CURRICULUM VITAE

Dr. RAJU PENTHALA, M. Sc. Ph. D
Postdoctoral fellow,
Chungnam National University,
Daejeon, South Korea.
E-mail: rajupenthala@gmail.com
Mobile: +8210-2548-1986 **(Whats App)**
+91-9985519940

Permanent Address
H. No: 3-232,
Village: Gavicherla,
Mondal: Sangem,
District: Warangal,
Pin: 506310, Telangana, India.

CARRIER OBJECTIVE

To succeed in an environment of growth and excellence this provides me job satisfaction, self-development and helps me to achieve personal as well as organizational goals.

EXPERIENCE

- Presently working as ***Postdoctoral fellow*** in "**Chungnam National University (CNU)** Daejeon, South Korea. From August 2017 to till date.
- I worked as ***Associate Scientist*** in "**Aragen Life Sciences** in Medicinal chemistry department, Nacharam, Hyderabad, India. From November 2015 to July 2017.

EDUCATION

Ph. D. in Organic Chemistry, **2010 -2016**

- **Ph. D.** Thesis entitled as ***"Studies on Synthesis and Biological Evaluation of Salicylic acid and Resveratrol-based Azole Heterocycles: Development of New Synthetic Methodologies"*** Thesis Supervisor: **Dr. M. S. R. Murty, Chief Scientist,** Medicinal Chemistry and Pharmacology Division, Indian Institute of Chemical Technology (IICT), Hyderabad, India.
- **M. Sc.** in Organic Chemistry **(Distinction)** **2007-2009**
  Osmania University, Hyderabad, India.
- **B. Sc.** in Chemistry, Botany and Zoology **(Distinction)** **2003-2006**
  Kakatiya University, Warangal, India.

PROFESSIONAL / RESEARCH HIGHLIGHTS

- Successfully finished **5** projects in time.
- Handled **4** to **6** chemists in Aragen Life Sciences and **6** graduation students in CNU.
- Preparing the quotes for milligrams to grams' projects for FTE activity.

- Weekly/Biweekly update project health tools followed by telecon discussion.
- Write up the research proposals and final summary reports.
- Competent skills in design and execute multi-step synthesis and development of novel organic synthetic methodologies.
- Profound efficiency in preparing research articles.
- Highly conversant with the experimental techniques such as NMR, HPLC, IR, thin layer chromatography and column chromatography [Grace and Combi-flash].
- Interpretation of the structure of organic compounds using ^{1}H NMR, ^{13}C NMR, IR, MASS and 2D-NMR spectroscopic data.

HONORS & AWARDS:

- Awarded ***Post-Doctoral Research Fellowship*** by National Research Funding (NRF), Republic of Korea. **2017-till date.**
- Received Award as one of the ***Best Reviewer*** for the journal of dyes and pigments. Awarded ***Senior Research Fellowship*** (CSIR-SRF) by Council of Scientific and Industrial Research (CSIR), India. **2012-2015.**
- Awarded ***Junior Research Fellowship*** (CSIR-JRF) by Council of Scientific and Industrial Research (CSIR), India. **2010-2012.**

PUBLICATIONS

1. Synthesis of salicylic acid-based 1,3,4-oxadiazole derivatives coupled with chiral oxazolidinones: Novel hybrid heterocycles as antitumor agents
   M. S. R. Murty, **Raju Penthala**, Lekshmi R. Nath and Ruby John Anto. **Lett. Drug Des. Discov, 2014, *11*, 1133-1142.**
2. Recyclable CuO nanoparticles-catalyzed synthesis of novel-2,5-disubstituted 1,3,4-oxadiazoles as antiproliferative, antibacterial, and antifungal agents
   M. S. R. Murty, **Raju Penthala**, Sudheer Kumar Buddana, R. S. Prakasham, Pompi Das, Sowjanya Polepalli, N. Jain and Sreedhar Bojja. **Med. Chem. Res, 2014, *23*, 4579-4594.**
3. Fermentative production of pyranone derivate I from marine *vibrio* sp. SKMARSP9: Isolation, characterization and bioactivity evaluation
   P. Shiva Krishna, B. Sudheer Kumar, **Raju Penthala**, M. S. R. Murty, T. Prabhakar Rao, M. A. Singara Charya, R. S. Prakasham. **Ind. J. Microbiol, 2015, 55, 292-301.**

4. Synthesis and biological evaluation of novel resveratrol-oxadiazole hybrid heterocycles as potential antiproliferative agents
   M. S. R. Murty, **Raju Penthala**, Sowjanya Polepalli, N. Jain **Med. Chem. Res, 2016, 25, 627–643.**
5. Design, synthesis and biological evaluation of novel resveratrol-triazole hybrid heterocycles as antimitotic agents
   M. S. R. Murty, **Raju Penthala**, Sowjanya Polepalli, N. Jain **(Communicated)**.
6. Synthesis, generic dyeing of nindigo derivatives on unmodified polypropylene; First time application in dyeing technology
   Raju Penthala, Rangaraju Satish Kumar, Hyorim Kim, Gisu Heo, and Young-A Son. **J. Nanosci. Nanotechnol. 2019, *19*, 1–7.**
7. Synthesis and efficient dyeing of anthraquinone derivatives on polyester fabric with supercritical carbon dioxide.
   Raju Penthala, Rangaraju Satish Kumar, Gisu Heo, Hyorim Kim, In Yeol Lee, Eun Hee Ko and Young-A. Son. **Dyes and Pigments 2019, 166, 330-339.**
8. Synthesis of azo and anthraquinone dyes and dyeing of nylon-6,6 in supercritical carbon dioxide
9. **Raju Penthala**, Gisu Heo, Hyorim Kim, In Yeol Lee, Eun Hee Ko, Young-A Son. **Journal of CO_2 Utilization 2020, *38*, 49-58.**
10. Synthesis of fluorescent cationic coumarin dyes with rigid molecular structures to improve lightfastness and their related modacrylic dyed fibers.
    Raju Penthala, Young-A Son. **Dyes and Pigments 2021, 190, 109294.**
11. Synthesis of novel reactive disperse dyes comprising carbamate and cyanuric chloride groups for dyeing polyamide and cotton fabrics in supercritical carbon dioxide.
    Raju Penthala, Hyeon Oh, Si Hyeong Park, In Yeol Lee, Eun Hee Ko, Young-A Son. **Dyes and Pigments 2022, 198, 110003.**
12. An ecofriendly dyeing of nylon and cotton fabrics in supercritical CO2 with novel tricyanopyrrolidone reactive disperse dye.
    Raju Penthala, Si Hyeong Park, Hyeon Oh, In Yeol Lee, Eun Hee Ko, Young-A. Son. **Journal of CO_2 Utilization 60 (2022) 102004.**
13. Design and synthesis and development of BODIPYs based prototype, optical monitoring pH responsive smart wound dressing.
    Raju Penthala, Hyeon Oh, In Yeol Lee, Eun Hee Ko, Young-A. Son **(Communicated)**.

14. Synthesis and modacrylic dyeing with cationic dyes and their selective removal by calix[4]arene-core from aqueous media.
Raju Penthala, Young-A. Son **(Manuscript under preparation)**.

15. Design, synthesis and characterization of Boron-based thermally activated delayed fluorescence (TADF) materials.
Raju Penthala, Si Hyeong Park, Hyeon Oh, Young-A. Son **(Communicated)**.

PARTICIPATED SYMPOSIA

1. **MEDCHEM Congress** February 25-26, 2011 Organized by RSC, NIPER, IICT, Hyderabad, India.
2. International symposium on **CHEMISTRY AND CHEMICAL BIOLOGY OF NATURAL PRODUCTS** August 2-4, 2012 CSIR-IICT, Hyderabad, India.
3. 5th International symposium on **DRUG DEVELOPMENT FOR ORPHAN / NEGLECTED DISEASES** February 26-28, 2013 CSIR-CDRI, Lucknow, India.

PERSONAL PROFILE

Nationality/Sex/Marital status	**:** Indian/Male/Married
Date of Birth	**:** 28-05-1986
Languages known	**:** English, Hindi & Telugu

REFERENCES

Dr. M. S. R. Murty
Retd. Chief Scientist,
Medicinal Chemistry & Pharmacology Division,
Indian Institute of Chemical Technology,
Hyderabad-500007, India,
Phone: +91-9441295329
E-mail: msrmurty@ymail.com

Dr. Tarun Pradhan
Principal Scientist,
Medicinal Chemistry Division,
GVK Bioscience, Nacharam,
Hyderabad-500076, India,
Phone: +91-8106399057
Email: tarunkanti.pradhan@gvkbio.com

Prof. Young-A Son
Department of Advanced Organic & Bio medical Engineering, Chungnam National University, Daejeon, 305-764, South Korea.
Tel.: +82 42 821 6620; fax: +82 42 821 8870.
Email: yason@cnu.ac.kr

DECLARATION

I hereby declare that all the details furnished above are true to the best of my knowledge and belief.

(Dr. RAJU PENTHALA)

BRIEF OUTLINE OF INDUSTRY RESEARCH WORK

Aragen (Formerly GVK Biosciences) is one of Asia's leading Discovery Research and Development organizations. It provides a broad spectrum of services, across the R&D and manufacturing value chain with a focus on speed and quality. During my Aragen period (1 year 9 months), I have involved in **Kalyra-18 (A and B), 19, and 32** projects. In these projects, I have participated in the following activities.

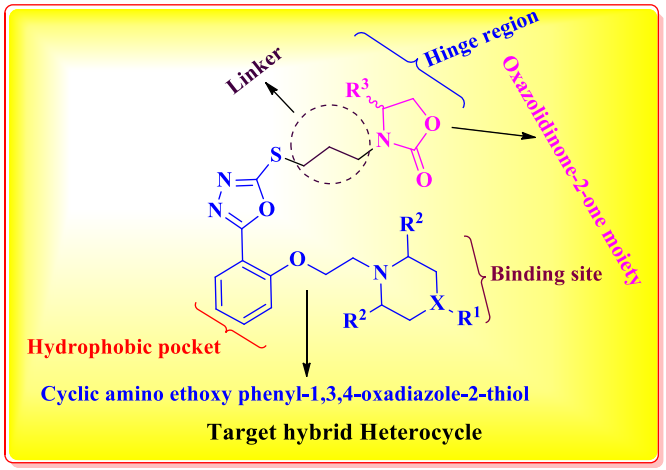
1. Successfully completed given targets and shipped on time.
2. While doing the projects I have handled 4 to 6 chemists and write up the final reports of target compounds.
3. Preparing of quotes for milligrams to grams for FTE activity.
4. Participated in weekly update followed by biweekly telecon discussions and updated project health tools on time to time.
5. Troubleshooting and interacting with the Analytical Department.

While working in Aragen, I was improved my communication, coordination skills, and ability to work with diverse cross-functional teams. Further, I learnt lot of experience and exposed to synthesis of several targets, and acquired proficient knowledge in retrosynthesis, coupling reactions, purification techniques. Finally, I have received good appraisal by organization.

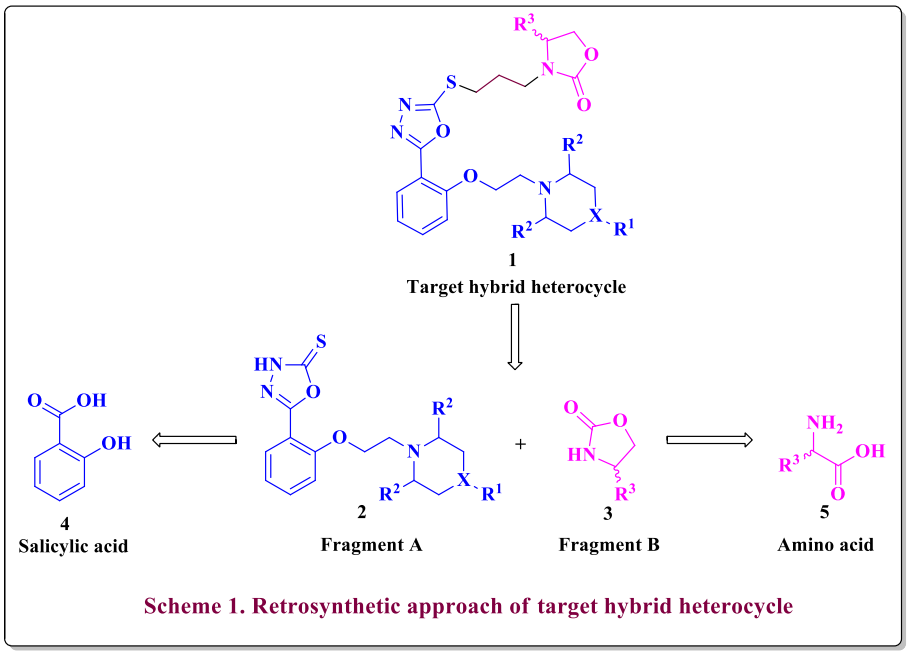
SUMMARY OF DOCTORAL RESEARCH

I have carried out my doctoral research work at Indian Institute of Chemical Technology (IICT), Hyderabad under the supervision of Dr. M. S. R. Murty, Retd. Chief Scientist, Medicinal chemistry and pharmacology department at IICT. I have obtained Ph.D. Degree in 2016. During my doctoral research work, I have accomplished in the designing and synthesis of new chemical entities (NCEs) and evaluation of their anti-cancer, anti-bacterial and anti-fungal activities. I have also proficient knowledge in development of various novel synthetic methods successfully executed multi-step synthesis. I have successfully completed **IICT-Mole bank project** and submitted 20 NCEs for the evaluation of Anti-tubercular activity. In addition, during my Ph.D. tenure, I have trained 4 M. Pharmacy students.

Synthesis and biological evaluation of salicylic acid-based 1,3,4-oxadiazole derivatives coupled with chiral oxazolidinones: Novel hybrid heterocycles as antitumor agents



The retrosynthetic approach for the synthesis of target hybrid heterocycle **(1)** envisioned to be assembled from fragments A **(2)** and B **(3)**, which in turn could be prepared from readily available salicylic acid **(4)** and amino acids **(5)** respectively. Thus, the main objectives would be: (i) to synthesize compound (2) using cyclization reaction of carboxylic acid *via* acid hydrazide with carbon disulphide, (ii) to form the chiral oxazolidinones (3) using Evans auxiliary method and (iii) finally coupling of these both fragments with a suitable linker.



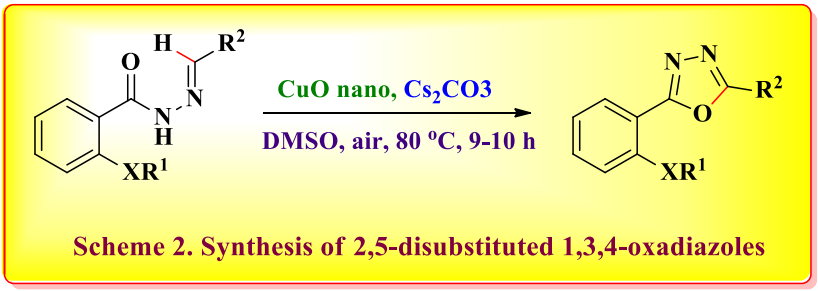
Scheme 1. Retrosynthetic approach of target hybrid heterocycle

In this protocol we have successfully synthesized twenty-eight novel hybrid heterocycles. All the compounds were evaluated for their *in vitro* anticancer, antibacterial, and antifungal activity. Most of the compounds showed moderate to good activity.

Recyclable CuO nanoparticles-catalyzed synthesis of novel-2,5-disubstituted-1,3,4-oxadiazoles as antiproliferative, antibacterial, and antifungal agents

2,5-disubstituted-1,3,4-oxadiazoles synthesized from *N*-aryl-*N*-arylidinehydrazines by using iodine, hypervalent iodine's, *N*-chlrosuccinimide/DBU, copper triplet. Herein, we developed a facile and efficient protocol for the synthesis of novel 2,5-disubstituted-1,3,4-oxadiazoles by the unreactive C–H functionalization of *N*-aroyl-*N*arylidinehydrazine derivatives catalyzed by recyclable CuO nanoparticles.

This reaction provides the advantages of high atom efficiency, simplified isolation of product, easy recovery, and recyclability of the catalyst. In this protocol involved principle is **"C(sp^2)–H activation followed by an intra-molecular C–O cross-coupling"**.

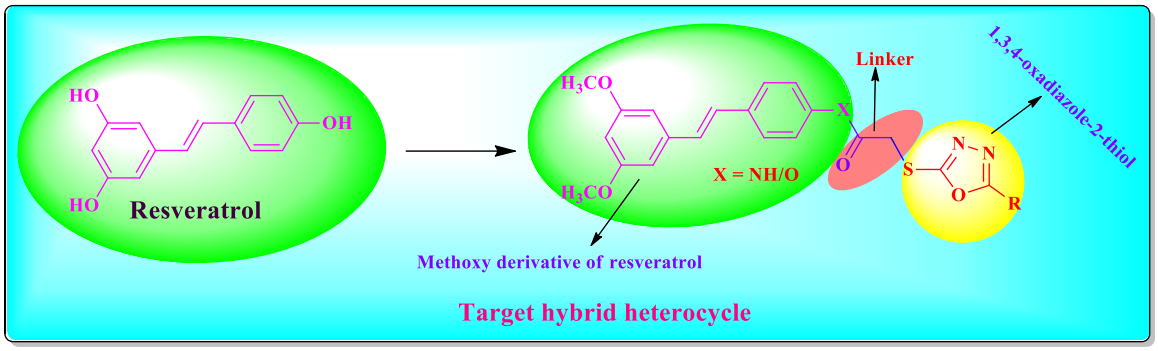


Scheme 2. Synthesis of 2,5-disubstituted 1,3,4-oxadiazoles

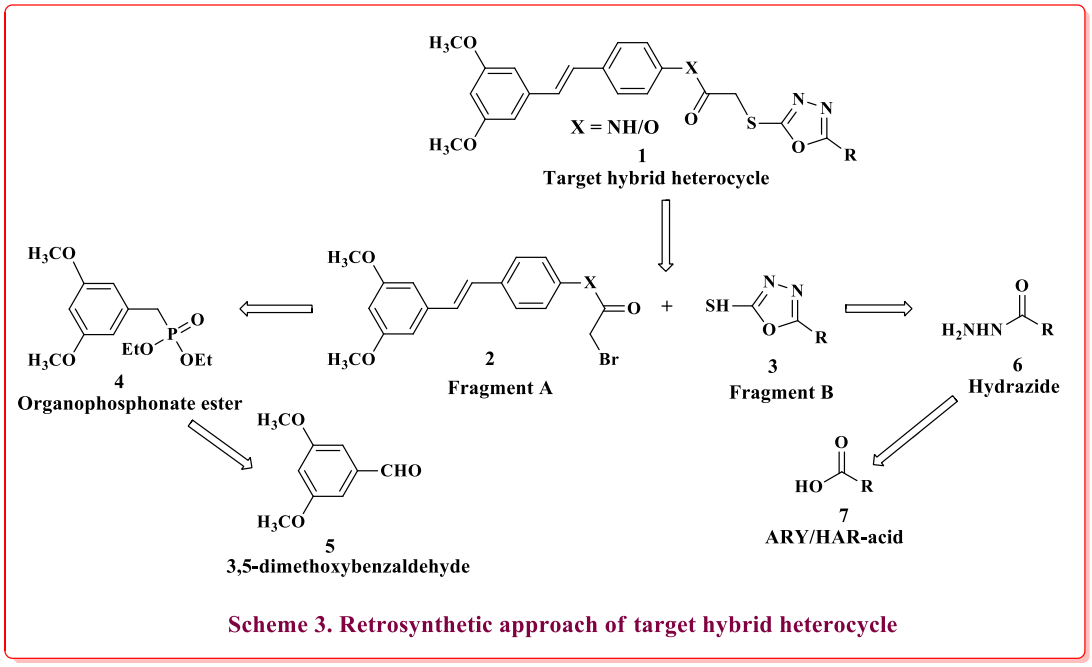
In this method we have successfully developed twenty novel compounds and also evaluated for their *in vitro* antiproliferative, antibacterial, and antifungal activity. Among the tested compounds four compounds were demonstrated promising antiproliferative activity than the standard drug CA4, and two compounds were displayed more potent antifungal activity than standard drug cycloheximide.

Synthesis and biological evaluation of novel resveratrol-based oxadiazole hybrid heterocycles as potential antiproliferative agents

Resveratrol is a naturally occurring stilbene phytoestrogen and exhibit excellent antiproliferative activity. Resveratrol exhibits cytotoxic effects against breast, skin, gastric, colon, prostate, pancreatic, and leukemia cancer cells. It shows anticancer activity at initiation, promotion, and progression stages. However, it has some limitations such as low bioavailability, metabolic instability and requires a high dose to induce apoptosis in cancer cells. Therefore, efforts have been made to improve the pharmacokinetic properties of resveratrol and to extend its anticancer activity. To achieve this goal, we hypothesized a hybrid molecule, which is obtained by coupling of 3,5-dimethoxy derivative of resveratrol bromides with various 5-substituted-1,3,4-oxadiazole-2-thiols. This approach may overcome the above drawbacks.



The retrosynthetic approach for the synthesis of target hybrid heterocycles envisioned to be assembled from fragments A **(2)** and B **(3)**, which in turn could be prepared from commercially available 3,5-dimethoxybenzaldehyde **(5)** and aromatic/heteroaromatic acids **(7)** respectively.



Scheme 3. Retrosynthetic approach of target hybrid heterocycle

Thus, the main objectives would be: (i) to synthesize fragment A **(2)** using Horner-Wadsworth-Emmons olefination of organic phosphonate **(4)** with aldehydes followed by acylation, (ii) to form the 5-substituted-1,3,4-oxadiazole-2-thiol **(3)** using well known cyclization from corresponding aryl/heteroaryl carboxylic acid **(7)** *via* acid hydrazide **(6)** (iii) finally coupling of these both fragments.

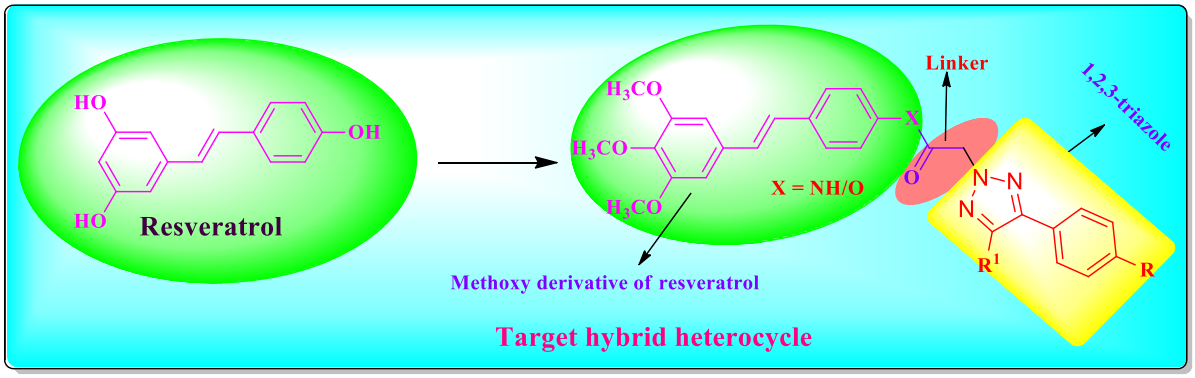
In this direction we have synthesized twenty novel resveratrol-based oxadiazole hybrid heterocycles and tested for their *in vitro* antiproliferative activity. All the compounds were showed superior antiproliferative activity than the reference compound resveratrol. Six compounds were endowed with excellent antiproliferative activity with GI_{50} < 0.1 µM. Thus

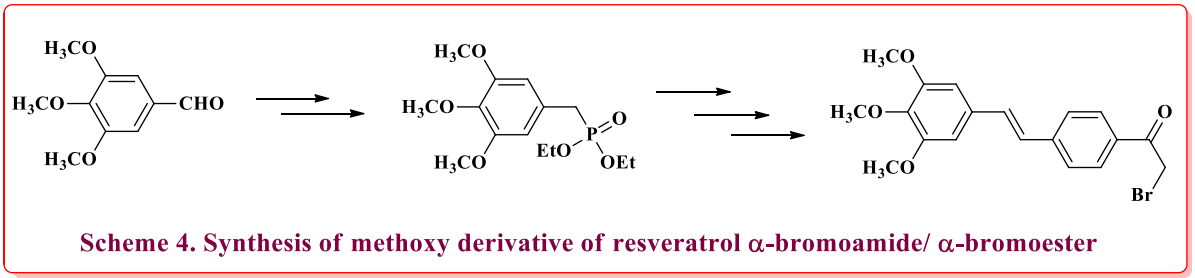
we believe that resveratrol-oxadiazole hybrid compounds may possibly be used as a good lead for the development of new antiproliferative agents.

Design, synthesis and biological evaluation of novel resveratrol-based triazole hybrid heterocycles as antimitotic agents

In continuation of our research to getting potential antiproliferative agents, we are designed and synthesized the novel resveratrol-based triazole hybrid heterocycles, which are developed from coupling of 3,4,5-trimethoxy derivative of resveratrol α-bromoamide / α-bromoester with various 4,5-disubstituted 1,2,3-triazoles.

In case of resveratrol the presence of a number of methoxy groups seems to be a fundamental requirement to obtain potent cytotoxic agents, and the 3,4,5,4'-tetramethoxystilbene (DMU-212) proved to be more potent and selective than the parent compound resveratrol in the inhibition of the cancer cell growth, especially in the case of anticancer activity. So in the present work, we have to synthesize a novel class of resveratrol-based triazole hybrid heterocycles, which are obtained by assembling of various 4,5-disubstituted 1,2,3-triazoles on a **(E)-4-(3,4,5-trimethoxystyryl)aniline / (E)-4-(3,4,5-trimethoxystyryl)phenol** backbone *via* amide / ester linkage.

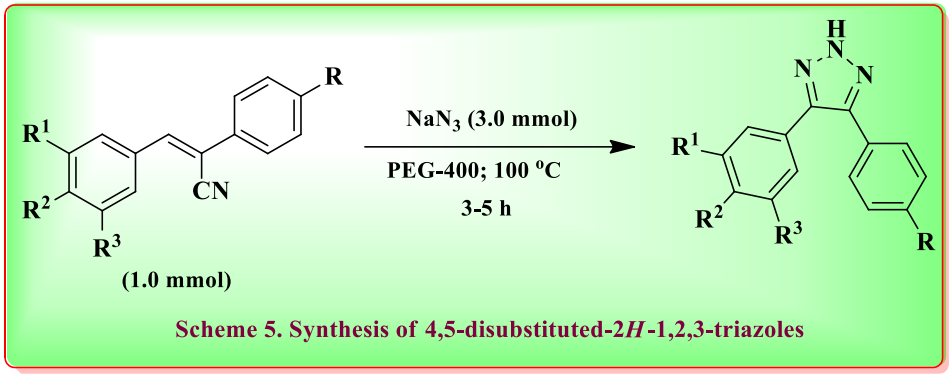




Scheme 4. Synthesis of methoxy derivative of resveratrol α-bromoamide/ α-bromoester

There are few reports are available for the synthesis of 4,5-disubstituted-1,2,3-triazoles by using Cp*RuCl(PPh_3)$_2$, NH_4Cl and L-proline as catalysts in presence of organic solvents. Herein we have synthesized these products *via* [3+2] cycloaddition of (Z)-2,3-disubstituted acrylonitriles with sodium azide in excellent yields using polyethylene glycol

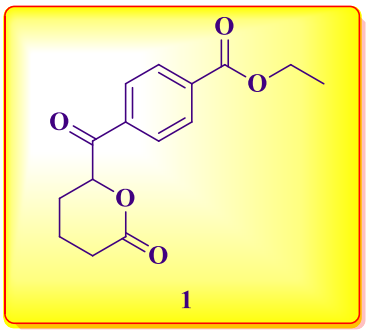
(PEG)-400 as a recyclable solvent **(Scheme 5)**. This method provides a green and much improved protocol over the existing methods.



Scheme 5. Synthesis of 4,5-disubstituted-2*H*-1,2,3-triazoles

A variety of 1,2,3-triazoles were developed, and coupled with 3,4,5-trimethoxy derivative of resveratrol α-bromoamide / resveratrol α-bromoester as a result we are obtained target hybrid heterocycles. All the synthesized compounds were tested for their *in vitro* antiproliferative activity. Most of the compounds showed potent cytotoxic activity. Two compounds were exhibited broad spectrum antiproliferative activity and four compounds were selectively active on HeLa cancer cell line than the standard drugs resveratrol and CA4.

Fermentative Production of Pyranone Derivate I from Marine *Vibrio* sp. SKMARSP9: Isolation, Characterization and Bioactivity Evaluation

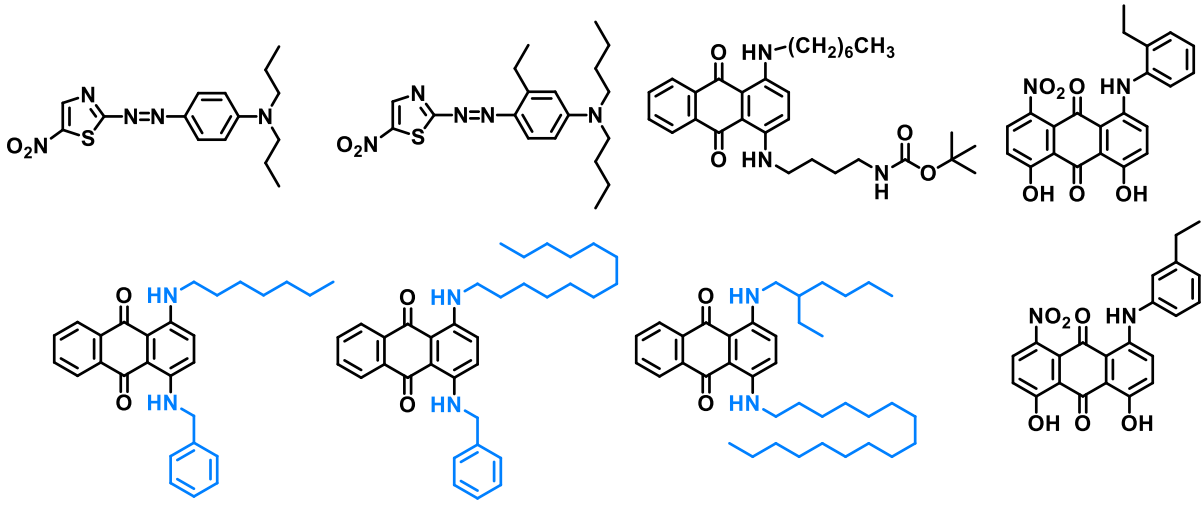


Pyranone derivative **1** was isolated from fermented broth of isolated marine bacterial strain *Vibrio* sp. SKMARSP9. The extract was purified and characterized by spectral data using NMR, DEPT, and ESI–MS. The purity of **1** was 97% which was confirmed by HPLC. The pyranone derivative **1** exhibited antioxidant activity and broad spectrum antimicrobial properties against gram negative and gram positive strains. Molecular docking analysis revealed that this pyranone derivative **1** may be a potential candidate at pharmaceutical sector.

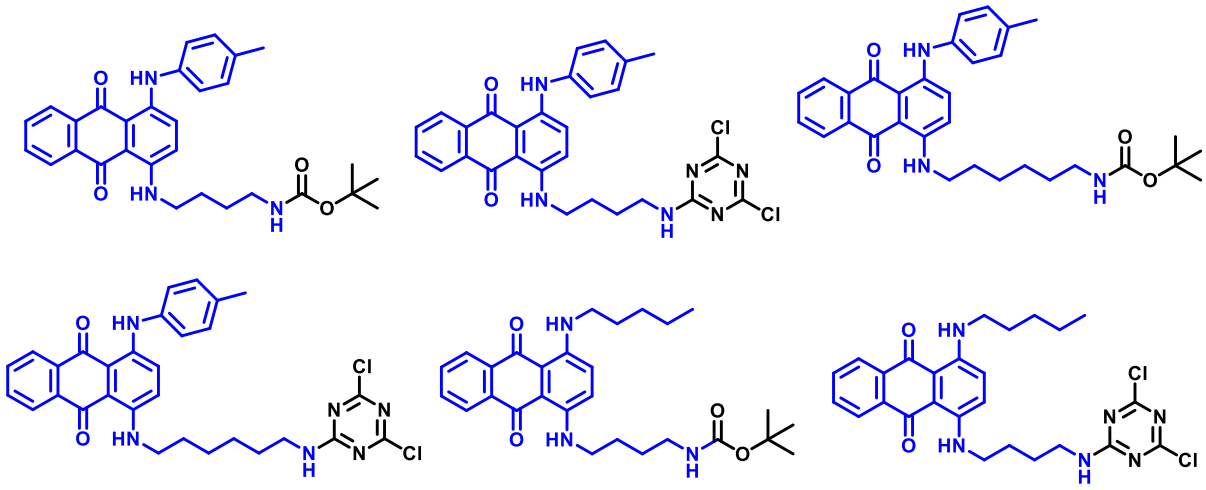
SUMMARY OF POST-DOCTORAL RESEARCH

My post-doctoral research work is going on at Prof. Young -A Son, Laboratory in Department of Advanced Organic Materials and Chemical Engineering, Chungnam National University (CNU), South Korea. Here, I completed two industrial projects and one project is undergoing (Ministry of Trade, Industry and Energy (MOTIE). In my Post-doctoral tenure, I have trained six MS students.

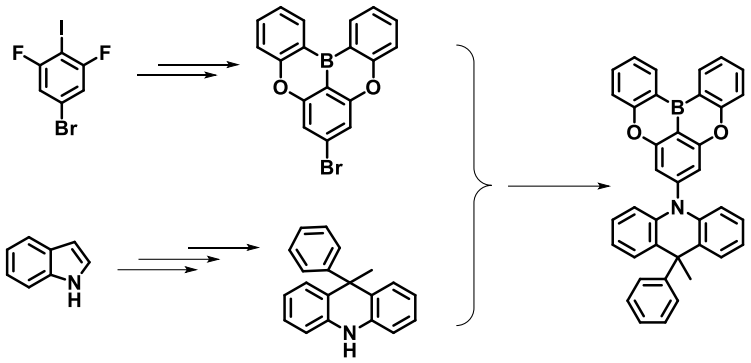
I have synthesized several disperse and reactive dyes on anthraquinone and tricyanopyrrolidone chromophores and applied for the dyeing of different kind of fabrics like PET, polypropylene, nylon, cotton and modacrylic fabrics under eco-friendly supercritical carbon dioxide.



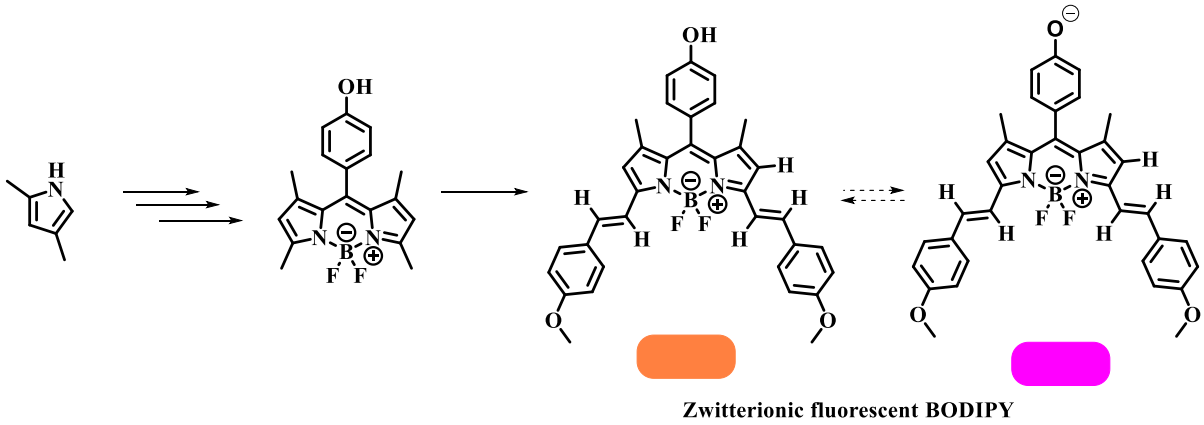
Scheme 7. Supercritical dyes for PET and nylon fabrics



Scheme 8. Supercritical dyes for cotton fabrics



Scheme 9. Synthesis of Boron-based thermally TADF compounds



Scheme 10. Synthesis of zwitterionic fluorescent BODIPY compounds for smart bandages