MgO has a rock salt structure with  $\text{Mg}^{2+}$  and  $\text{O}^{2-}$  ions which are octahedral

coordinated, making bulk magnesium oxide as diamagnetic material with a wide band gap of 7.8 eV [8]. Due to its wide band gap, inexpensiveness and long term stability, the MgO is used in potential applications of numerous disciplines. It can be extensively utilized in the fields of translucent ceramics, refractory, plasma display panel, absorbents in many pollutants and superconducting products [9]. Due to good photocatalytic properties of MgO, it is being used in the form of ultra-thin shell on the surface of some metal oxides such as  $\text{SnO}_2$  [10], ZnO [11] and  $\text{TiO}_2$  [12] to improve the efficiency of dye-sensitised solar cells. Also, it is an eco-friendly material and is extensively used in many medical, industrial and agricultural products [13–16].

Currently, research is more dedicated towards synthesising the undoped and transition metal doped semiconducting nanomaterials. For semiconductors, doping is an effective method to improve and control the optical and electrical properties. Nowadays researchers are selecting simple and cost effective dopant atoms like Cr, Fe, Cu, Ni, Ag, Nd, Eu and Al to develop and modify the unique features of synthesised host nanomaterials [17]. Out of all transition metal ions, zinc has been chosen to improve the optical, electrical and luminescent properties of MgO. It is because; the  $\text{Zn}^{2+}$  doping is expected to alter the electronic band structure of

\* Corresponding author.

E-mail addresses: [yathisharo@yahoo.com](mailto:yathisharo@yahoo.com) (R.O. Yathisha), [arthobha@yahoo.co.in](mailto:arthobha@yahoo.co.in) (Y. Arthoba Nayaka).

<https://doi.org/10.1016/j.molstruc.2020.128407>

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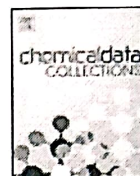
Dr. Vital Rao. K.S  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

PRINCIPAL  
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(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.



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## Data Article

## Development of Azure-B modified pencil graphite electrode as an electrochemical sensor for the investigation of Levofloxacin in pharmaceutical and biological samples

M.M. Vinay, Y. Arthoba Nayaka\*, R.O. Yatisha, K.V. Basavarajappa, P. Manjunatha, H.T. Purushothama

Department of Chemistry, School of Chemical Science, Kuvempu University, Shankaraghatta, 577451, Karnataka, India

## ARTICLE INFO

Article history:  
Received 12 November 2019  
Revised 27 April 2020  
Accepted 27 May 2020  
Available online 5 June 2020

Keywords:  
Cyclic voltammetry  
Differential pulse voltammetry  
Electrochemical impedance spectroscopy  
Levofloxacin

## ABSTRACT

Electrochemical investigation of Levofloxacin (LVF) was carried through cyclic voltammetry (CV), differential pulse voltammetry (DPV) and square wave voltammetry (SWV) techniques by using sensitive Azure-B modified pencil graphite electrode (Azure-B/PGE). The PGE and Azure-B/PGE have been characterized by electrochemical impedance spectroscopy using 5 mM  $K_3[Fe(CN)_6]$  in 0.1 M KCl and  $R_{ct}$  values were found to be 190 and 1.2 k $\Omega$  respectively. The effects of scan rate, pH, concentration and interfering substances were studied. The 1.2  $\mu$ M LOD of LVF has been obtained in the linear range 2–125  $\mu$ M. This scheme could be successfully used to determine the concentration of LVF in biological fluids and pharmaceutical samples.

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## Specifications table

|                         |                                                                                                               |
|-------------------------|---------------------------------------------------------------------------------------------------------------|
| Subject area            | : Physical Chemistry and Analytical Chemistry                                                                 |
| Compounds               | : Levofloxacin                                                                                                |
| Data category           | : Electrochemical                                                                                             |
| Data acquisition format | : Voltammograms, differential pulse voltammetry, square wave voltammetry, Characterization of the data        |
| Data type               | : Analyzed                                                                                                    |
| Procedure               | : Azure-B modified pencil graphite electrode preparation and applied for electrochemical investigation of LVF |
| Data accessibility      | : Data is with this article                                                                                   |

## 1. Rationale

The antibiotics are the most commonly used drug to treat bacterial diseases. Fluoroquinolones are the synthetic antibacterial drugs used as medicine since the 1980s. Levofloxacin (LVF) 9-fluoro-3,7-dimethyl-10-(4-methylpiperazin-1-yl)-2,3-dihydro-7H [1,4]oxazino[2,3,4-ij]quinoline-6-carboxylic acid is one of the fluoroquinolone agent fights against the gram-negative pathogens and few gram-positive bacteria via the hindrance of their DNA gyrase [1]. LVF has been extensively utilized as a medicine in the human and veterinary system. Normally LVF tolerated at some instances and may excess causes the common side effects such as headache, nausea, insomnia, dizziness, diarrhea, toxic skin disorder, Stevens-Johnson syndrome, joint pain, allergic pneumonitis, kidney damage, liver failure, and blood-related issues [2]. So, it is necessary to

\* Corresponding author.

E-mail address: [drarthoba@yahoo.co.in](mailto:drarthoba@yahoo.co.in) (Y.A. Nayaka).

Dr. Vittal Rao. K.S  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

PRINCIPAL  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.



## Analytical & Bioanalytical Electrochemistry

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### Full Paper

# Development of Single Walled Carbon Nanotube-Molybdenum Disulfide Nanocomposite/Poly-ethylene Glycol Modified Carbon Paste Electrode as an Electrochemical Sensor for the Investigation of Sulfadiazine in Biological Samples

Matad Mallikarjunaiah Vinay, Yanjerappa Arthoba Nayaka, Kempugonapla Virupakshappa Basavarajappa, Puttaiah Manjunatha, Hanumasagara Thimmappa Purushothama, and Rangapura Onkarappa Yathisha

Department of Chemistry, School of Chemical Science, Kuvempu University, Shankaraghatta -577451, Karnataka, India

\*Corresponding Author, Tel.: +919448855078; Fax: +9108282 256255

E-Mail: [drarthoba@yahoo.co.in](mailto:drarthoba@yahoo.co.in)

Received: 24 December 2019 / Received in revised form: 30 January 2020 /

Accepted: 31 January 2020 / Published online: 29 February 2020

**Abstract-** A rapid electrochemical analysis of sulfadiazine (SFZ) has been carried out by cyclic voltammetry (CV) and differential pulse voltammetry (DPV) methods by employing a sensitive single walled carbon nanotube-molybdenum disulfide nanocomposite/poly ethylene glycol modified carbon paste electrode (SWCNT-MoS<sub>2</sub>/PEG/CPE). The SFZ shows anodic peak potential at 0.94 V (vs. Ag/AgCl) in 0.1 M PBS of pH 7.0. The SFZ has been examined at different scan rate from 50 to 300 mVs<sup>-1</sup> in 0.1 M PBS of pH 7.0 and the nature of mass transfer route is diffusion-controlled process. The different pH from 5.6 to 8.0 was analyzed at SFZ and obtained the slope value 0.063 proves the equal number of electrons and protons were involved in the reaction. In DPV mode LOD of SFZ in the linear range of 2-90 µM was found to be 1.69 µM. The prepared electrode was examined by electrochemical impedance spectroscopy (EIS) using 5 mM K<sub>3</sub>[Fe(CN)<sub>6</sub>] in 0.1 M KCl. The effective surface area of SWCNT-MoS<sub>2</sub>/PEG/CPE was found to be 0.262 cm<sup>2</sup>. This method could be successfully employed to determine the concentration of SFZ in biological fluids.

**Keywords-** Carbon paste electrode, Cyclic voltammetry nanotubes, Nanoparticles, Sulfadiazine

  
**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

  
**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.

# PHYSICO-CHEMICAL AND TRACE METAL PROFILE OF PURLE TANK, SHIVAMOGGA DISTRICT, KARNATAKA

RAVIKUMAR, R\*, PURUSHOTHAMA, R\*\* AND KIRAN B.R\*\*\*

\*Assistant Professor, Department of Geology, Sahyadri Science College, Shivamogga-577201, Karnataka.

\*\*Lecturer, Department of Environmental Science, Sahyadri Science College, Shivamogga-577201, Karnataka.

\*\*\*Research & Teaching Assistant in Environmental Science, DDE, Kuvempu University, Shankaraghatta- 577 451, Karnataka, India.

## ABSTRACT

The present investigation is aimed to know the concentration of trace metals (Iron, Zinc, Copper, Nickel, Chromium, Lead and Cadmium) in the sediment and water samples of Purle tank of Shivamogga district, Karnataka during the year 2017-18. The study revealed that the Purle tank is contaminated by few trace metals. The order of sequence of the levels of trace metals in the tank water for 5 sites was  $Pb > Zn > Cu > Cr > Cd > Fe$ , for sediment samples was  $Fe > Pb > Cr > Zn > Cd > Cu$ . The geoaccumulation index for trace metals show that the tank is extremely polluted. The present analysis reveals that sediment and water of the tank needs some degree of treatment in order to protect from future contamination.

**Key words:** Purle tank, trace metals, water quality, pollution, Shivamogga.

## INTRODUCTION

Tanks are the dynamic lentic aquatic system that supports a unique biological integrity. Tanks are degrading due to anthropogenic activities. Biodiversity of tanks are threatened due to over utilization of resources and undesirable activities. It is noted that species rich water bodies are capable of self maintaining (Abida Begum *et.al.*, 2008). Several limnologists have studied the limno-biotic factors of certain tanks and rivers showed

  
**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

VOLUME 14, ISSUE 5, 2020

  
**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.

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# INFLUENCE OF WEATHER PARAMETERS ON INCIDENCE OF YELLOW STEM BORER, *SCIRPOPHAGA INCERTULAS* (WALKER) IN RICE ECOSYSTEM SHIVAMOGGA, KARNATAKA

D. Shilpa<sup>1</sup>, K.L. Naik<sup>2</sup> and B.B. Hosetti<sup>3</sup>

Department of Zoology, Sahyadri Science College, Kuvempu University Shivamogga-577203 (Karnataka), India.

## Abstract

A field experiment was conducted on the Influence of weather parameters on incidence yellow stem borer, *Scirpophaga incertulas* (Walker) in rice ecosystem Shivamogga, Karnataka incidence of yellow stem on rice variety Jyothi, initiated from 11<sup>th</sup> standard week (9.37 %) of dead of heart and maximum during 15<sup>th</sup> standard week (36.5%) and white ear head started at 17<sup>th</sup> standard week (17.2 %) and maximum during 19<sup>th</sup> standard week (22.8%) during Summer. In Kharif, the incidence of yellow stem borer initiated from 33<sup>rd</sup> standard week (8.1%) of dead heart and maximum during 39<sup>th</sup> standard week (32.2 %). And white ear head started at 37<sup>th</sup> standard week (19.0%) and maximum during 42<sup>nd</sup> standard week (38.5%) whereas weather parameters viz., maximum temperature, minimum temperature, rainfall showed significant positive correlation with the incidence of yellow stem borer.

**Key words:** Weather parameters, Kharif, Jyothi variety, *Scirpophaga incertulas*.

## Introduction

Rice (*Oryza sativa*), occupies the prominent place in Indian agriculture and staple diet of over half of the world's population, is grown on over 145million ha in more than 110 countries, and occupies almost one fifth of the total world cropland under cereals (Pathak and Khan 1994). About 90% of world's rice produced and consumed in Asia (Anonymous, 2004). Globally, rice is the second most widely consumed cereal next to wheat and it has occupied an area of 163.2 million hectares with total production of 719.7 million tonnes (Anonymous, 2014). Rice crop is subjected to sustain a considerable damage by a number of insect pests and among them yellow stem borer (YSB), *Scirpophaga incertulas* (Walker) is one of the most destructive pest and is widely distributed monophagous pest in Indian sub-continent and has assumed the number one pest status attacks the rice crop at all growth stages (Pasulu *et al.*, 2002). The extent of rice yield losses due YSB has been estimated as 20-70% (Catling *et al.*, 1987). It causes "Dead hearts" at vegetative stage of the crop (active tillering stage) and "White ear head" at the reproductive stage of the crop (panicle initiation stage). Yellow stem borer cause

significant yield loss during September, November and February, March seasons (Gosh 1962). Globally Yellow stem borer causes yield loss of 10 million tonnes and 50% of the insecticides are used for their management in the rice fields (Gailce *et al.*, 2013).

Meteorological factors such as Temperature, rainfall and relative humidity play important role in seasonal abundance, distribution and population buildup of insect pests and greatly influence the outbreak population (Chen *et al.*, 1968). So the present study has undertaken to know the infestation of yellow stem borer during summer and Kharif.

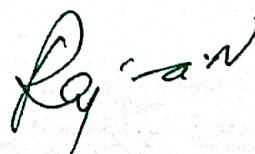
## Materials and Methods

The experiment was conducted in Kudli, Shivamogga Karnataka during summer and Kharif 2018 on rice variety Jyothi, for this purpose field preparation were done and all the recommended cultivation practices were followed during the period of investigation, however experimental field was kept free from insecticidal spray throughout the study.

The observations on yellow stem borer infestation were made at weekly interval till harvesting. The percent borer incidence was assessed by counting the number of

\*Author for correspondence : E-mail : kidsgowda100@gmail.com

  
**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.



**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)





## ROLE OF GUT MICROFLORA IN TOXICITY OF *BACILLUS THURINGIENSIS* SUBSPECIES *GALLERIAE* TO THE LARVAE OF *SPODOPTERA LITURA* (NOCTUIDAE: LEPIDOPTERA)

Yalashetti Sanjay<sup>1</sup>, Rudrappa Onkarappa<sup>1</sup> and Yandigeri Mahesh<sup>2</sup>

<sup>1</sup>Department of Microbiology Sahyadri science college (Autonomous), Vidyanagar, Shivamogga, Karnataka, India-577203

<sup>2</sup>Department of Genomic Resources, ICAR-National Bureau of Agricultural Insect Resources, Hebbal, Bengaluru, Karnataka, India-560024

\*Correspondence author E-mail: sanjuhrg@gmail.com

### Abstract

It is well known understands that synergistic and additive effects both between *Bt* toxins and other compounds do occur. Mode of action of *B. thuringiensis* (*Bt*) Cry toxins are very specific. Different strains of *Bt* are specific to different receptors in insect gut wall. *Bt* toxicity depends on recognizing receptors, damage to the gut by the toxin occurs upon binding to a receptor. Each insect species have different types of receptors. Comparatively less consideration has been devoted to other important research aspects, such as the compound network of molecular interactions underpinning the host killing mechanism and the role of factors other than the pore-forming toxins that contribute to *B. thuringiensis* pathogenicity and virulence. The presence of symbiotic gut flora in the insect midgut also plays a major role. We examined the interaction between *Bacillus thuringiensis* subsp. *galleriae* and larval gut flora in the lepidopteran pest, *Spodoptera litura*. Dose-mortality bioassays of *Bt galleriae* were conducted on normal and gut flora eliminated larvae of *S. litura*. The results showed that the gut microflora play a major role in determining the toxicity of *B. thuringiensis*.

**Keywords:** Bacterial diversity, insect gut microbes, Elimination of bacteria, microbial interactions

### Introduction

The entomopathogenic bacterium, *Bacillus thuringiensis* (*Bt*) produces parasporal crystals that are toxic to wide array of insects and other related organisms. The targeted mode of action in the insect gut includes solubilization of the crystals upon ingestion by the susceptible insect and its activation by midgut proteases then binding to the pore forming toxin at specific receptors present on the midgut brush border membrane vesicle (Soberon *et al.*, 2016). However, comparatively less interest has been shown to the other factors such as the function of gut microflora in modulating *Bt* toxicity. Insects harbor a different range of gut bacteria that aids in host insect nourishment and protection from pathogenic microbes (Engel and Moran, 2013). However, compared to mammalian gut, the insect gut harbors only few microbial species, but specialized in their function. DGGE analysis of the field population of *Spodoptera litura* reportedly contain more than 15 gut bacterial OTUs (Gadad *et al.*, 2017).

It is well understood that the *S. litura* is relatively less susceptible to many *Bt* strains including the widely used *Bt kurstaki* HD-1. *S. litura* (Noctuidae: Lepidoptera) is a polyphagous pest and cosmopolitan in distribution. The various experimental evidences indicate that the gut microflora play an additive role in increasing the toxicity of *Bt* in few insect species (Broderick *et al.*, 2009). However, in other insects the gut microfloras were linked to degradation/inactivation of toxic effect of *Bt* (Heckel *et al.*, 2018; Xia *et al.*, 2018).

*Bt* is considered as feasible alternative way to manage the pests under organic agriculture as well as to eliminate the pesticide resistant individuals. The current work explored the effective role of gut microflora on toxicity of *Bt* to the larvae of *S. litura*.

### Materials and Methods

#### Collection and rearing of test insect

The egg masses and larvae of *S. litura* were collected from cabbage field at ICAR-NBAIR farm, Bengaluru, Karnataka, India (13°05' N, 77°33' E). The *S. litura* larvae were reared on fresh castor leaves till pupation. During ovipositions of the adult moths were provided with 10% honey solution fortified with multivitamins. Eggs were surface sterilized in 0.2% sodium hypochlorite solution and the larvae from F1 generation were maintained on chickpea based artificial diet at 28± 2 C, 60% relative humidity and 14:10h photoperiod.

#### Elimination of gut microflora

The elimination of gut micro flora was determined by feeding the larvae of *S. litura* with a range of antibiotic concentrations in combination. The neonate larvae of *S. litura* was fed with a combination of streptomycin and rifampicin (each 50µg/ml) amended diet till molting to second instar was found to inhibit >99% of the culturable midgut bacteria in the larvae and hence in subsequent gut curing experiments the same combination and dose were used. The freshly molted second instar larvae reared on antibiotic amended diet and normal diet were used in dose-mortality bioassays.

#### Culturing and formulation of *Bacillus thuringiensis* (*Bt*)

The locally isolated *Bt* subsp. *galleriae* (MTCC 8977) was grown in Luria Bertani broth at laboratory conditions 150 rpm for 72 hours at 30°C. The sporulated culture was centrifuged at 8000 rpm and the pellet was washed twice with 0.5M NaCl solution followed by washing thrice with sterile distilled water. The resultant pellet was subjected to lactose-acetone based co-precipitation method (Dulmage *et al.*, 1970). The precipitate containing spore crystal mixture was vacuum dried, powdered and used for bioassay studies.

Dr. Vittal Rao. K.S  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.





## BIOLOGY OF POTATO TUBER MOTH *PHTHORIMAEA OPERCULELLA* (ZELLER) UNDER STORAGE AT DIFFERENT SEASONS IN HASSAN DISTRICT, KARNATAKA, INDIA

Kushala G.<sup>1</sup>, Ramesh Babu H.N.<sup>2</sup> and Rajeshwari N.<sup>2</sup>

<sup>1</sup>Department of Botany, Kuvempu University, Jnana Sahyadri, Shankaraghatta (Karnataka), India

<sup>2</sup>Department of Botany and Seed Technology, Sahyadri Science College, Kuvempu University, Shivamoga (Karnataka), India

### Abstract

Studies were under taken to learn biology of the Potato Tuber Moth *Phthorimaea operculella* (Zeller) on potato under storage conditions during winter, summer season and rainy season. Results obtained showed that with an average range temperature of 28°C and relative humidity 66% in winter season, average range temperature of 33°C and relative humidity 47% in summer season and average temperature of 30°C and average of relative humidity of 79% in rainy season, the development durations of immature stages were as follows, The incubation period was 3.6 days in winter season, 3 days in summer 3.5 days in rainy season. The larval stage duration average was 11.8 days in winter, 8.2 days in summer season, 10.3 days in rainy season. The pupal stage duration average was 6.1 days in winter season, 6 days in summer and 7.1 days in rainy season, the total life cycle average was 21.5 days in winter, 17.2 days in summer and 20.9 days in rainy season, the average number of eggs laid by female was 118.6 eggs/female in winter season for 60.4 eggs/female in summer season, 90.5 in rainy season. The female survived for an average of 16.9 days in the winter, 11.1 days in summer, 13.3 days in rainy, the male survived for 14.9 days in winter season, 8.2 days in summer season and 11 days in rainy season.

**Key words:** Potato, Storage, Seasons and Life cycle

### Introduction

Potato (*Solanum tuberosum* L.) popularly known as 'The king of vegetables', has emerged as fourth most important food crop in India after rice, wheat and maize. Indian vegetable basket is incomplete without Potato. Because, the dry matter, edible energy and edible protein content of potato makes it nutritionally superior vegetable as well as staple food not only in our country but also throughout the world, According to 2018 data Area of potato in Karnataka is 41,000 ha, Production 36,10,000 tonne and Productivity is 13.30 tonne/ha, in Hassan district Area of potato is 11071 ha, Production 1,42,971 tonne and Productivity 12.91 tonne/ha (Department of Horticulture, Hassan 2018).

Insect pests are one of the major constraints in the commercial production of potato crop. According to Simpson (1977) this species has apparently originated

from Western South America along with its host (Graf, 1917). It was first introduced to India in 1906 through seed potatoes brought to Bombay from Italy (Lefroy, 1907).

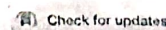
The potato tuber moth *Phthorimaea operculella* (Zeller) is a serious insect pest of potato it causes great damage in store condition. In some cases the damage reached 100 per cent for the stored potato. Potato tuber moth (PTM) is found in tropical, subtropical, and Mediterranean areas (Golizadeh and Esmaeili, 2012) is the most serious pest both in field and storage, causing great damage to foliage and tubers and it is one of the pests that causes the most extensive damages in the field and storage of potatoes, especially in warm dry climates (Larrein *et al.*, 2007).

The larvae mine leaves and tubers, causing damage to potatoes in storage and in field condition. Although, the larvae do some feeding on potato foliage and stems,

  
**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

  
**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.

REVIEW



# Synthesis, characterization, and biological activity of Cu(II) and Co(II) complexes of novel N<sup>1</sup>,N<sup>2</sup>-bis(4-methyl quinolin-2-yl)benzene-1,2-diamine: CuO and CoO nanoparticles derived from their metal complexes for photocatalytic activity

N. Venugopal, G. Krishnamurthy, H. S. Bhojyanaik, M. Madhukar Naik\*, and N. Sunilkumar

Department of Chemistry, Sahyadri Science College, Kuvempu University, Shivamogga, Karnataka, India

## ABSTRACT

The present work focuses on the synthesis of Cu(II) and Co(II) complexes obtained from 2-Chloro-4-methylquinoline and *o*-Phenylenediamine. The newly obtained compounds were characterized by elemental analysis, UV-Vis, FTIR, <sup>1</sup>H NMR, LC-MS, and magnetic susceptibility measurement. The molar conductance values indicate the non-electrolytic nature of the complexes. Based on spectral data indicate octahedral geometry for both Cu (II) and Co(II) complexes. The metal complexes were used as precursors for the synthesis of CuO and CoO nanoparticles via solid-state thermal decomposition without using a catalyst and both the synthesized metal oxide was showed good photocatalytic activity for the degradation of methylene blue dye. Furthermore, the synthesized ligand and its metal complexes have been tested for antibacterial and antifungal activity. The metal complex showed enhanced antitubercular activity against *M. tuberculosis*. The *in-silico* molecular docking study was used to predict the binding interaction of the prepared compounds with target receptor GlcN-6-P synthase.

## ARTICLE HISTORY

Received 14 June 2020  
Accepted 2 August 2020

## KEYWORDS

Metal complexes; nanoparticles; molecular docking; photocatalytic degradation

## Introduction

Quinoline derivatives are exciting heterocycles for the reason that they are present in many natural products, especially in alkaloids, and exhibit broad spectrum of biological activities.<sup>[1-3]</sup> They are also essential pharmacophores in contemporary drug discovery and remain the most flexible class of compounds possessing specific pharmacological effects such as antibacterial,<sup>[4]</sup> antifungal,<sup>[5]</sup> antiamoebic,<sup>[6]</sup> antileishmanial,<sup>[7]</sup> antimalarial,<sup>[8]</sup> antitumor,<sup>[9]</sup> immunosuppressive,<sup>[10]</sup> analgesic, vasorelaxant,<sup>[11]</sup> antiplasmodial,<sup>[12]</sup> anticonvulsant, and antihypertensive activities.<sup>[13]</sup> Moreover, quinoline derivatives are of considerable interest as a ligand toward transition metal ions plays a very significant role in biological processes. Based on today studies, the development of new metal-based anti-microbial agents is the important role in a research area of inorganic medicinal chemistry.<sup>[14]</sup> In this context, the metal complexes of transition metal salts with quinoline derivatives were significantly investigated as a model structure of some vital organic molecules.<sup>[15,16]</sup> Metal complexes are more active than the free ligands and they were found to speed up drug action and the efficacy of organic therapeutic agents.<sup>[17,18]</sup> The phases of interaction and geometrical position of the metal complexes in ligand chelation atmosphere serve as a model to enzyme containing metal ion.<sup>[19,20]</sup>

Furthermore, the metal complexes have two important criteria: the first is their excellent bio-activity and second complexes were used as a precursor to synthesize pure CuO and CoO nanoparticles using the thermal decomposition method.<sup>[21,22]</sup> Among these, the transition metal oxide nanoparticles played an important role due to their vast applications in photocatalytic degradation of dyes, chemical sensors, Li-ion battery and supercapacitor.<sup>[23-26]</sup> Notably, there are various approaches that have been presented in order to prepare CuO and CoO nanoparticles, involving hydrothermal, combustion approach and microemulsion approach etc.<sup>[27-30]</sup> Therefore, employing the coordination metal complexes via thermal decomposition method has been considered as one of the most useful and applicable inexpensive technique for the synthesis of metal oxide nanostructure.

The present research work focuses on to synthesize and characterization of Cu(II) and Co(II) metal complexes derived from 2-Chloro-4-methylquinoline and *o*-Phenylenediamine (QB) and characterized by different spectroscopic technique. The geometry of the metal complexes was inferred by electronic spectroscopy and magnetic susceptibility measurements. Furthermore, CuO and CoO particles were prepared from their corresponding metal complexes. The produced nanomaterials were characterized by employing X-ray diffraction (XRD), SEM, FTIR, and

CONTACT G. Krishnamurthy ✉ gkrmnaikshahyadri@gmail.com Department of Chemistry, Sahyadri Science College, Kuvempu University, Shivamogga, Karnataka, India.

Current Affiliation: Department of Chemistry, MVJ College of Engineering, Bangalore, 560067

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Original Research Article

**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**

Sasigolli Annappa Srikanta\*, Putta Naik Parmeswara Naik, Ganga naik Krishanamurthy

Department of Chemistry, Sahyadri Science College, Shivamogga, Karnataka, India

**ARTICLE INFORMATION**

Received: 21 January 2019  
Received in revised: 26 February 2019  
Accepted: 3 March 2019  
Available online: 12 May 2019

DOI: 10.22034/AJGC/2020.2.3

**KEYWORDS**

Electrolysis  
Surface morphology  
Organic electro-synthesis  
Cathode

**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 ( $^1\text{H}$ ,  $^{13}\text{C}$ ), and SEM.

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**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shivamogga.  
Corresponding author, email: [shreekantha.cambs@gmail.com](mailto:shreekantha.cambs@gmail.com)  
Tel.: 08182257214.

  
**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.



## Spectral, DFT, molecular docking and antibacterial activity studies of Schiff base derived from furan-2-carbaldehyde and their metal(II) complexes

Manjuraj T.<sup>1</sup>, Yuvaraj TCM<sup>1</sup>, Jayanna N.D.<sup>2</sup>, Shreedhara S H<sup>3</sup>,  
Sarvajith M S<sup>4</sup>

<sup>1</sup>Department of Chemistry, Sahyadri Science College (Auto), Shimoga, Karnataka INDIA.

<sup>2</sup>Department of Chemistry, S. S. M. S. College, Athani, 59104, Belagaum, Karnataka, INDIA.

<sup>3</sup>Sahyadri Science College (A) Shivamogga, INDIA.

<sup>4</sup>Manipal Institute of technology, Manipal, INDIA.

**Abstract:** Metal(II) complexes of cobalt(II) (1), copper(II) (2), nickel(II) (3), and zinc(II) (4) with Schiff base ligand derived from furan-2-carbaldehyde were synthesized and elucidated by IR, electronic, mass, <sup>1</sup>H-NMR and magnetic susceptibility measurements. Using DFT-based optimization of structures, bond length, bond angle, HOMO-LUMO energy gaps, and molecular electrostatic potential maps (MEP) of ligand and complexes 1-3 were theoretically calculated at the B3LYP/6-311++G(d,p) level of theory. HOMO-LUMO energy gap was calculated which allowed the calculation of comparable properties like chemical hardness, chemical inertness, and chemical potential. The Ni(II) and Cu(II) complexes showed potent inhibition against all the bacterial strains. In comparison with antibacterial activity, molecular docking studies were carried out with protein receptor SEC2 (PDB: 41STB) in *Staphylococcus aureus*.

**Keywords:** Furan-2-carbaldehyde, Metal complexes, DFT, Antibacterial, Molecular docking.

**Submitted:** October 06, 2018. **Accepted:** May 04, 2020.

**Cite this:** Manjuraj T, Juvaraj T, Jayanna N. Spectral, DFT, molecular docking and antibacterial activity studies of Schiff base derived from furan-2-carbaldehyde and their metal(II) complexes. JOTCSA. 2020;7(2):449-62.

**DOI:** <https://doi.org/10.18596/jotcsa.467859>.

**\*Corresponding author. E-mail:** [manjuraj877@gmail.com](mailto:manjuraj877@gmail.com).

### INTRODUCTION

The Schiff base ligands with nitrogen and oxygen donor atoms act as good chelating agents for the transition and non-transition metal ions. The azomethine (-CH=N-) linkage present in Schiff base ligands and its metal (II) complexes show a wide range of biocidal activities such as antibacterial (1) antifungal (2) anti-inflammatory

(3) anticancer, anti-diabetic (4), and antitumor activities. Furthermore, the interactions of these complexes with DNA have gained much attention due to their possible applications as new therapeutic agents (5-7). The high affinity for the chelation of the Schiff bases towards the transition metal ions is utilized in preparing their complexes in the solid form (8-10). The tractability of Schiff base ligands can be

**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

**JAYANNA N.D.**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.



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Research Article



## Optical and electrical properties of organic dye sensitized Cr-ZnO and Ni-CdO nanoparticles

R. O. Yathisha<sup>1</sup> · Y. Arthoba Nayaka<sup>1</sup>Received: 8 January 2020 / Accepted: 12 February 2020 / Published online: 19 February 2020  
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### Abstract

In this work presents an approach for the selection of dye sensitized Cr-ZnO and Ni-CdO nanoparticles as a photo anode material for the applications of DSSCs. The 4 wt% Cr-ZnO and Ni-CdO nanoparticles were synthesized through simple and fast microwave combustion method. X-ray diffraction (XRD) was used for the detection of crystalline phases and size of the synthesized nanomaterials. It confirms the existence of hexagonal wurtzite phase of Cr-ZnO (30–35 nm) and cubic phase of Ni-CdO (43–45 nm) nanoparticles. SEM and TEM micrographs of Cr-ZnO and Ni-CdO reveal that the synthesized samples are prismatic and spherical shaped, respectively. Optical absorption of Cr-ZnO and Ni-CdO nanoparticles before and after sensitization with Trypan Blue (TB), SPADNS (SPD) and Evans Blue (EB) dyes were examined through UV-Visible spectroscopy. The results show that the selected dyes improve the absorption edge of Cr-ZnO and Ni-CdO nanoparticles to longer wavelength side. HOMO and LUMO energy levels of the dyes were calculated by cyclic voltammetry. I-V characteristics of Cr-ZnO and Ni-CdO films before and after sensitization with dyes revealed the influence of dye sensitization on photo conductivity of Cr-ZnO and Ni-CdO nanoparticles.

**Keywords** Bandgap · Cr-ZnO · Dyes · Evans blue · Photoconductivity · Ni-CdO

### 1 Introduction

In an efficient dye sensitized solar cell (DSSC), a sensitizer (dye) is one of the important key components which improve the efficiency of solar energy conversion. Over the past decades, the ruthenium (Ru) complex based DSSCs were developed by researchers, which have shown high light to energy conversion efficiencies of over 11% [1]. However, high cost of synthesis, problematical steps of compound purification, very less yield of product and environmental concern have limited the potential applications of Ru complexes. These disadvantages of Ru based complexes have given an insight for the development of metal free organic sensitizers. These dyes are used in the DSSCs due to their various significant advantages

such as high absorption co-efficient, easy for synthesis and purification, less toxic, affordable cost and eco-friendliness [2]. The recent reports highlighted the highest photo conversion efficiency of DSSCs from organic sensitizers is greater than 13.5% indicates that the organic dye sensitizers are also proves to be the significant materials for DSSCs compared to Ru, Ce and Zn transition metal sensitizers. The anchoring modes of the dye molecules to the crystalline semiconductor surface are of essential significance, the interaction and the extent of electronic coupling between the lower unoccupied state (LUMO) of dye and the conduction band of semiconductor influencing directly the overall cell performance [3]. Anchoring with wide band gap semiconductor surface (ZnO, TiO<sub>2</sub>, SnO<sub>2</sub>) has been achieved by using a number of essential

**Electronic supplementary material** The online version of this article (<https://doi.org/10.1007/s42452-020-2257-7>) contains supplementary material, which is available to authorized users.

Y. Arthoba Nayaka, [drarthoba@yahoo.co.in](mailto:drarthoba@yahoo.co.in); R. O. Yathisha, [yathisharo@yahoo.com](mailto:yathisharo@yahoo.com) | <sup>1</sup>Department of PG Studies and Research in Chemistry, Kuvempu University, Jnanasahyadri, Shankaraghatta, Karnataka 577451, India.

SN Applied Sciences (2020) 2:451 | <https://doi.org/10.1007/s42452-020-2257-7>

**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

**PRINCIPAL**  
**SAHYADRI SCIENCE COLLEGE**  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.

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# Intrinsic irreversibility of $\text{Al}_2\text{O}_3\text{-H}_2\text{O}$ nanofluid Poiseuille flow with variable viscosity and convective cooling

Variable  
viscosity and  
convective  
cooling

Felicita Almeida and B.J. Gireesha

*Department of Mathematics, Kuvempu University, Shankaraghatta,  
Karnataka, India*

P. Venkatesh

*Department of Mathematics, Sahyadri Science College, Shimoga, Karnataka, India, and*

G.K. Ramesh

*Department of Mathematics, K.L.E Society's J.T. College, Gadag, Karnataka, India*

Received 14 September 2020

Revised 21 September 2020

24 September 2020

Accepted 1 October 2020

## Abstract

**Purpose** – This study aims to investigate the flow behavior of aluminum oxide–water nanofluid with variable viscosity flowing through the microchannel parallel with the ground, with low aspect ratio. The study focuses on the first and second law analyses of Poiseuille flow using water as the base fluid with alumina nanoparticles suspended in it. Combined effects of thermal radiation, viscous dissipation, variable viscosity, nanoparticle shape factor and volume fraction on the thermal performance are studied and the in-built irreversibility in the process is examined.

**Design/methodology/approach** – The governing equations with dimensions are reduced to non-dimensional equations by using dimensionless quantities. Then, the Runge–Kutta–Fehlberg shooting scheme tackles the present non-linear equations.

**Findings** – The outcomes of the present analysis reveal that the activation energy parameter with its increase, depletes the exergetic effectiveness of the system, thus defending the fact to keep the activation energy parameter the lowest as possible for the system efficiency. In addition, thermal radiation and Biot number enhance the release of heat energy, thereby cooling the system. Bejan number graph exhibits the decreasing behavior for the increased nanoparticle shape factor, whereas the temperature enhances with the rise in nanoparticle shape factor.

**Originality/value** – The effects of nanoparticle shape factor in Poiseuille flow for alumina–water nanofluid in low aspect ratio microchannel is inspected at the earliest. Exergetic effectiveness of the system is studied and heat transfer characteristics are explored for thermal radiation effect and activation energy parameter. Besides,  $Be(\eta)_{\text{Sphere}} > Be(\eta)_{\text{Blades}}$ .

**Keywords** Poiseuille flow, Variable viscosity, Convective cooling, Activation energy

**Paper type** Research paper

## Nomenclature

$A$  = pressure gradient parameter;

$Be$  = Bejan number;



The authors gratefully acknowledge Department of Science and Technology, Government of India for their financial support to Department of Mathematics, Kuvempu University, Shankaraghatta, Karnataka, India under DST-FIST Program (Ref No. SR/FST/MS-1/2018-2023).

International Journal of Numerical  
Methods for Heat & Fluid Flow  
© Emerald Publishing Limited  
0961-5539  
DOI: 10.1108/IJNMF-09-2020-0075

  
**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

  
**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.



## RESEARCH ARTICLE

## HEAT TRANSFER WILEY

# Exploration of irreversibility and thermal motion of a nanoliquid with the Newton boundary condition by using the Darcy–Forchheimer rule

B. J. Gireesha<sup>1</sup> | P. Venkatesh<sup>2</sup> | D. O. Soumya<sup>1</sup>

<sup>1</sup>Department of PG Studies and Research in Mathematics, Kuvempu University, Shankaraghatta, Shivamogga, Karnataka, India

<sup>2</sup>Department of Mathematics, Sahyadri Science College, Kuvempu University, Shankaraghatta, Shivamogga, Karnataka, India

## Correspondence

B. J. Gireesha, Department of PG Studies and Research in Mathematics, Kuvempu University, Shankaraghatta 577451, Shivamogga, Karnataka, India.  
Email: bjgireesu@gmail.com; bjgireesu@rediffmail.com

## Abstract

This study has been conducted to focus on magnetohydrodynamic flow of a nanoliquid through a microchannel in the presence of a magnetic field. In this article, carbon nanotubes suspended in an aqueous medium were our considered fluid, and we focused on both singlewall and multiwall carbon nanotubes. The numerical calculations have been made via the fourth- and fifth-order Runge–Kutta–Fehlberg method. The flow of the nanoliquid in a microchannel with porosity has been scrutinized with the existence of mutual effects, like, the nanoparticle volume fraction, suction or injection, thermal-dependent heat source, convective boundary conditions, Darcy friction factor, and thermal motion of the nanoparticles. The influence of every major parameter on the profile of momentum, temperature, and entropy generation has been displayed graphically, and we discuss their physical aspects. The numerical outcomes demonstrated that the momentum profile augmented with the buoyancy force, angle of inclination, and Darcy number. Thermal energy was enriched with the heat source parameter, Darcy number, and Hartmann number. The irreversibility rate declined with the

**Abbreviations:** MWCNTs, multiwall carbon nanotubes; SWCNTs, singlewall carbon nanotubes.

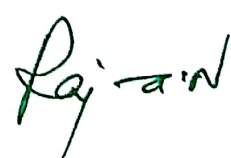
Heat Transfer. 2020;1–20.

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**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.

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# Investigation of irreversibilities in a microchannel by differing viscosity, including buoyancy forces and suction/injection

Puttaswamy Venkatesh<sup>1</sup> | Bijjanal Jayanna Gireesha<sup>2</sup> | Felicity Almeida<sup>2</sup>

<sup>1</sup>Department of Mathematics, Sahyadri Science College, Shivamogga, Karnataka, India

<sup>2</sup>Department of Studies and Research in Mathematics, Kuvempu University, Shivamogga, Karnataka, India

## Correspondence

B. J. Gireesha, Department of Studies and Research in Mathematics, Kuvempu University, Jnanasahyadri, Shankaraghatta, Shivamogga, Karnataka 577451, India.  
Email: bjgireesu@rediffmail.com

## Abstract

Single-phase Poiseuille flow considering oxides of copper-water nanoliquid in the upright microchannel with uneven viscosity causes the production of inbuilt irreversibility in the system. This is reported in the present investigation involving the buoyancy force with suction/injection at the walls by taking into account different shapes of nanoparticles. The equations so obtained being highly nonlinear is attempted to solve via Runge-Kutta-Fehlberg shooting scheme. Flow and heat transmission characteristics are explored by considering the nanoparticle's shape. The result exemplifies that the viscosity variation parameter escalates the flow profile as well as temperature profile. The thermal radiation and Biot number boost the let go of thermal energy, which leads to system cooling. The temperature profile for nanoparticle shape factor upholds the fact that temperature is high for lamina-shaped nanoparticles and least for spherical-shaped nanoparticles. Also, the Biot number, radiation parameter, and nanoparticle volume fraction serve in lowering the entropy, which augments the exergetic effectiveness of the system.

## KEYWORDS

convective conditions, irreversibility, Poiseuille flow, suction/injection, variable viscosity







## Synthesis of CuO micro and nanoparticles as composite additives for corrosion resistant Zn-composite coatings on mild steel

K. Deepa & Y. Arthoba Nayaka

To cite this article: K. Deepa & Y. Arthoba Nayaka (2020): Synthesis of CuO micro and nanoparticles as composite additives for corrosion resistant Zn-composite coatings on mild steel, Inorganic and Nano-Metal Chemistry, DOI: [10.1080/24701556.2019.1711404](https://doi.org/10.1080/24701556.2019.1711404)

To link to this article: <https://doi.org/10.1080/24701556.2019.1711404>



Published online: 17 Feb 2020.



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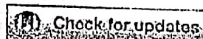


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*Rajan*  
**PRINCIPAL**

SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.





Cite this: *New J. Chem.*, 2020,  
44, 14095

## Microwave-assisted green synthesis, characterization and adsorption studies on metal oxide nanoparticles synthesized using *Ficus Benghalensis* plant leaf extracts†

Arunkumar Lagashetty,<sup>a,\*</sup> Sangappa K. Ganiger,<sup>b</sup> Preeti R. K.,<sup>c</sup> Shashidhar Reddy<sup>d</sup> and Malathesh Pari<sup>†</sup>

Environmentally friendly synthesis of metal oxide nanoparticles is a worthwhile contribution to the science and technology field. The conversion of metal salts into metal oxides using plant extract has attracted considerable attention from researchers due to the simplicity of the process. Special attention has been provided to the green synthesis of metal oxide nanoparticles using easily available plants with an eco-friendly system compared to other conventional methods. The advantages of green synthesis are minimizing the by-product and thus eliminating contaminants and using imperishable and lower-risk components. The biological diversity of plant extracts, for instance, as well as the accessibility to numerous phytochemicals in various parts of the plants is an important aspect in considering plants for integrating nanoparticles. An attempt has been made to synthesize metal oxides such as  $\text{Fe}_3\text{O}_4$ ,  $\text{CeO}_2$  and  $\text{ZnO}$  using *Ficus benghalensis* plant leaf extract. The structure and morphology of the as-prepared metal oxide samples were studied using powder X-ray diffraction and scanning electron microscopy techniques. Fourier transform infrared spectroscopy study was undertaken to study the bonding in the metal oxide samples. Moreover, morphology and particles size of the above samples was studied by using transmission electron microscopy. Energy-dispersive X-ray analysis study was undertaken to know the formation of metal oxides. Furthermore, the adsorption study of heavy metal ions ( $\text{Pb}^{2+}$ ,  $\text{Hg}^{2+}$ ) on metal oxides was performed to know the adsorbent nature of metal oxides.

Received 8th April 2020,  
Accepted 2nd July 2020

DOI: 10.1039/d0nj01759k

rsc.li/njc

### 1. Introduction.

Nanotechnology has received considerable importance in comparison with other technologies because of its various potential properties and applications.<sup>1,2</sup> Next-generation technology will be built by tailoring the blocks of multiple applications. Metals and metal oxide nanoparticles show high specific surface area and a high fraction of surface atoms. Physicochemical characteristics of metal and metal oxides nanoparticles, including catalytic activity, optical properties, electronic properties, antibacterial properties, and magnetic properties are gaining

considerable attention from researchers for studying their novel methods of synthesis.<sup>3,4</sup> Compared to their bulk material forms, nanomaterials prepared using various plant extraction techniques show enhanced unique properties and applications with proper manipulation.<sup>5–7</sup> Studies on synthesizing metal nanoparticles through biological routes especially using plant extracts is rapidly developing because of its simple experimentation. The biological methods for material synthesis at the nanoscale levels are in accordance with the eco-friendly system, thus avoiding huge consumption of fuel. Currently, in the synthesis protocol, there is a considerable requirement to develop environmentally benevolent nanoparticle synthesis processes that do not use toxic chemicals.<sup>8–10</sup> The requirement for environmentally friendly non-toxic synthesis protocols for nanoparticle synthesis has led to a developing interest in biological approaches that are free from toxic chemicals formed as by-products. Thus, there is an increase in demand for green nanotechnology.<sup>11,12</sup> Multiple biological approaches for both extracellular and intracellular nanoparticles synthesis have reported using microorganisms, including bacteria, fungi and

<sup>a</sup> Department of Studies in Chemistry, Vijayanagara Sri Krishnadevaraya University, Ballari-583105, Karnataka, India. E-mail: arun.lagashetty@gmail.com

<sup>b</sup> Department of Physics, Government Engineering College, Ratichur-584135, Karnataka, India

<sup>c</sup> Department of Zoology, Gulbarga University, Kalaburagi, 585103 Karnataka, India

<sup>d</sup> Department of Chemistry, SDM College of Engineering and Technology, Dhurwad-580002, Karnataka, India

† Electronic supplementary information (ESI) available. See DOI: 10.1039/d0nj01759k

*P. R. K.*  
PRINCIPAL

SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.



2020

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# A Facile Cobalt (II) Tetra Amino Phthalocyanine Ingrained Polyoxy Aniline (PANI) Nano-fiber Film Layer Based Electrode Material for Amperometric Determination of Thiocyanate

Malathesh Pari<sup>1</sup> · K. R. Venugopala Reddy<sup>1</sup>

Received: 17 January 2020 / Accepted: 23 March 2020  
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## Abstract

This work describes the synthesis of tetra amino cobalt(II)phthalocyanine ingrained PANI nanofiber (TACoPc-PANI) and their characterization by spectroscopic and analytical techniques. The TACoPc-PANI thin film layer-based sensor was used for the determination of thiocyanate (SCN<sup>-</sup>) is reported in present work. We present PANI with tetra-amino cobalt (II) phthalocyanine immobilized sensor in comparison with phthalocyanine thin film layer onto a sensing surface of glassy carbon electrode (GCE). The sensing of thiocyanate is done on tetra amino cobalt (II) phthalocyanine modified glassy carbon electrode (GCE/TACoPc) in the linear range (CV 0.2–10, CA 0.15–20  $\mu\text{mol L}^{-1}$ ), sensitivity (CV 2.3523, CA 0.0457  $\mu\text{A } \mu\text{M}^{-1} \text{cm}^{-2}$ ) and lower detection limit (CV 0.06, CA 0.05  $\mu\text{mol L}^{-1}$ ) for better electrochemical studied TACoPc was ingrained with PANI nanofibers which increase the electron transferring ability and surface area of GCE, therefore sensing of thiocyanate as studied on GCE/TACoPc-PANI in the linear range of (CV 0.1–50, CA 0.05–50  $\mu\text{mol L}^{-1}$ ), sensitivity (CV 1.0684, CA 0.017  $\mu\text{A } \mu\text{M}^{-1} \text{cm}^{-2}$ ) and lower detection limit (CV 0.03, CA 0.017  $\mu\text{mol L}^{-1}$ ) GCE/TACoPc-PANI ingrained modified sensor electrode shows good electrocatalytic activity than the modified electrode with TACoPc alone towards detection of thiocyanate molecules. The GCE/TACoPc-PANI shows good repeatability, stability and high selectivity even in the presence of an excess of thiosulfate, thiourea, sulfide.

Electronic supplementary material The online version of this article (<https://doi.org/10.1007/s10904-020-01515-8>) contains supplementary material, which is available to authorized users.

✉ Malathesh Pari  
malatheshpari@gmail.com

<sup>1</sup> Vijayanagara Sri Krishnadevaraya University Ballari,  
Ballari, Karnataka 583105, India

Published online: 31 March 2020

Springer

PRINCIPAL  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.



KAVAKA 55: 65-70 (2020)

doi:10.36160/Kavaka/55/2020/65-70

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## Two new records of Genus *Agaricus* from Western Ghats forests of India

R. Kantharaja, K. J. Nandan Patel, M. Krishnappa\*

Department of PG Studies and Research in Botany, Kuvempu University, Jnana Sahyadri, Shankaraghatta, Shivamogga, Karnataka 577 451, India

\*Corresponding author Email: krishnappam4281@yahoo.com  
(Submitted on July 25, 2020; Accepted on October 10, 2020)

### ABSTRACT

Two species of the genus *Agaricus* L., each from Sect. *Brunneopilei* Rehm. (*A. Chionomurensis* Karva, Gulah and K.D. Hyde) and Sect. *Arvenses* (Kearns and Muth.) Kearns and Muth. (*A. flocculosipes* R.L. Zhao, Desjardins, Gulah and K.D. Hyde) are newly reported from India. The specimens were collected from different parts of Central Western Ghats and studied by morphological, microscopic and molecular phylogenetic using nrITS and nrLSU sequences. The current study presents the descriptions, color photographs, and phylogenetic relationships.

**Keywords:** *Agaricales*, Basidiomycota, ITS, morpho-molecular taxonomy, Western Ghats.

### INTRODUCTION

*Agaricus* L., a genus of saprophytic fungi, commonly producing fleshy, gilled mushrooms belongs to order Agaricales (Agaricomycetes, Basidiomycota). The genus is species-rich with more than 500 species worldwide (Gulah and Chen, 2018), that are edible, medicinal, and even poisonous. With the advancement in molecular phylogeny, number of investigators (Zhao *et al.*, 2011; Chen *et al.*, 2017; He *et al.*, 2016; Parra *et al.*, 2018) has revisited the classification of the genus in the past decade. Presently six subgenera and 24 sections have been recognised under genus *Agaricus* (Gulah and Chen, 2018).

The genus *Agaricus* is cosmopolitan in distribution and grows in various habitats. Western Ghats of India is one of the eight global biodiversity hotspots. Bhadra Wildlife Sanctuary falling in this area is quite rich in mushroom population. A study to assess the macrofungal diversity in this area was initiated in the year 2016. Out of the collections studied two interesting species of genus *Agaricus*, namely *A. chionomurensis* (sect. *Brunneopilei*) and *A. flocculosipes* (sect. *Arvenses*) were documented which are being described for the first time from India (Upadhyay *et al.*, 2017; Sami *et al.*, 2018).

### MATERIALS AND METHODS

The studied sporocarps are collected from Kakanahosudi (13°45'09.0"N 75°33'07.0"E) and Chitballi (13°43'59.6"N 75°28'33.1"E) of Bhadra Wildlife Sanctuary, Central Western Ghats region of Karnataka during June-September, 2019.

**Sampling and morphological characterization:** Sporocarps encountered during the survey are collected with field notes on macro-morphological characteristics and habitat conditions were documented on the field key especially designed for the purpose (Abi *et al.*, 2017). Collected basidiomata were subsequently dried and utilized for further characterization. Micro-morphological characters are studied using Olympus CH20i binocular light microscope and subsequently identified (Zhao *et al.*, 2012; Kanumaratna *et al.*, 2014).

**DNA Extraction and PCR:** Freshly collected sporocarps were used for extraction of DNA by the CTAB method (Kantharaja and Krishnappa, 2020). 100 mg of inner tissue of

the sporocarp was homogenized directly by micro-pestle (Tersons) in a micro-centrifuge tube with 500 µL of 2X CTAB extraction buffer at 65°C. Vortexed for few seconds and incubated at 65°C for 1 hour. Slightly cooled and centrifuged at 13000 rpm for 30 minutes. 3 µL of RNase A is mixed with centrifugate and incubated for 10 min at 37°C. 500 µL of PCI (25:24:1) (Himedia) was added to the mixture and centrifuged at 10000 rpm for 10 min at room temperature. To the supernatant 600 µL of ice-cold isopropanol was added and incubated overnight. To pellet the DNA the mixture was centrifuged at 10000 rpm for 10 minutes at 10°C. The pellet was washed twice with 70% ethanol and dissolved in 50 µL of 1X TE buffer. The extracted DNA was analyzed for purity using 0.8% agarose gel electrophoresis and Bio-photometer (Eppendorf India Pvt. Ltd.).

PCR reactions were carried out using Eppendorf Mastercycler nexus G92 in 0.2 ml PCR tubes with 50 µL reaction mixture containing, 25 µL double distilled water, 8 µL 10X PCR buffer A (Himedia), 2.5 µL of each primer, 0.5 µL of Taq DNA polymerase (3U/µL), 1.5 µL dNTP's mixture (Himedia) and 10 µL of DNA template. The primer pairs ITS 1 and ITS 4 (White *et al.*, 1990) for the nrITS region and LROR and LRS (Vilgalys and Hester, 1990) for nrLSU region were used. The thermal profile for nrITS amplification; 4' 94°C, 32 cycles of 30" 94°C, 1' 52°C, 1' 72°C and a final extension step of 7' 72°C, for nrLSU 5' 94°C, 30 cycles of 30" 94°C, 1' 47°C, 1' 72°C and a final extension step of 7' 72°C. The PCR products were examined on 1% Agarose gel stained with Ethidium Bromide and visualized under Gel image Documentation System (BioRad) followed by clean up and sequencing in Eurofins Genomics India Pvt. Ltd.

The obtained sequences were aligned by Clustal W (Maddala *et al.*, 2019) in BioEdit sequence alignment editor v. 7.2.5 (Hall, 1999). The consensus sequences are used for the BLAST search on the NCBI GenBank database to identify the sequence similarity and distance tree results. The sequences are deposited to GenBank.

**Sequence alignment and phylogenetic analysis:** Based on published literature (Kerrigan *et al.*, 2005, 2008; Zaho *et al.*, 2012; Kanumaratna *et al.*, 2014), a total of 38 sequences (23 ITS and 15 LSU) were retrieved from the NCBI GenBank nucleotide database (Table 1 & 2) and combined with newly



PRINCIPAL

SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.





## Indigenous storage practices for paddy in shimoga district, Karnataka

Sunil Kumar TV<sup>1\*</sup>, Rajeshwari N<sup>2</sup>, Krishnappa M<sup>3</sup>, Ramesh Babu HN<sup>4</sup>

<sup>1,2,4</sup> Department of Botany and Seed Technology, Sahyadri Science College, Kuvempu University, Shimoga, Karnataka, India

<sup>3</sup> Department of Applied Botany, Kuvempu University, Shankaraghatta, Karnataka, India

### Abstract

Storage of paddy is one of the important intermediate stage between production and consumption. Use of paddy is regular in daily basis in most part of the world. Storage of paddy done in many ways by considering usage. If paddy has to be transported it will be stored in bags some other methods are also used by farmer's or by storage holders. These storage methods studied in present work are following from generation to generation hence they considered as indigenous storage practices. Practices followed for storing paddy in many villages of Shimoga district were studied, each storage structure is unique and different in its method of construction, materials use and usage. Farmers or storage holders are using these methods which have retained from more than hundreds of years accordingly their capacity in maintaining the quality and quantity of stored paddy seeds.

**Keywords:** paddy, traditional storage, non-chemical storage, ecofriendly storage

### 1. Introduction

Paddy (*oryza sativa*, L.) is consumed worldwide. It is one of the staple food, grain produced and consumed by India is increasing Prakash *et al.* (2016) <sup>[1]</sup> and consumption rate also becoming more. 17% of the year food production must be stored considered security of the nation according FAO (food and agriculture organization) Xiaoli *et al.* (2008) <sup>[2]</sup>. It is easy for paddy to grow, harvest, pack, store and transport. It had good amount of nutrients, vitamins, carbohydrates and many varieties of food can be prepared, so consumption percentage is high among the world. One of the major challenges for the paddy grower is to match the need of demand within the time period, make reach for the maximum population even one in longer distance. Improper handling of postharvest processes maximize the fungal activity and mycotoxin percentage during storage was recorded by Magan and Aldred (2004) <sup>[3]</sup> so storage systems must be very good, it's very much need to consider physical and chemical properties otherwise changes occur as ages passes during storage it down grade the milling quality also Zhongkai *et al.* (2003) <sup>[4]</sup>. For storage of paddy many more methods are followed in some part of world air tight storage are preferred in this insects and microbes get controlled by increase rate of carbon dioxide within the closed system by Thilakarathna *et al.* (2005) <sup>[5]</sup>. Insects in storage container can live in temperature between 8 - 41°C (Jayas and White 2003) <sup>[6]</sup>. Considering safety, quantity and transportation storage done by some methods which is following traditionally by people at their household level. In our study area 27 villages are visited and interacted with the storage holders and to farmers. Our study area Shimoga is part of Malnad region, we selected parts of shimoga region for field survey which comes under the Malnad belt. It receives more rainfall in a year, weather and land is very much suitable for paddy to grow, as rice is main course in the daily food of people of Malnad they prefer paddy to grow regularly. Farmers who growing paddy will store paddy by some of the method which became common method among them in their region, which referred as traditional storage systems.

Pre storage process like drying is needed, improper drying effect on antioxidants (phenolic and anthocyanin) which lead early aging of stored rice by Lindemann *et al.* (2019). these precautions help paddy to store for longer period. It's an important decision to select good suitable storage structures which are user friendly ecofriendly and economic. Economic storage systems has to be promote more considering the poor farmer number among the nation (Mehta *et al.* 2012) <sup>[8]</sup>. Maximum quantities like several quintals of paddy can stored in these systems at household level. In early days paddy stored in panatha or kanaja are used for sowing also, as per the farmers feedback seeds stored for 3-5 months shows more than 80% of germination in field condition. There for these storage methods are very preferable ones among the farmers in Shimoga region.

### 2. Methodology

#### 2.1 Field survey

During the survey we observed several storage systems which in use, most of the storage holder's prefer 2-3 type of storage system to use regularly at their household level. We done the survey in taluks of Shimoga district which comes under Malnad belt region. There are three taluk Sagara, Hosanagara and Thirthahalli come under Malnad belt. These field areas was visited during the month June-August 2019 in this visit we approached many villages of the three region and interacted with number of farmers and storage holders. Information regarding Paddy growing, variety of paddy growing, harvesting, drying and storage process are collected. Here mainly we are focusing on method of traditional storage using. So collected some important and elaborate information about storage system we got the information like type of a storage system used, the construction methodology, maintain process & cost, pre filling process, method followed to get optimum moisture in paddy before filling are noted in our data sheath. Paddy sample and storage system photos was collected. Three taluk was surveyed people of these taluk in between them sharing the information or knowledge about to choose best

**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.

**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.



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# DNA Binding, Molecular Docking and Antimicrobial Evaluation of Novel Azo Dye Ligand and Their Metal Complexes

Published: 26 November 2019

Volume 30, pages 2608–2625, (2020) [Cite this article](#)



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N. Venugopal, G. Krishnamurthy , H. S. Bhojya Naik & J. D. Manohara

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## Abstract

In the present work, the synthesis of novel azo dye ligand 6-hydroxy-4-methyl-2-oxo-1-propyl-5-[(E)-1,3-thiazol-2-ylidiazetyl]-1,2-dihydropyridine-3-carbonitrile (L) and its Cu(II), Co(II) and Ni(II) transition complexes were prepared. The newly formed compounds were characterized by elemental analysis, UV-Vis, FT-IR, <sup>1</sup>H NMR, LC-MS, TGA and magnetic susceptibility measurement. The molar conductance indicates that all the metal complexes are non-electrolytic in nature. Based on spectral data, square planar geometry was deduced for Cu(II) and Ni(II) complexes, Co(II) complex has tridentate chelation of ligand and produce an octahedral geometry around the metal ion. Additionally, the computational study has been performed using density functional theory (DFT) calculation was used to study the electronic structure of synthesized ligand and their complexes. The in vitro antimicrobial activity of the azo dye ligand and its complexes was tested against Gram +ve bacteria (*Bacillus subtilis*), Gram -ve bacteria (*Escherichia coli*), yeast (*Candida albicans*) and fungus (*Aspergillus flavus*). All the complexes showed enhanced biocidal activity compared to the free ligand. Moreover, azo dye ligand and its metal complexes have been studied for their antioxidant activity. The DNA-binding activity of metal complexes (1a–1c) was studied by electronic absorption spectroscopy and fluorescence spectroscopy. All the complexes bound to CT-DNA through an intercalation mode. Additionally, all the metal complexes act as good cleavage agents against the pBR322 DNA. The computer-aided molecular docking studies of metal complexes with the receptor of GlcN-6-P synthase showed that metal complexes are potent drugs for the target enzymes.

  
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# Synthesis, Characterization, DFT Studies and Biological Activity of Ru(III), La(III) and Ce(III) Triphenylphosphine Complexes Containing 2-Aminothiazole and 2-Aminotriazole

Published: 19 March 2020

Volume 30, pages 3332–3356, (2020) [Cite this article](#)



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Satish Naik, P. Parameshwara Naik , G. Krishnamurthy , N. Venugopal, Nagaraja Naik & T. R. Ravikumar Naik

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## Abstract

In the present paper a series of triphenylphosphine complexes containing mixed ligands like 2-aminothiazole (Ath) and 2-aminotriazole (Atz) have been prepared. The complexes are of the formula  $[MCl_3((PPh_3)(Ath)_2)]$  and  $[MCl_3((PPh_3)(Atz)_2)]$ ,  $[M = Ru(III), Ce(III) \text{ and } La(III)]$ . These complexes were characterized by different spectral techniques. Additionally, the computational study has been performed using density functional theory (DFT) and the calculation is used to examine the electronic structure of the synthesized complexes. The biological activities of all the synthesized complexes were evaluated and the comparative account in properties between the triphenylphosphine metal complexes containing 2-aminothiazole and 2-aminotriazole ligands has been made. The DNA-binding property of these metal complexes was investigated using electronic absorption spectroscopy and fluorescence spectroscopy. The antibacterial and antifungal activity against bacterial species (Gram -ve bacteria: *Escherichia coli*, *Salmonella typhi*) and (Gram +ve bacteria: *Staphylococcus aureus* and *Bacillus subtilis*) and fungi (*Aspergillus niger* and *Candida albicans*). The antioxidant study was carried out against the 2,2-diphenyl-1-picrylhydrazyl radical (DPPH) which showed that the metal complexes are good antioxidant, as compared to BHT. Further, the in-silico molecular docking study was performed to predict the possible binding sites of the metal complexes.

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(Constituent College of Kuvempu University)

SHIMOGA, Karnataka State.





# Synthesis, characterization, electrochemistry, biological and molecular docking studies of the novel Co(II), Ni(II) and Cu(II) complexes derived from methanethiol bridged (2-((1H-benzo[d]imidazol-2-yl)methylthio)-1H-benzo[d]imidazol-6-yl)(phenyl)methanone

N. Sunil Kumar<sup>a</sup>, G. Krishnamurthy<sup>a</sup> ✉, Madhusudana somegowda<sup>b</sup>, Malathesh Pari<sup>c</sup>, T.R. Ravikumar Naik<sup>d</sup>, K.S. Jithendra Kumara<sup>a</sup>, Satish Naik<sup>a</sup>, Shivananda Kandagalla<sup>e</sup>, Nagaraja Naik<sup>f</sup>

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## Highlights

- The ligand BIPM used to synthesize Co(II), Ni(II) and Cu(II) complexes. The electrocatalytic activity of the Co(II) complex was studied by cyclic voltammeter using modified GCE towards various concentration of dopamine (DA).
- The antimicrobial, antioxidant, cytotoxicity, DNA binding and DNA cleavage activity studies of the ligand and metal complexes were performed.
- The molecular docking of the Co(II) complex on 6-bp DNA (PDB code: 1Z3F) and C-KIT Tyrosine kinases (TRKs) (PDB code: 1t46).

## Abstract

The bio-active Co(II), Ni(II) and Cu(II) complexes derived from new (2-((1H-benzo[d]imidazol-2-yl)methylthio)-1H-benzo[d]imidazol-5-yl)(phenyl)methanone were synthesized in good yield. The structure of these metal complexes have been characterized using IR, UV-visible, mass spectra, <sup>1</sup>H NMR, TGA and powder XRD techniques. The spectral data of the Co(II) and Ni(II) complex indicated the tri-dentate bonding mode with the ligand and that of the Cu(II) complex is in bi-dentate bonding mode. The electrocatalytic activity of the Co(II) complex was studied by cyclic voltammeter using modified GCE towards various concentration of dopamine (DA, 3,4-dihydroxyphenethylamine). The obtained I<sub>p</sub> value linearly increased with increasing scan rates, indicating the oxidation process of dopamine (DA) which occurred by modified Co(II) complex/GCE through diffusion controlled process. The antimicrobial, antioxidant and cytotoxicity studies of the ligand and its metal complexes were performed, the obtained results showed that the complexes are more potent bio-active as compared with uncoordinated ligand. The DNA binding property of the metal complexes were performed on double strand *calf thymus* DNA using electronic absorption and fluorescence emission methods, in addition, photo induced DNA cleavage activity also studied on *pBR322* DNA. The molecular docking of the Co(II) complex on 6-bp DNA (PDB code: 1Z3F) and C-KIT Tyrosine kinases (TRKs) (PDB code: 1t46), further confirms the inhibition ability of the metal complex. The experimental results and the drug likeness property of the metal complexes suggest the possible applications of metal complex which, could be developed as a potent drug in the near future,

Graphical abstract

*K. S. Jithendra*  
PRINCIPAL  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.

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# Optical and antibacterial evaluation of biofunctionalized Cu:ZnS nanoparticles

| Original Article | Published: 05 December 2020

| Volume 3, pages 937–946, (2020) [Cite this article](#)



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[G. Arun Kumar](#), [H. S. Bhojya Naik](#) , [R. Viswanath](#), [G. Krishnamurthy](#) & [Prabhaker Walmik](#)

## Abstract

This article focuses on the surface stabilization of ZnS NPs doped with  $\text{Cu}^{2+}$  ions by casein with relatively different concentrations through microwave method. The surface attributes of the fabricated NPs were characterized by FTIR, XRD, TEM, HRTEM, and EDS measurement which showed the incorporation of Cu ions in doped ZnS NPs. Optical properties were studied using UV–vis and PL spectroscopy. XRD pattern showed zinc blend structure for both uncapped and capped. Absorption spectrum was an evidence for the strong confinement effect in the form of blue shift. Spherical shape with 8 nm (uncapped) and 3 nm (capped) were specified from TEM images. PL spectrum covered UV and visible regions with shift in the emission peak towards a shorter wavelength side. Biological activity of capped NPs was highly effective against various bacterial strains with enhanced luminescence property, which makes them to materialize as an innovative division of antibacterial agent.

  
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 (Constituent College of Kuvempu University)  
 SHIMOGA, Karnataka State.





ISSN 0975-413X  
CODEN (USA): PCHHAX

Der PharmaChemica, 2020, 13(4): 5-16  
(<http://www.derpharmachemica.com/archive.html>)

## Synthesis, Characterization and Biological studies on 3d-metal complexes of 5-[(1, 5-dimethyl-3-oxo-2-phenyl-2, 3-dihydro-1H-pyrazol-4-yl) diazenyl]-1-ethyl-6-hydroxy-4-methyl-2-oxo-1, 2-dihydropyridine-3-carbonitrile

Shridhar P Melkeri<sup>1</sup>, P. Parameshwara Naik<sup>1\*</sup>, G. Krishnamurthy<sup>1</sup>, Prabhaker Walmik<sup>1</sup>, Priyarani RS<sup>2</sup>

<sup>1</sup>Department of Chemistry, Sahyadri Science College, Kuvempu University, Shivamogga, Karnataka-577201, India

<sup>2</sup>Department of Chemistry, Kuvempu University, Shankaraghatta, Karnataka-577451, India

\*Corresponding author: Parameshwara Naik, Department of Chemistry, Sahyadri Science College, Kuvempu University, Shivamogga, Karnataka-577201, India, Email: [parashchem@gmail.com](mailto:parashchem@gmail.com)

### ABSTRACT

*N*-heterocyclic ligand 5-[(1,5-dimethyl-3-oxo-2-phenyl-2,3-dihydro-1H-pyrazol-4-yl) diazenyl]-1-ethyl-6-hydroxy-4-methyl-2-oxo-1,2-dihydropyridine-3-carbonitrile (L) and a few of their transition metal complexes have been synthesised and characterized by different physico-chemical techniques. The electronic and magnetic susceptibility measurements suggest an octahedral geometry for all the complexes excepting Zn(II) complex which possess tetrahedral geometry. The results of thermo-gravimetric analysis showed that the synthesized complexes have thermal stability and confirms the absence of coordinated or lattice water molecules. The bio-potency of all these compounds was investigated by using antimicrobial, antimycobacterial and cytotoxic activities. All the transition metal complexes were noticeably exhibited inhibition properties against the tested microbes.

**Keywords:** Antipyrine, transition metal complexes, antimicrobial studies cytotoxic activities

### INTRODUCTION

The development of multicurative drugs by the use of coordination compounds especially the complexes containing heterocyclic systems is an advanced research in the field of bio-inorganic and medicinal chemistry [1-5]. The use of metal based drugs for the treatment of various diseases not only cure the particular disease but also suppress the high toxicity and directs to identify the various mechanistic paths to overcome the clinical problems [6-9]. In order to achieve the above impending challenges, researchers across the globe trying to design metal based drugs having heterocyclic ligand system [10-12]. Among the general ligating systems known, the azo linked heterocyclic molecules are largely used in the preparation of transition metal chelates due to their versatile properties [13]. They readily form stable complexes with different coordination numbers and exhibit brilliant shades of colour due to the presence of azo linkage along with the metal ions [14]. The presence of heteroatoms, pi electrons and extended conjugation still enhances the various physical, optical, biological and electrochemical properties of the molecules [15-17].

The azo *N*-heterocycles exhibited versatile behaviour towards biological, electrochemical, optical and other industrial applications [18-21]. Furthermore, these can also be helpful as better chelating agents and can be able to form stable complexes with coordination number 4 and 6. Recent reports revealed that the metal chelates having pyridone nucleus proved to be efficient antimicrobial, antitubercular, anticancer, and anti-inflammatory agents [22-23]. Thus, in this paper we made an attempt to synthesize transition metal complexes containing pyridone moiety and studied their biochemical properties.

In continuation of our previous research work we have synthesised some heterocyclic compounds and characterized them by various spectral techniques. The biological activities of the ligand and their metal complexes have been evaluated. We observed that, the synthesised complexes exhibited excellent biological activity.

### EXPERIMENTAL

#### Materials and methods

The chemicals, reagents and starting materials used for the synthesis of ligand and its metal complexes were obtained commercially from Sigma Aldrich Chemical Company and Spectrochem and they were used without further purification. The thin layer chromatography was used to monitor

# SCREENING OF PHYTOCHEMICAL CONTENT AND IN VITRO BIOLOGICAL INVESTIGATION OF *CANTHUM DICOCCUM* (GAERTN.) AND *AMISCHOPHACELUS AXILLARIS* (L.)

MEGHASHREE K S, LATHA K P\*, VAGDEVI H M, AJISH A D, JAYANNA N D, ARUNKUMAR N C

Department Chemistry, Sahyadri Science College, Shimoga, Karnataka, India. Email: lathakp337@gmail.com

Received: 28 October 2019, Revised and Accepted: 16 November 2019

## ABSTRACT

**Objective:** The objective of the study was to study the pet ether, ethyl acetate, and ethanol leaf extracts of *Canthium dicoccum* and *Amisophacelus axillaris* for anthelmintic activity and antihypertensive activity.

**Methods:** The antihypertensive activity was carried out by employing a colorimetric assay based on the hydrolysis of Histidyl-Hippuryl-Leucine and anthelmintic activity carried out against Indian earthworm *Pheretima posthuma*.

**Results:** The pet ether leaf extract both the plants exhibited the maximum antihypertensive activity with a percent inhibition of 61.82 for *C. dicoccum* (Gaertn.) and 84.12 for *A. axillaris* (L.) as compared with Captopril showing percent inhibition 85.37 and for anthelmintic activity, it is found that ethanol extract of *C. dicoccum* and ethyl acetate extract of *A. axillaris* exhibited significant activity against the standard drug albendazole.

**Conclusion:** This study investigated the potential of *C. dicoccum* and *A. axillaris* as a new source against the antihypertensive activity. The outcome of anthelmintic activity revealed that the ethyl acetate and ethanol extracts exhibited a considerable amount of anthelmintic activity, which is mainly due to the active phytoconstituents present in the extracts.

**Keywords:** Antihypertensive, Anthelmintic, *Canthium dicoccum* (Gaertn.), *Amisophacelus axillaris* (L.), Angiotensin-Converting Enzyme Inhibitors

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## INTRODUCTION

Hypertension is nowadays common among people of all age groups. It does not give any early warning symptoms, but it exerts more load on heart and blood vessels due to which it is termed as a silent killer. Immense importance has been given to the study of hypertension with the development of a realistic method to measure it in the past century due to constant change in the lifestyle of people. Physicians have been working tirelessly to ascertain the relation between high blood pressure and risk of failure of heart, kidney, and even causes a stroke. Some early attempts in 1930s and 40s, including surgical procedures involving cutting nerves to blood vessels, including high fever and reducing sodium content in diets, few case studies have yielded significant results proving the treatments are effective in lowering blood pressure and improving outcomes with minor setbacks. One of the proved methods of treatment of hypertension apart from drugs is by improving lifestyle and standard of living. The method of treatment associated with dietary and lifestyle measures considerably reduces the arterial pressure thereby mitigates cardiovascular morbidity and mortality [1-4]. Search for new drugs, mainly from cheap and reliable natural products, and mainly plants are of significant interest in the development of more efficient and better-tolerated drugs. Therefore, it is relatively essential to study the inhibition of angiotensin-converting enzyme (ACE) to prevent and manage hypertension. Macroparasitic disease caused by parasitic worms that are visible to naked eye affecting humans as well as other animals wherein a part of the body or an organ is infected by the worm is known as helminthiasis. Presently, helminthiasis is one of the common agents of infection rampant in developing as well as underdeveloped countries. The spread of helminthiasis which is a significant contributor to global diseases is worsened by prevailing malnutrition, pneumonia, anemia, and eosinophilia in underdeveloped countries [5] due to the nonavailability of basic health infrastructure and medically trained personnel to handle the situations. Helminthiasis is rarely fatal but is a major cause of morbidity [6]. The medicines available in the market which are chemically synthesized are not

effective up to the mark and in some cases have developed resistance thereby causing recurrences of the diseases. Thus medicinal plants which are rich in botanical anthelmintics [7,8] serve as an alternate source for the development of more effective and less toxic medicines which has encouraged further research and development in analyzing new plant-derived medicines.

*Canthium dicoccum* (Gaertn.), the Ceylon boxwood also known as Bellachi in Kannada, belongs to the family Rubiaceae [9]. In India, its bark is used for fever and decoction of the root is used internally for diarrhea. Bark powder with sesame oil is used in rheumatic pain [9,10]. The plant is proved for its anti-inflammatory [11], antidiabetic, and nephroprotective activity [12].

*Amisophacelus axillaris* (L.) is a species of perennial plants in the family Commelinaceae commonly called Negila there in Kannada. It is native to the Indian Subcontinent, southern China, South East Asia, and Northern Australia. It grows in monsoon forest, woodland, and wooded grassland. Traditionally plant is used for anti-inflammatory, antiparasitic, and antifungal property. In India, leaves are used for the treatment of tympanitis and as food for pigs [13].

## METHODS

The *C. dicoccum* (Gaertn.) leaves were collected in the month of June-July in Hosangar (T), Fig. 1 Shimoga district, Karnataka and *A. axillaris* (L.) Fig. 2 leaves were collected in the month of July-August in Agumbe region, Shimoga district, Karnataka. Both the plants were authenticated and deposited in the Department of Botany Kuvempu University, Shankaraghatta, with voucher number KUAB4688 for *C. dicoccum* (Gaertn.) and KUAB1687 for *A. axillaris* (L.). The collected plant material was shade dried and coarsely pulverized. The pulverized plant material was subjected to the hot method of extraction using Soxhlet extractor. The extraction method was carried out using numerous solvents, namely, pet ether, ethyl acetate, and ethanol per their

  
**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,

  
**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State,



## PHYTOCHEMICAL SCREENING IN VITRO BIOLOGICAL ACTIVITIES AND ISOLATION OF ACTIVE MOLECULE FROM *VITEX ALTISSIMA* LEAVES

PREETHI NAIDU V<sup>1</sup>, VAGDEVI HM<sup>2\*</sup>, LATHA KP, AJISI AD<sup>1</sup>

<sup>1</sup>Department of Chemistry, Sahyadri Science College, Shivamogga, Karnataka, India. <sup>2</sup>Department of Sahyadri Commerce and Management College, Shivamogga Karnataka, India. Email: vagdevihm17@gmail.com

Received: 25 July 2020, Revised and Accepted: 05 September 2020

### ABSTRACT

**Objective:** The objective of this work is to investigate the antibacterial, anthelmintic activity of the leaves of *Vitex altissima* and isolation of the bioactive molecule.

**Methods:** The agar disk diffusion method is implemented to evaluate the antibacterial activity of the plant leaves of *V. altissima*, using petroleum ether, ethyl acetate, and ethanol extracts. Exactly 1 mg of each extract is dissolved in 1 ml of dimethyl sulfoxide. The circular Whatman filter paper of diameter 5 mm was dipped in each extract and placed over solidified agar medium. The zone of inhibition was measured. The petroleum ether, ethyl acetate, and ethanol extracts of the plant have been used to carry out the anthelmintic activity against Indian earthworms *Pheretima posthuma*. The column chromatography technique is used for the isolation of bioactive molecules.

**Results:** The results revealed that the ethyl acetate extract exhibited a remarkable zone of inhibition against Gram-positive and Gram-negative bacteria. The petroleum ether, ethyl acetate, and ethanol extracts produce zero percentage zone of inhibition against *Escherichia coli* bacteria. The ethanol extract showed potent anthelmintic activity. The spectral data confirm that the structure of the bioactive molecule is 4-hydroxybenzoic acid.

**Conclusion:** The preliminary results of the study revealed that the ethyl acetate extract of the plant exhibited a broad zone of inhibition against various Gram-positive and Gram-negative bacterial strains and ethanol extract showing significant anthelmintic activity. Spectral data confirmed the structure of the bioactive molecule. The obtained bioactive molecule is responsible for exhibiting potent antibacterial activity.

**Keywords:** *Vitex altissima*, Verbenaceae, Phytochemical constituents, Antibacterial, Anthelmintic activity, *Pheretima posthuma*, Column chromatography.

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### INTRODUCTION

Plants are the essential foundation of medicine. Some important drugs that are still in use today are derived from conventional medicinal herbs. Plants and their active constituents play a vital role in the prevention of a variety of diseases. Numerous medicinal plants have been identified and modern scientific tools are used to study their authenticity, safety, and efficacy of their therapeutic use. The results revealed the great potential of medicinal plants in the field of pharmacology. Helminthiasis is among the most important animal diseases inflicting heavy production losses. Helminths are the most common infectious agent of humans in developing countries and which produce a global burden of disease and contribute to the prevalence of malnutrition, anemia, eosinophilia, and pneumonia. The disease is highly prevalent, particularly in third world countries, due to poor management practices [1]. However, increasing problems of development of resistance in helminths against anthelmintics have led to the proposal of screening medicinal plants for their anthelmintic activity [2,3]. The plants are known to provide a rich source of botanical anthelmintics [4,5].

The genus *Vitex* includes nearly 270 known species of trees. *Vitex altissima* commonly known as a peacock chaste tree. It belongs to the family Verbenaceae. It is usually found in the countries of Indo-Malaysian region - Bangladesh, India, Indonesia, Myanmar, Papua New Guinea, and Sri Lanka. It is a woody plant reaching 20 m height. The leaves are trifoliate or palmate, compound, and opposite. The inflorescences are in terminal panicles. The corolla is bluish-white. The purplish-black fruit is a four seeded drupe [6]. The common names in Kannada are Myrle, Nevaladi, and Balgay. The bark of the plant is mainly used in the treatment of rheumatic swellings. The leaves and roots are used

in Ayurvedic medicine [7]. It is used to treat inflammations, wounds, ulcers, allergies, worm infections, urinary system diseases, stomatitis, cardiac diseases, anorexia, blindness, and leprosy. Therefore, the present study has been undertaken to explore chemical constituents and the antibacterial and anthelmintic activities of petroleum ether, ethyl acetate, and ethanolic extract of *V. altissima* leaves.

### METHODS

#### Collection of plant materials

The specimens were collected from Hosanagara Taluk, Shivamogga District, Karnataka, India. The plant was authenticated by the taxonomist. A voucher specimen (KU/SSC-53/2017) was deposited in the Department of Biotechnology, Sahyadri Science College, Kuvempu University, Shivamogga.

#### Processing of plant material

The leaves of the selected plant were collected in the month of August. The leaves were washed in running water, sprayed ethanol to avoid fungus, and chopped into small pieces, this was shade dried over a period of 3 weeks. The dried leaves were milled into a fine powder by the mixer. The powder stored in clean polythene bags in a cool, dry place until further use.

#### Extraction of plant material

About 0.5 kg of dried, powdered material was successively extracted with petroleum ether, ethyl acetate, and ethanol using a hot Soxhlet extractor. The plant material was processed with different solvents such as petroleum ether, ethyl acetate, and ethanol. Finally, the obtained solvent extracts were reduced using a rotary evaporator and

Dr. Vikal Rao. K.S  
 Dept. of Chemistry  
 Sahyadri Science College,  
 Shimoga.

SAHYADRI SCIENCE COLLEGE  
 (Constituent College of Kuvempu University)  
 SHIMOGA, Karnataka State.





Received on 16 November 2019; received in revised form, 27 January 2020; accepted, 29 March 2020; published 01 November 2020

## DETERMINATION OF DRUG TOXICITY OF ACETAMINOPHEN USING 3D SCAFFOLD CULTURES OF IMMORTAL HUMAN HEPATOCARCINOMA CELL LINES

M. S. Suma<sup>1</sup>, K. S. Jamuna<sup>1</sup>, C. K. Ramesh<sup>\*1</sup> and Riaz Mahmood<sup>2</sup>

PG Department of Studies and Research in Biotechnology<sup>1</sup>, Sahyadri Science College, Kuvempu University, Shimoga - 577203, Karnataka, India.

Department of Postgraduate Studies and Research in Biotechnology and Bioinformatics<sup>2</sup>, Jnana Sahyadri, Kuvempu University, Shimoga - 577451, Karnataka, India.

### Keywords:

APAP, Cytotoxicity, 3D PDMS scaffold culture, Hepatocarcinoma cell lines, HepG2, Huh-7

Correspondence to Author:  
Dr. Ramesh C. K.

Associate Professor,  
PG Department of Studies and  
Research in Biotechnology, Sahyadri  
Science College, Kuvempu  
University, Shimoga - 577203,  
Karnataka, India.

E-mail: ckramck@gmail.com

**ABSTRACT:** Acetaminophen (APAP), well-known as paracetamol, is a safe analgesic and antipyretic agent at a therapeutic dose. However, overdoses of APAP can induce hepatotoxicity, which in turn causes severe liver injury. Various hepatic models mimicking liver architecture have been investigated to examine the potential hepatotoxic effects of chemicals and drugs, but there is always a demand for *in-vitro* high-throughput hepatic platforms for measuring the hepatotoxicity. This study aims to provide a simple, easy to fabricate and work, a micro-space three-dimensional (3D) scaffold culture system as an *in-vitro* model for APAP induced hepatotoxicity studies on hepatocarcinoma cell lines (HCC - HepG2 and Huh-7). A silicon mould based template was used to cast out polydimethylsiloxane (PDMS) hexagonal scaffolds. Cytotoxicity was performed by MTT assay. Fluorescence microscopy is used to know the differences in the morphology of the cells grown on scaffolds. mRNA levels of cytochrome P450 2E1 (CYP2E1) expressions were demonstrated through qRT-PCR technique. This study examined the characteristics and usefulness of HepG2 and Huh-7 cell lines grown on the PDMS scaffold system, a three-dimensional culture method as an *in vitro* human model for APAP-induced hepatotoxicity studies. Scaffold cultured HepG2 and Huh-7 cells showed higher expression of mRNA levels of CYP2E1, more susceptibility for APAP. We have verified that *in-house* developed PDMS scaffold culture method for APAP toxicity, by measuring cytotoxicity studies, measuring DNA proliferation, and by showing the expression of CYP2E1 in our system.

**INTRODUCTION:** Acetaminophen (APAP, paracetamol), also commonly known as *Tylenol*, is the most commonly taken analgesic worldwide and is recommended as first-line therapy in pain conditions by the World Health Organization (WHO). It is also used for its antipyretic effects, helping to reduce fever<sup>1-2</sup>.

However, overdoses of APAP of 10-15g can cause serious toxicity and is harmful to the liver and the kidneys<sup>3-4</sup>. APAP can induce different cytotoxic mechanisms on different hepatocarcinoma cell lines (HCC). It can induce caspase-dependent apoptosis on hepatoma Huh-7 and SK-Hep1 cells<sup>5-6</sup> and induces apoptosis and necrosis on hepatoma HepG2 cells and Hep3B cells<sup>7-8</sup>. Although many studies were reported, the underlying cytotoxicity mechanisms caused by APAP are still unclear.

To evaluate pathophysiological mechanisms and screen new drugs against diseases, detailed *in vivo* and *in-vitro* models of disease are essential. Most knowledge of APAP-induced liver injury has been

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| <p>QUICK RESPONSE CODE</p>                                      | <p>DOI:<br/>10.13040/IJPSR.0975-8232.11(11).5611-18</p> |
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| <p>DOI link: <a href="http://dx.doi.org/10.13040/IJPSR.0975-8232.11(11).5611-18">http://dx.doi.org/10.13040/IJPSR.0975-8232.11(11).5611-18</a></p> |                                                         |





## Research Article

www.ijrap.net (ISSN:2229-3566)



### ASSESSMENT OF ANTIMICROBIAL ACTIVITY OF ETHANOLIC EXTRACTION OF *USNEA GHATTENSIS* AND *USNEA UNDULATA*

Archana Ramachandra Mesta <sup>1\*</sup>, Rajeswari N <sup>2</sup> and Vinayaka Shankarnarayana Kanivebagilu <sup>3</sup>

<sup>1</sup> Research Scholar, Department of Botany, Kumadvathi First Grade College, Shimoga Road, Shikaripura, Shimoga, Karnataka, India

<sup>2</sup> Associate Professor, Department of Botany, Sahyadri Science College, Shimoga, Karnataka, India

<sup>3</sup> Associate Professor, Department of Botany, Kumadvathi First Grade College, Shimoga Road, Shikaripura, Shimoga, Karnataka, India

Received on 18/09/19 Accepted on 04/11/19

\*Corresponding author

E-mail: archa.mesta@gmail.com

DOI: 10.7897/2277-4343.110115

#### ABSTRACT

The fungal partner of lichens produces a great variety of biologically active metabolites such as antibiotic, antiviral, anti-inflammatory and many others. Antimicrobial is a substance which either inhibits the growth of micro-organism or kills the microbes. The pathogenic microorganisms causing number of diseases in plants and animals have developed resistance against many commonly available chemicals and antibiotics. Lichens are the combination of two life forms algae and fungi. A large number of lichens are known for the source of important secondary metabolites. The present study aims at the antimicrobial properties of two species of *Usnea* belonging to the largest family Parmeliaceae. The antibacterial activity of two species of *Usnea* was tested against six organisms such as *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Salmonella typhi*, *Escherichia coli*, *Vibrio cholerae*, *Bacillus coagulans*. Both species of *Usnea* had shown inhibitory activity against all pathogen but to different extent. These two species of *Usnea* are found in large quantity in Mullayangiri of Karnataka and these two species can be used sustainably in the preparation of antimicrobials.

**Keywords:** *Usnea*, antimicrobial, pathogen, Parmeliaceae

#### INTRODUCTION

The symbiotic association of fungi and algae or cyanobacteria forms the slow growing life forms called lichens. Lichens are very sensitive organisms and show poor growth in industrial area and big cities. Hence they are considered as indicators of air pollution<sup>1</sup>. More than 50% of lichens that have been studied synthesize substances with some degree of antimicrobial activity<sup>2</sup>. Many researches have been carried out to prove the antifungal and antimicrobial activity of the lichens. Different concentrations of lichen extracts have a variable degree of lichen activity<sup>3</sup>. Antifungal and antimicrobial activity of extracts from *Usnea* species is extremely proved. Secondary metabolites such as Usnic acid, Pulvinic acid derivatives, aliphatic acids, orcinol type depsides and depsidones are well known for its effective antimicrobial activity.

Lichens and their products are used in traditional medicines for centuries and used as an alternative treatment in various parts of the world. The secondary metabolites of lichens are unique with respect to higher plants and are found their uses in many fields such as medicines, dyes, cosmetics, deodorants, preservatives and also in biopesticides. These lichens grow slowly but still they are resistant to decaying microorganisms. This fact suggests that the lichen substances are very effective antibiotics<sup>4</sup>.

The secondary metabolites from the lichens have the capacity to inhibit the seed germination in vascular plants and spore germination in mosses<sup>5</sup>. These antimicrobial roles of the secondary metabolites of lichens have made possible for the lichens to live for hundreds of years<sup>6</sup>. *Usnea ghattensis* and *Usnea undulata* are fruticose lichens with bushy thallus. *U. ghattensis* is erected bushy but *U. undulata* shows sub-pendant thallus. *U.*

*ghattensis* is found growing in Karnataka and Maharashtra<sup>5,6</sup> whereas *U. undulata* is distributed in states of Arunachal Pradesh, Meghalaya, Nagaland, Karnataka, Kerala and Tamil Nadu<sup>6,7</sup>.

#### MATERIAL AND METHODS

##### Collection of the sample

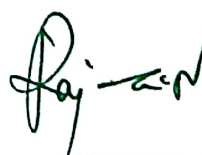
Lichen *Usnea ghattensis* is collected from the Mullayangiri and Kemmangundi hills of Karnataka and Mahabaleshwar hills of Maharashtra. The lichen *U. undulata* was collected from Mullayangiri peaks of Karnataka, India. The collected lichens were dried and stored in lichen herbarium of KFGC, Shikaripura. The lichens were identified up to species, based on its anatomy, morphology and chemical characters<sup>8,12</sup>. The herbarium voucher specimen number of *U. ghattensis* is LHKFGC0012 and *U. undulata* is LHKFGC0015, are used for preparing the lichen extracts.

##### Test organisms

Six bacterial cultures were procured from Microbiology Department, Sahyadri Science College, Shimoga, India. *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Salmonella typhi*, *Escherichia coli*, *Vibrio cholerae*, *Bacillus coagulans* are the 6 test organisms.

The lichens were washed, dried and ground to powder. 10 g portion of powder was added to 100 ml of ethanol, mixed well, sonicated and left for 48 hours at room temperature with occasional stirring. The extracts were prepared by decanting the contents of flask through a clean muslin cloth and again with Whatman No.1 filter paper to get a clean filtrate. The filtrate was

  
**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga.



**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.





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# Assessment of Chemical Properties of *Tinospora Cordifolia*

Nafeesa Begum<sup>1</sup> | Ranjith Y<sup>2</sup>

<sup>1</sup>Assistant Professor, Department of Botany, Sahyadri Science College, Shivamogga

<sup>2</sup>Lecturer, Department of Botany, Sahyadri Science College, Shivamogga,

## To Cite this Article

Nafeesa Begum and Ranjith Y, "Assessment of Chemical Properties of *Tinospora Cordifolia*", *International Journal for Modern Trends in Science and Technology*, 6(12): 45-49, 2020.

## Article Info

Received on 07-November-2020, Revised on 22-November-2020, Accepted on 28-November-2020, Published on 01-December-2020.

## ABSTRACT

The plant produces have phyto medicine this can be derived from bark, leaf, flower, fruit and seeds (Raghunathan and Rama Mitra, 1982). In the present study the phyto chemical analysis were carried out in leaf and bark of *Tinosporacordifolia*. *Tinosporacordifolia* is an important medicinal plant used in ayurvedic system of medicine. The stem of the plant is grayish brown in colour and bitter in taste. The stem is soft wooded, dry. The plant has been used as an anti spasmodic, anti inflammatory, Jaundice, Diabetes, seminal weakness, urinary tract infections, fever, skin diseases and expectorant, carminative, digestive, anti stress and aphrodisiac.

**KEYWORDS:** *Tinospora cordifolia*, Phytochemicals, Chikka magalore District,

## I. INTRODUCTION

Then importance of plant is known to us well, the plant kingdom is a treasure house of potential drug and from the plant are easily available less expensive safe and efficient rarely have side effect. About most of the people use traditional medicine which as compound derived from medicinal plant. However such plant should be investigated better understand their properties, the medicinal plant action on human body and these bioactive substances includes synthesized by primary or rather secondary metabolism of living organisms. The plant produces have phyto medicine this can be derived from bark, leaf, flower, fruit and seeds (Raghunathan and Rama Mitra, 1982). In the present study the phyto chemical analysis were carried out in leaf and bark of *Tinosporacordifolia*. *Tinosporacordifolia* is an important medicinal plant used in ayurvedic system of medicine. The stem of the plant is grayish brown in colour and

bitter in taste. The stem is soft wooded, dry. The plant has been used as an anti spasmodic, anti inflammatory, Jaundice, Diabetes, seminal weakness, urinary tract infections, fever, skin diseases and expectorant, carminative, digestive, anti stress and aphrodisiac. Piles problems can be controlled by eating this plant mixed with milk or water and thus preventing the bleeding and constipation (Kirtikar et.al, 1987) Leaves are rich in protein, calcium and phosphorous (Singh and Singh 2003; Sinha et.al., 2004). The alcoholic extract caused reduction in fasting blood sugar which has been interpreted as indicating some indirect action of drug on carbohydrates metabolism (Sinha et.al, 2004). Decoction of *Tinosporacordifolia* showed anti-inflammatory activity, paste or juice of this plant is applied locally for burning sensation (Sinha et.al., 2004). *Tinosporacordifolia* the killing ability of





# Preliminary Phytochemical Screening of Medicinal Plants used in Traditional Medicine

ArunakumarN C<sup>1</sup> | Ranjith Y<sup>2</sup>

<sup>1</sup>Department of Chemistry, Sahyadri Science College, Kuvempu University, Shivamogga

<sup>2</sup>Department of Botany, Sahyadri Science College, Kuvempu University, Shivamogga

## To Cite this Article

ArunakumarN C and Ranjith Y, "Preliminary Phytochemical Screening of Medicinal Plants used in Traditional Medicine", *International Journal for Modern Trends in Science and Technology*, 6(10): 109-112, 2020.

## Article Info

Received on 30-September-2020, Revised on 12-October-2020, Accepted on 15-October-2020, Published on 23-October-2020.

## ABSTRACT

Fundamental screening of phytochemicals is a significant advance, in the location of the bioactive standards present in restorative plants and therefore may prompt medication disclosure and improvement. In the current examination, chief phytoconstituents of the six chose restorative plants of various families were distinguished so as to relate their essence with bioactivities of the plants. Screening of six chose therapeutic plants was performed for the presence of tannins, flavonoids, terpenoids, saponins, steroids, phlobatannins, starches, glycosides, coumarins, alkaloids, proteins, emodins, anthraquinones, anthocyanins and leucoanthocyanins utilizing standard strategies. All the chose restorative plants were found to contain tannins and flavonoids. In addition, terpenoids were additionally present in all the chose plants aside from *P. dactylifera*. But *P. dactylifera*. Then again, saponins and steroids were missing in all plants aside from *S. chirata* and phlobatannins were missing in all plants aside from *R. sativus*. Likewise, starches, glycosides and coumarins were available in all the chose plants aside from *P. dactylifera* and *R. sativus*. Alkaloids were available in all the chose plants aside from *F. religiosa*, *P. dactylifera* and *R. sativus*. Proteins were available just in *F. religiosa* and *S. chirata*. Though emodins, anthraquinones, anthocyanins and leucoanthocyanins were missing in all the chose six plants. It is evident from the study that *S. chirata* is of highest therapeutic efficacy possessing majority of phytochemical classes of compounds and *P. dactylifera* is of lowest therapeutic potential due to the absence of majority of phytoconstituents.

**KEYWORDS:** Medicinal plants, Preliminary, Screening, Phytochemical.

## INTRODUCTION

Restorative plants other than remedial specialists are likewise a major wellspring of data for a wide assortment of synthetic constituents which could be created as medications with exact selectivity. These are the repositories of conceivably valuable substance mixes which could fill in as more up to date leads and signs for current medication plan [1]. The most significant of these bioactive constituents of plants are alkaloids, tannins, flavonoids and phenolic mixes [2]. Relationship

between's the phytoconstituents and the bioactivity of plant is attractive to know for the combination of mixes with explicit exercises to treat different wellbeing afflictions and ongoing infections too [3].

Inferable from the noteworthiness in the above setting, such starter phytochemical screening of plants is the need of great importance so as to find and create novel helpful specialists with improved adequacy. Various exploration bunches have likewise detailed such examinations all through

EFFICIENT AND SCALABLE SYNTHESIS OF *N*-(4-OXO-3-SUBSTITUTED-2-SULFANYLIDENE IMIDAZOLIDIN-1-YL)-8-NITRONAPHTHO [2,1-*B*]FURAN-2-CARBOXAMIDE DERIVATIVES AND THEIR ANTIMICROBIAL ACTIVITIES

KM. Nagarsha<sup>1</sup>, KP. Latha<sup>1\*</sup>, D. Ramesh<sup>2</sup>,

MN. Kumaraswamy<sup>2</sup> and DR. Ramesh<sup>3</sup>

<sup>1</sup>Department of Chemistry, Sahyadri Science College, Shivamogga-577202, Karnataka, Bangalore, India.

<sup>2</sup>Department of Chemistry, Sir M V Govt. Science College, Bommanakatte, Bhadravathi-577303, Karnataka, Bangalore, India.

<sup>3</sup>Department of Chemistry, Govt. First Grade College, Shikaripura-577427, Karnataka, Bangalore, India.

ABSTRACT

The various substituted aromatic isothiocyanates in glacial acetic acid on treatment with 8-nitronaphtho[2,1-*b*]furan-2-carbohydrazide 4 afforded 2-(8-nitronaphtho[2,1-*b*]furan-2-carbonyl)-*N*-substitutedhydrazine-1-carbothioamides 5a-e. These on refluxing with chloroacetylchloride in DMF as a solvent yields *N*-(4-oxo-3-substituted-2-sulfanylideneimidazolidin-1-yl)8-nitronaphtho[2,1-*b*]furan-2-carboxamides 6 a-e. The structures of 5a-e and 6a-e have been established by spectral studies and they have been screened for antimicrobial activities.

**Keywords:** 8-nitronaphtho[2,1-*b*]furan-2-carbohydrazide and antimicrobial activities.

INTRODUCTION

A heterocyclic Imidazolidines are important building blocks in biologically active compounds containing highly conserved five-member ring which formed of nitrogen-containing pharmacophores acts as a structure blocks in biologically active compounds because it carriers of pharmacologically active carbonyl compounds, its derivatives found to have application in the field of medicinal chemistry. Imidazolidines and their fused derivatives are keys in many bioactive compounds and they showed good biological activities<sup>1-2</sup> like anticonvulsant, antihypertensive activity<sup>3-4</sup>, anti-proliferative<sup>5</sup>, antihyperglycemic<sup>6</sup>, anticancer<sup>7</sup>. These derivatives were also showed good results towards anti-inflammatory, antinociceptive activities<sup>8</sup>, antibacterial and antifungal activities. In particular, the

derivatives of Naphtho[2,1-*b*]furan has various pharmacological activities<sup>10-12</sup> and biological activities<sup>13-14</sup>. The application of these compounds in pharmaceutical field prompted us to synthesize some new nitro substituted naphtho[2,1-*b*]furan with imidazolidines. Encouraged by the wide spectrum of biological activities associated with naphtho[2,1-*b*]furan and different heterocyclic bearing compounds and in continuation of our earlier work<sup>15-22</sup>, we reported in this paper the synthesis of title compounds by different routes and investigation of their biological activity. Further, the efficiency of the synthesized molecules was confirmed by their antimicrobial activities.





## A review: Transmission of novel corona virus (Covid-19) disease effect on animals

Mahanthesh Kumar GT<sup>1</sup>, Madhusudana Somegowda<sup>2</sup>, Amulya RN<sup>3</sup>, Prabhakar Walmik<sup>4</sup>

<sup>1</sup> Department of Plant Biotechnology, University of Agricultural and Horticultural Science, Shivamogga, Karnataka, India

<sup>2</sup> Department of Plant Biochemistry, University of Agricultural and Horticultural Science, Shivamogga, Karnataka, India

<sup>3</sup> Department of Zehrs, University of Agricultural and Horticultural Science, Shivamogga, Karnataka, India

<sup>4</sup> Department of Studies and Research Chemistry, Sahyadri Science College, Kuvempu University Shivamogga, Karnataka, India

### Abstract

Corona virus is causes respiratory infection which includes pneumonia, cold, sneezing and coughing and body temperature variation, digestion imbalance (diarrhea) and respiratory infection in humans. Corona virus transmitted human to human or human to animal via airborne droplets. Corona virus enters and affected in animals, some researchers have identified some specific types of cell in a nose that are the primary infection, and from mouth, sexually transmit contact through membrane and angiotensin converting enzyme-2(ACE)-2 exopeptidase receptor. WHO and European center for disease prevention and control (ECDC) advised to avoid public place and close contact to infected persons and pet animals. Initially, Corona virus (2019-nCoV) was isolated from Wuhan market China on 7<sup>th</sup> Jan 2020. While the majority of cases result in mild symptoms, some progress to pneumonia and multiorgan failure. The death per number of diagnosed cases is estimated at between 1% and 5%, but varies by age and other health conditions. The infection is spread from one person to others via respiratory droplets, often produced during coughing and sneezing. It takes 2-14 days to develop symptoms from the day of exposure. Reverse transcription-polymerase chain reaction (RT-PCR) from a nasopharyngeal swab or oropharyngeal swab is the standard method of diagnosis. The infection can also be diagnosed from a combination of symptoms, risk factors, and a chest computed tomography scan showing features of pneumonia. Measures recommended to prevent the disease include frequent hand washing, maintaining distance from other people, and not touching one's face. The use of masks is recommended for those who are suspected to have the virus and to their caregivers, but not the general public. As of still, there is no vaccine or specific antiviral treatment for COVID-19; management involves treatment of symptoms, supportive care, and experimental measures. The World Health Organization declared the 2019-2020 CoV outbreak a pandemic and a Public Health Emergency of International Concern.

**Keywords:** coronavirus, covid-19, mers-cov, sars-cov, wuhan, ecdc, ace-2 exopeptidase receptor.

### Introduction

#### History and Origin

First case of corona virus was notified as cold in 1960. According to the Canadian study 2001, approximately 500 patients were identified as Flu-like system; 17-18 cases of them were confirmed as infected with corona virus strain by polymerase chain reaction. Corona was treated as simple non-fatal virus till 2002. In 2003, different reports published with the proofs of spreading the corona to many countries such as United States America, Hong Kong, Singapore, Thailand, Vietnam and in Taiwan. Several case of severe acute respiratory syndrome caused by corona and their mortality more than 1000 patient was reported in 2003. This was the black year for microbiologist. When microbiologist was started focus to understand these problems. After a deep exercise they conclude and understand the pathogenesis of disease and discovered as corona virus. But till total 8096 patient was confirmed as infected with corona virus. So, in 2004, World health organization and centres for disease control and prevention declared as "state emergency". Another study report of Hong Kong was confirmed 50 patients of severe acute respiratory syndrome while 30 of them where confirmed as corona virus infected. In 2012, Saudi Arabian reports were presented several infected

patient and deaths. COVID-19 was first identified and isolated from pneumonia patient belongs to Wuhan, china.

#### Sample collection method

Selection of patient for testing: o Any Patient who satisfies the testing "Criteria for SARI/COVID-19" as prescribed by State or Central Government. o any patient identified by "As a suspected case of SARI/ COVID-19" the treating doctor

#### Steps to be followed for specimen collection using aseptic method

1. Nasal swab and/or throat swab specimens is to be collected as per GOI guidelines.
2. Sample collection area should be kept clean and table or work surface should be properly disinfected with surgical spirit.
3. Collect required details from the patient and fill the sample collection form.
4. Ensure that patient is seated in a comfortable seating position.
5. Clearly explain the sample collection procedure to ensure full cooperation from the patient.
6. Wear appropriate personal protective equipment (PPE)

**Dr. Vittal Rao. K.S**  
Dept. of Chemistry  
Sahyadri Science College,  
Shimoga

**PRINCIPAL**  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.



## Assessment of quality of packaged water marketed in Ibb city, Yemen for drinking purpose

<sup>1</sup>Wadie Ahmed Al-Shargabi, <sup>2</sup>Raya Qaid Alansi, <sup>3</sup>Ravikumar, R  
and <sup>4</sup>Janardhana, M.R.

<sup>1</sup>Department of Medical Laboratories, Faculty of Medical and Health Sciences, Turba Branch, Taiz University, Taiz, Yemen

<sup>2</sup>Yemen Standardization and Metrology Organization, Yemen.

<sup>3</sup>Department of Geology, Sahyadri Science Collage, Kuvempu University, Shivamogga, Karnataka, India.

<sup>4</sup>Department of Geology, Yuvaraja's collage, University of Mysore, Mysore, Karnataka, India.

**Abstract:** The current study involves the analysis and evaluation of the 38 bottled water samples being sold in 0.75, 1.5 and 5 liters capacity containers across Ibb city, Yemen. Water samples were evaluated for physico-chemical and biological characteristics to assess the suitability for drinking purpose. The evaluated physical parameters consist of net weight of the samples, seal of the bottle caps, taste and odor. The collected samples were analyzed for pH, TDS and TH as well as the determination of the concentration of Mg, Cu, Zn, Fe, Cd, Mn, Ni and Cr elements and SO<sub>4</sub>. The microbial analysis was also conducted in terms of most probable number (MPN) of total coliforms in water samples. The results showed that most of the water samples are slightly alkaline in nature. The packaged water is characterized by the palatable taste, odorless, concentration of chemical elements ranging from below the detection limit to within the permissible limits of Yemen Standard and Measure Organization (YSMO). The microbial analysis reveals the absence of most probable number (MPN) of total coliforms and *Escherichia coli* (E. coli) in water samples. Correlation analysis among most of the chemical parameters indicates positive correlation of TDS, Mg and SO<sub>4</sub> with TH while pH is negatively correlated with TH and others are not significant. All parameters evaluated are well within the permissible limits of YSMO standard and suitable for drinking purpose.

**Key words:** Packaged water. Physico-chemical parameters. E-coli. Correlation matrix. Ibb city. Yemen.

Date of Submission: 17-04-2020

Date of Acceptance: 02-05-2020

### I. Introduction

The quality of drinking water is closely associated with human health, and supply of potable drinking water by any governments, is one of the important public health priorities (Sarker et al., 2016). The non-availability of good quality drinking water has resulted into a number of health challenges as water is known to be a primary causative agent of many contagious diseases. In developing countries of the world, 80 % of all diseases and over 30 % of deaths are related to drinking water (Sarker et al. 2016; Onweluzo and Akuagbazie, 2010). Access to safe drinking water is key to sustainable development, food production, poverty reduction and quality health (Adekunle et al., 2004). Unfortunately, such water sources are scarce and even when they are available; they are seldom safe for consumption. Approximately three out of five persons in developing countries do not have access to safe drinking water (Mengesha and Baye2004). Under such circumstances, it is generally considered that treated packaged water is safe for usage by people.

Ibb city (Fig. 1) located between Sana'a, the capital of Yemen, and Taiz governorates, bounded by latitude 13°58'48" and longitude 44°10'48", lacks any surface fresh water resources. Ibb is situated at an elevation of about 2000 m above sea level. The population of the governorate of Ibb is about 1.5 million, and according to the Yemeni National Information Center (YNIC), its population constitutes 10.8% of the total population of the Republic, and is the third largest governorate of the Republic in terms of population. Population density is 1932 persons/Km<sup>2</sup>. In the absence of any surface fresh water resources, the population of Ibb city relies entirely on groundwater for their demands. At the present time, more than twenty wells are in operation, ten of which feed directly into the pipe network and ten feed the high level reservoir. The depth of the wells ranges from 135 up to 333m (Dar Al Handasah; 2006) below ground level.

Provision of safe drinking water is one of the most essential amenities to be made available for citizens in the modern world (Joseph et al., 2018). Local authorities of Ibb city, supply water to its citizens through pipe network however it cannot be consumed directly due to its aesthetic value. A significant number of people consume packaged water which is partially treated using filters for purification and ozone for sterilization. But, there is still a debate on the efficiency of filtration system to comply with the regulations as water that



## Isolation and Characterization of Alkaline Protease Producing *Streptomyces tendae* SO-13 from Rhizosphere Soils of Western Ghats

Subbaraju A and R Onkarappa\*

Department of Studies and Research in Microbiology, Sahyadri Science College,  
Kuvempu University, Shivamogga-577203, Karnataka, India

### ABSTRACT

Microbial alkaline proteases are among the salient hydrolytic enzyme and used extensively as biocatalysts, Extracellular alkaline protease is of great importance due to its applications in detergent, food and leather industries by the prokaryotic actinomycetes. The present investigations were focusing on soil actinomycetes. Screening for alkaline protease and characterization of specific strain from rhizosphere soil from Western Ghats of Karnataka, India. The zones of hydrolysis were observed on skim milk agar medium under pH 10.0 at 30±02 OC for 5 to 7 days and produced 117.67 U/mL of alkaline protease by the fermentation. Morphological and biochemical characterization of the isolate was carried out and found that the isolate belongs to the *Streptomyces* genus. Further species confirmation of the *Streptomyces* was done by 16S rRNA gene sequencing. The obtained nucleotide sequences SO-13 were submitted to the GenBank database and the accession number assigned is MW130237. The results reveal the isolate SO-13 was identified as *Streptomyces tendae*. The present data reveal that the isolate SO-13 represents *Streptomyces tendae*. The potentiality of the eco-friendly enzyme could be used for various industrial applications. The alkaline protease production from *Streptomyces tendae* SO-13 is the potent strain for commercial use. Further investigation at the commercial level and novel applications of alkaline proteases to be carried out.

**KEY WORDS:** WESTERN GHATS, RHIZOSPHERE SOIL, STREPTOMYCES TENDAE, ALKALINE PROTEASE.

### INTRODUCTION

The Western Ghats of India has been considered as one of thirty-four biodiversity hot spots in the world, with rich flora and fauna. The Western Ghats of Karnataka popularly known as Sahyadri hills are treasure houses of endangered species but less studied concerning microbial biodiversity. Actinomycetes are widely distributed in soil,

and constitute a significant part of soil microflora (Bawazir and Manjula 2018). Soil actinomycetes are prokaryotes with various metabolic activities (Chavan et al., 2013). Actinomycetes are gram-positive, filamentous, bacteria, characterized by the formation of aerial mycelium, and spores on solid media, with DNA high in G+C content of 60-70 mol% (Shirling and Gottlieb 1966; Subbaraju and Onkarappa 2018).

Among the microorganisms, actinomycetes acquire special importance as the power source of antibiotics and, other bioactive primary and secondary metabolites such as enzymes (Chavan et al., 2013). Sources of commercial enzymes cover a wide range from microorganisms then animals and plants sources. Fungi and yeast contribute about 50%, bacteria 25%, animal 8% and plant 4% of the total in commercial enzymes production (Azmi et al., 1999). Proteases of neutrophilic as well as alkaliphilic

#### Article Information:

Corresponding author email: [actino.research@gmail.com](mailto:actino.research@gmail.com)  
Received 21/10/2020 Accepted after revision 17/12/2020  
P-ISSN: 0974-6455 E-ISSN: 2321-4007  
Thomson Reuters ISI Clarivate Analytics  
Web of Science ESCI Indexed Journal

#### Identifiers & Pagination:

Vol 13(4) E-Pub 31<sup>st</sup> Dec 2020 Pp- 2249-2254  
This is an open access article under Creative Commons  
License Attribution International (CC-BY 4.0)  
Published by Society for Science & Nature India  
DOI: <http://dx.doi.org/10.21786/bbrc/13.4/93>



## A Brief Study on Climate Change

Shantha A R

Assistant Professor Department of Zoology Sahyadri Science College Shivamogga.

### Abstract:

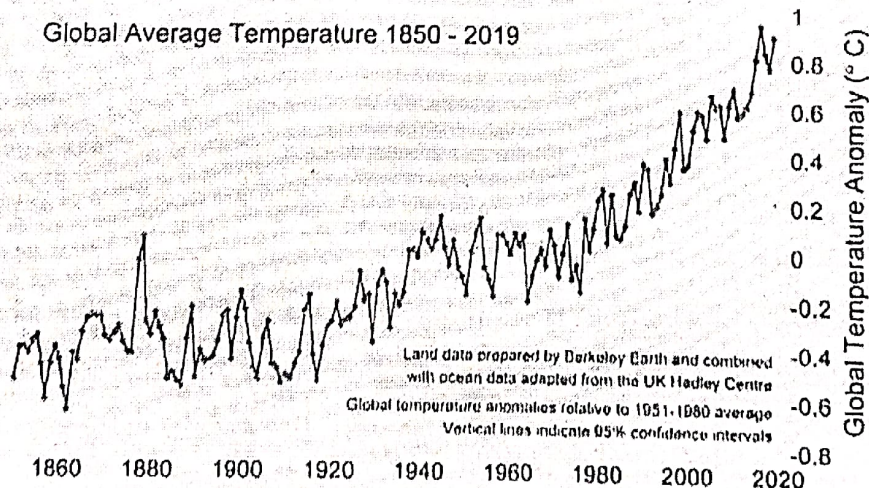
With the advent of globalization, urbanization and modernization the quality of environment is degrading at an alarming rate. Since the last two centuries we can observe drastic change in science and technology. With the advancement in science, the mankind is leading a more sophisticated life, however, at the cost of our environment. The ever rising population is putting forth new challenges and more demands in terms of natural resources (like water, food), employment, materials and equipments and many more. In order to meet these demands, we have constantly been exploiting nature. Due to intense interplay of social, economic and technological activities, the impact on our environment is now a topic of major concern. Because all the living creatures are a part of environment and any imbalance in the same, disturbs the biotic components of it. In the present condition depletion of ozone layer due to greenhouse gases has resulted in global warming which in turn is causing, melting of ice, increased average temperature of the planet, irregular seasons etc. It is now an urgent need to all the governments and public of the world to call for a sustainable development. International organizations are working to protect and preserve environment. The major challenge is now to shift towards sustainable development without hindering the progress in science and technology.

**Key Words:** Globalization, Urbanization, Modernization, Global Warming, Greenhouse gases, Biotic components, Sustainable development, Ozone layer

Date of Submission: 04-09-2020

Date of Acceptance: 19-09-2020

UNFCCC stands for United Nations Framework Convention on Climate Change. It is an international protocol that came into effect in 1994, with the objective to address global climate change resulting from anthropogenic activities and to achieve greenhouse gases stabilization. According to UNFCCC, climate change is defined as, "Change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" [UNFCCC].



Source : Google

Image

The graph above illustrates the global temperature anomalies from 1850 to 2019. It can be clearly interpreted that over the decades the average temperature of the planet has been increasing though there are some downfall seen in the graph. The average temperature of Earth has risen by 0.76 degree centigrades over





## Biological Science

## A REPORT ON ECONOMIC IMPORTANCE OF HONEY AND OTHER BEE PRODUCTS.

Smt. Shantha A.R.

Assistant Professor, Department of Zoology, Sahyadri Science College, Shivamogga, Karnataka.

## ABSTRACT

Honey has been one of the most highly valued element in Indian culture. It has been used since ages for cooking, for its medicinal properties and as an active ingredient in beauty products. Rearing of honey bee and extracting its products such as honey and wax is proved to be very economic and income generating. Culture of honey bees is called Apiculture, which is a scientific method of rearing, breeding and managing bees. Culturing bees also helps in crop pollination. Bee keeping has been practiced in India since time immemorial. The earliest reference dates back to Vedas and Ramayana, however, the Western method of Apiculture was introduced first in India in late 19<sup>th</sup> century in Bengal and Punjab. Apiculture is already an industry in developed countries and in the developing countries, its full economic potential is yet to be realized.

## KEYWORDS:

Honey bees are the subset of bees which represent a smaller fraction of bee diversity. These bees are the tiny living members of the tribal apini all in the genus *Apis* and all of which produce and store liquified sugar(honey) to some degree and construct colonial nests out of wax secreted by the worker bees in the colony. Other types of related bees produce and store honey but only members of Genus *Apis* are considered as "True Honey Bee". Honey bees now live in all parts of the world except in extreme polar region. Bee adaptability to different climates and environment has proved to be genuinely amazing. As a result of specific climate conditions and peculiarities of nectariferous flora, there developed various breeds of honeybees during the course of their evolutionary history. India has all the 4 species of honey bees:

- 1) *Apis cerana indica* (Indian bee)
- 2) *Apis dorsata* (Rock bee)
- 3) *Apis mellifera* (European bee)
- 4) *Apis florea* (Little bee)

## Economic Importance of honey:

Honey is used by human beings in different ways of which the most important are food and medicine.

- 1) Food value of honey
- 2) Medicine value
- 3) Bee wax
- 4) Other uses of honey.

## Honey as food:

The food value of honey can be estimated by the fact that 200gms of honey provides nourishment as 11.5 litres of milk or 1.6kg of cream and 330gms of meat. 2.1gms of honey provides as much as 67K cal of energy. It contains sugars, minerals, vitamins and other vital elements that are readily absorbed by the system. Honey is used in many dishes as it adds unique flavour to the food and enhances its taste. It can be taken by both healthy man and ill person, anytime, during any season. However, excess intake of honey may cause digestive problems, increase blood sugar level and causes too much weight gain.

## Honey as medicine:

Honey is the major honey bee product in terms of familiarity and profit. Since beginning, much of attention has been focused on its potential health benefits for humans. Honey is used in counter pharmaceuticals and drug preparations. It is proved to be a desirable medicinal product. Honey has been regarded as a cure for many ills from early times which is used to treat many diseases, particularly asthma, coughs, hoarseness and tough morning phlegm have been well known for a long time. Physicians agree that honey is an excellent remedy for constipation, flatulence, colic and purges of the internal organs. Its special virtue as a laxative is also well known.

Today honey is a component of many commercially manufactured pharmaceutical products. Atleast 200 ton are used in the world annually in various types of cough mixture. It is used as a palatable sweetening agent in general pharmaceuticals. Many physicians consider that medicine that has honey is superior to the same medicine made without honey. It is commonly used as a base for ointments and honey is used by itself for treating burns. It is a non-adhesive and most

comfortable dressing than others. It is successfully used as a surgical dressing for open wounds, burns and reptile infections. It is used for sobering drunken patients and also against sicknesses resulting from radiation treatment. Honey increases the rate of metabolism of alcohol in the presence of fructose.

Honey is mildly antiseptic and sedative, generally used in ayurvedic system of medicine. It is quite helpful in building up of the blood and also used as preventive agents against cough, cold and fever. It is also used for blood purification and as causative for ulcers, tongue and alimentary canal. It has been shown that typhoid germs are killed by honey within 48 hours. *Brucella pneumoniae* germs can be killed within 4 days and germs of diphtheria are killed within 50 hours.

## Bee wax:

Bee wax are of 2 types: natural and artificial.

The worker bees secrete wax from the gland situated in the abdomen. Bee wax is very useful by-product of beekeeping relationship. It is yellowish to greenish brown colour and insoluble in water, and completely soluble on ether. A large quantity of wax produced and exported come from the *Apis dorsata* bees. Bee wax has been traditionally used for many purposes though there are no sufficient research to provide evidence for it. It has been used for treating fungal infections such as ringworms, high cholesterol, stomach ulcers, muscle pain and diarrhea. Bee wax is also a widely used commodity in cosmetics. Other lesser known uses of bee wax include lubricating agent, crayon making, for problem of extreme dryness of hair. There are candles made of bee wax, which illuminate brighter and gives off pleasant scent too along with purification of surrounding air.

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Biological Science

A REPORT ON INFESTATION OF ROOT GRUBS

Smt. Shantha A.R. Assistant Professor and Chairman, Department of Zoology, Sahyadri Science College, Shivamogga, 577203.

**ABSTRACT** Root grubs, also known as "white grubs" are pests that belong to the family of Scarabaeidae of order Coleoptera. They are considered as "National pests" in India. Out of 1500 species recorded in India, 40 species are reported to be serious pests on economically important agricultural and horticultural crops in different parts of the country. These 40 species can be widely classified under 3 sub-families Melolonthinae, Rutelinae and Dynastinae. Most of the major root grubs belong to genus *Holotrichia*. Common plants that are attacked by root grubs include areca nut, ground nut, soya bean, corn and sugarcane. This abstract is based on the survey conducted on areca nut fields in places of Sringeri and Sagar which are in the districts of Chikkamagaluru and Shivamogga respectively. The report is focused on infestation of root grub on areca nut, one of the most common plants grown in the Southern part of India.

**KEYWORDS:** Root grubs, White grubs, Scarabaeidae, Coleoptera, Melolonthinae, Rutelinae, Dynastinae, *Holotrichia*, *Areca* Nut, Shivamogga, Chikkamagaluru, Sringeri, Sagar.

In the name "Areca Nut", the word "areca" has been derived from a Malayalam word a "adaykka" which means 'Cluster of nuts'. Scientifically it is known as *Areca catechu* L. and belongs to family palmace and genus *Areca*. It has over 76 species among which only *Areca catechu* L. is the only species cultivated. Cultivation of areca nuts is concentrated in South Western and North Eastern regions of India. According to the Food and Agricultural Organization, India ranks first in both areas (57%) and production (53%). Among different states, Karnataka is the major areca nut producing state in India. It grows over an area of 120 thousands hectares and more than 2 lakhs families of farmers are involved in areca nut production.

Areca nuts are attacked by an array of insect and non-insect pests. The pests infect all parts of the palm including stem, leaves, flowers, roots and nuts. Brown bug *Balyssetta hemisphaericum* targ was the first record as a pest of areca nuts by Coleman and Rao (1918). Since then about 102 insect and non insect pests have been reported to be associated with areca nut palm (Hahr and Daniel, 1982), among which few causes considerable economic losses to the crop. To combat this pest usually insecticides are recommended, prolonged dumping of chemicals not only causes soil pollution but also has deleterious effects on soil flora and fauna.

Identification of root grub species

The following characteristics can be used to identify *Leucopholis* sp.

1. Maxillary stridulatory teeth arranged in a clear longitudinal line parallel on the rostrum, separated by less than twice the length of the Pall.
2. Roundish Pall, not very strongly sclerotised.
3. Body uniformly black, external surface of the body uniformly covered with subovate, yellowish spots and scales (In adults)
4. Pygidium is broader and slightly triangular.
5. On average, females are larger than males. Antennal club is almost the same length as the first antennal segment. Hind tibial spurs broad and spatula like.
6. Males are externally similar to females. Antennal club 2 1/2 times the length of the first antennal segment. Hind tibial spurs spine like and pointed.

Male genitalia: Spiculum gastrale with two slightly sclerotised areas, one on each side, sometimes connected, between the two arms.

Root grub population density

Root grub population was more in a new paddy field converted into areca nut gardens. Reason behind this could be that, in paddy fields converted into areca nut gardens, the soil had more water holding capacity which maintained a moisture level congenial for root grub existence throughout the year near the root zone only.

Symptoms of damage

In an areca nut root grub was found to feed on the terminal tender portion of the roots. Dr. Nihal Rao K.S. Chemist, Sringeri, Sagar, Chikkamagaluru, Karnataka State, India, reported that the grubs cut off the supply of water and nutrients, causing shortage of

water and nutrients results in various kinds of symptoms. Some of them include root damage, yellowing of leaves, and pencil and tapping.

Different management practices:

During the survey arecanut growers were interviewed to know the management practices adopted by them to tackle the arecanut root grubs.

1. More than half of the growers (64.50%) adopted chemical control by using insecticides mainly chlorpyrifos 20 EC (3 ml to 12 ml per litre) and phorate 10 G (20 to 50 grams per tree).
2. Use of botanical insecticides accounted for 22.57%, among which 12.90% of farmers used neem products.
3. Farmers who used mechanical collection of root grubs in the garden recorded 9.67%.
4. Other methods used by farmers included the use of salt (10 to 50 kg/acre) which accounted for 6.42% and 9.20% left their land without any control measures.

Studies on yield loss due to arecanut root grubs

Intervention of protection methods in a arecanut ecosystem resulted in an average 8.85 kgs of nuts per palm compared to unprotected conditions which yielded on average 7.05 kgs of nuts per palm. Statistically both were on par with each other. Whether or not root grubs affect yield to a significant extent can only be concluded after a prolonged study of 3 to 4 years during different seasons.

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*Signature*

PRINCIPAL  
SAHYADRI SCIENCE COLLEGE  
(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.





## Zoology

## A REPORT ON STEM CELLS AND THEIR APPLICATIONS

**Smt. Shantha A.R.** Assistant Professor and Chairman, Department of Zoology, Sahyadri Science College, Shivamogga 577203.

**ABSTRACT**

Stem cells are the building blocks of life. They have remarkable potential to regenerate and develop into many different cell types in the body during early life and growth. They are also a class of undifferentiated cells that are able to be differentiated into specialized cells types. Stem cells are characterized by certain features such as totipotency, pluripotency, multipotency, oligopotency and unipotency. The history of stem cell research had an embryonic beginning in the mid 1800s with the discovery that few cells could generate other cells. In the 1900s the first stem cells were discovered when it was found that cells generate blood cells. Nowadays, stem cell therapy is under research and till now, a very few stem cell therapies have been regarded as safe and successful. It is also found that stem cell therapy cast a number of side effects too. The cost of the procedure too is expensive and is not easily affordable.

**KEYWORDS:****Characteristics of stem cells :**

1. **Totipotent** - The ability to differentiate into all possible cell types. Examples are the zygote formed at egg fertilization and the first few cells that result from the division of the zygote.
2. **Pluripotent** - The ability to differentiate into almost all cell types. Examples include embryonic stem cells that are derived from the mesoderm, endoderm and ectoderm layers that are formed in the beginning stages of embryonic stem cells differentiation.
3. **Multipotent** - The ability to differentiate into a closely related family of cells. Examples include Hematopoietic (adult) stem cells. That can become red and white blood cells and platelets.
4. **Oligopotency** - The ability to differentiate into a few cells. Examples include (adult) lymphoid or myeloid stem cells.
5. **Unipotent** - The ability to only produce cells of their own type but have the property of self renewal required to be labeled a stem cell. Examples include adult muscle stem cells.

**Sources of stem cells :**

Stem cells come from three main sources :

1. Embryos formed during the blastocyst phase of embryological development (embryonic stem cells).
2. Adult Tissue (adult stem cells).
3. Umbilical cord blood.

**Adult stem cells :**

Adult or somatic stem cells exist throughout the body after embryonic development and are found inside of different types of tissues. The stem cells have been found in tissues such as the brain.

Bone marrow, blood, blood vessels, skeletal muscles, skin and the liver. They remain in a quiescent or non dividing state for years until activated by disease or tissue injury. Adult stem cells can divide or self renew enabling them to generate a range of cell types from the originating organs or even regenerate the entire original organ. It is generally thought that adult stem cells are limited in their ability to differentiate based on their tissue of origin, but there is some evidence to suggest that they can differentiate to become other cell types.

**Embryonic stem cells:**

Embryonic stem cells are derived from human embryos that are in the blastocyst phase of development. Sexual reproduction begins when a sperm fertilizes a female ovum to form a single cell called zygote which then begins a series of divisions forming 2,4,8,16 cells etc. This group of cells is called blastocyst. It consists of an inner cell mass (embryo blast) and an outer cell mass (trophoblast). The trophoblast becomes part of the placenta and the embryo blast becomes all the structure of the adult organism. This latter mass is the source of embryonic stem cells to impotent cells.

When extracting embryonic stem cells the blastocyst state signals went to isolate stem cells by placing the "inner cell mass" of the blastocyst into a culture dish containing a nutrient rich broth lacking the necessary stimulation to differentiate, they begin to divide and replicate while maintaining their ability to become any cell type in the human body, eventually, these undifferentiated cells can be stimulated to create specialized cells.

**Umbilical cord blood :**

Umbilical cord is an important source of stem cells, whether hematopoietic and thus obtainable from placental blood, or mesenchymal easily obtainable from the tissue of the cord itself. Mesenchymal Stem Cells (MSC) are a type of multipotent adult stem cells. MSCs have a good capacity to renew themselves and differentiate continuously into specialized cells of the various human tissues. However, MSCs can be found in more considerable numbers in Wharton's jelly, the matrix of umbilical cord and in placental tissues. The added advantage of Wharton's jelly is that there is no risk in harvesting procedure. The useful phenomenon of multi differentiating capacity has been interpreted as the expression of the "Plasticity" property of the MSCs.

**Identification of stem cells :**

One way to identify stem cells in a lab and the standard procedure for testing bone marrow or HSC is by transplanting one cell to save an individual without HSCs. If the stem cells produce new blood and immune cells, it demonstrates its potency.

Clonogenic assays (a laboratory procedure) can also be employed in vitro to test whether single cells can differentiate and self renew. Researchers may also inspect cells under a microscope to see if they are healthy and undifferentiated or they may examine chromosomes.

To test whether human embryonic stem cells are pluripotent, scientists allow the cells to differentiate spontaneously in cell culture, manipulate the cells so they will differentiate to form specific cell types, or inject the cells into an immune suppressing mouse to test for the formation of a teratoma.

**Stem cells delivery method :**

The clinical staff utilize various methods for injecting the stem cells including following injections:

**1. Intravenous injection (IV Injection)**

The IV delivery method is a very simple process. A tubing line with a catheter tip threaded over a needle is placed into the patient's vein. Once proper placement is obtained, the needle portion is removed and the flexible plastic catheter is left in place in the vein with the tubing attached. The stem cell suspension will be administered through the IV after dexamethasone.

**2. Intrathecal (IT) injection :**

An IT injection is also commonly referred to as a spinal tap. It is a procedure used to access a cerebrospinal fluid (CSF) of the brain and spinal cord, and helps to deliver stem cells directly into the CSF, by passing the blood brain barrier. This is the least invasive method for delivering stem cells directly into CNS.

**3. CT Guided Intra spinal cord injection:**

For patients with spinal cord injuries injection of stem cells will be performed after the spine MRI has been conducted to identify the exact injury locations.

**4. Intramuscular Injection:**



# Documentation Of Exotic Plants In Shivamogga District, Karnataka

Nafeesa Begum B.R.Kiran

**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:** Exotic plants, 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 [6,7]. *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 sniffing, 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.

## 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.

- Chairman, Department of Botany, Sahyadri Science College, Shivamogga, Karnataka
- Research & Teaching Assistant in Environmental Science, DDE, Kuvempu University, Shankaraghatta, Karnataka

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 km<sup>2</sup> (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.).

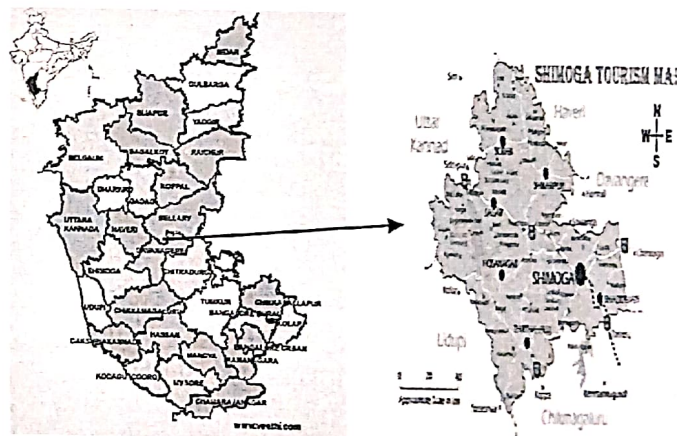


Figure1: Study area map  
(Source: www.pinterest.com; www.veethi .com)

## 3. RESULTS & DISCUSSION

Exotic floristic details of the Shivamogga district revealed a total of 63 species belonging to 61 genera and 32 families

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# Simultaneous electroanalysis of dopamine, paracetamol and folic acid using TiO<sub>2</sub>-WO<sub>3</sub> nanoparticle modified carbon paste electrode

N.B. Ashoka<sup>a</sup>, B.E. Kumara Swamy<sup>a</sup> , H. Jayadevappa<sup>b</sup>, S.C. Sharma<sup>c,1</sup> 

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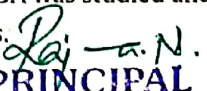
## Highlights

- Mixed titanium oxide and tungsten trioxide nanoparticles (TiO<sub>2</sub>-WO<sub>3</sub>NPs) was prepared by using hydrothermal method.
- Prepared TiO<sub>2</sub>-WO<sub>3</sub>NPs were used as a modifier in preparing carbon paste electrode (CPE).
- Simultaneous determination of dopamine (DA), paracetamol (PA) and folic acid (FA) was studied.
- TiO<sub>2</sub>-WO<sub>3</sub>NPs/MCPE shown well resolved anodic peak for DA, UA and FA mixture.
- Stability, reproducibility and analytical applications of TiO<sub>2</sub>-WO<sub>3</sub>NPs/MCPE were determined.

## Abstract

In this study, mixed titanium oxide and tungsten trioxide nanoparticles (TiO<sub>2</sub>-WO<sub>3</sub>NPs) were prepared and characterized by different characterization techniques. The prepared materials TiO<sub>2</sub>-WO<sub>3</sub>NPs were used as modifiers in carbon paste electrode (TiO<sub>2</sub>-WO<sub>3</sub>NPs/MCPE) to study the electrochemical behaviour of dopamine (DA) in phosphate buffer solution (PBS) at pH 7.4 by using cyclic voltammetric (CV) technique. The TiO<sub>2</sub>-WO<sub>3</sub>NPs/MCPE shows enhanced electrocatalytic activity compared to bare CPE. As a result, the TiO<sub>2</sub>-WO<sub>3</sub>NPs/MCPE was used for further electrochemical studies. The effect of pH proposed that an equal number of electron and proton are involved in the electrochemical reaction of DA. The DA concentration determination was in the range  $2 \times 10^{-6}$  M to  $18 \times 10^{-6}$  M and the limit of detection (LOD) and limit of quantification were found to be 10.18 nM and 34.32 nM. From the scan rate study the oxidation of DA was found to be adsorption controlled and simultaneous detection of DA, PA and FA were well separated in CV and differential pulse voltammetric (DPV) technique. Moreover the stability and reproducibility of TiO<sub>2</sub>-WO<sub>3</sub>NPs/MCPE at DA was studied and furthermore successfully demonstrated for the detection of DA in blood serum and injection samples.

## Graphical abstract

  
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(Constituent College of Kuvempu University)  
SHIMOGA, Karnataka State.