

3.2.1 - Institution has created an ecosystem for innovations and has initiatives for creation and transfer of knowledge

Our Institution provides healthy atmosphere, infrastructure, resources, confidence for enhancement of the capacity and competencies of students and teachers in research and innovative activities. All innovative and extension activities are student centric. Various activities are conducted to nurture and nourish youth's minds. These activities help students to understand the various problems faced by the society. It enables them to find out solutions on them.

The institution has "AKKA" Ladies Association, N.S.S. & NCC wings, Gymkhana –in doors and outdoor Sports and culture, Science Association, study circles, staff club etc. through which students and faculty members are encouraged to undertake innovative activities which are helpful for creation and transfer of knowledge. Activities conducted by these are helpful to develop leadership qualities, various skills and planning.

- 1. Research Counsel:** Our institution is a recognized research centre of Karnatak University, Dharwad. 22 staff members are the research guides and are successfully guided about 100 students for Ph.D. degrees and many more students are pursuing Ph.D. programme. Research guides and the research scholars exhibited a remarkable contribution in the field of their research specialization and evidenced through an average of 50 research publications every year in national and international journals with high impact factor and h-index. Many of the research guides and students have received awards and honours for their outstanding contribution. Teachers have been awarded with many major and minor projects funded by various funding agencies like UGC, DBT, CSIR, DST, VGST, KUD etc. Approximately Rs.1.5 crore sanctioned towards the projects during last five years. Many of our teachers have national and international collaborative research programmes with University of North Florida, Jain University, Bangalore etc.
- 2. Science Association:** Institute has an academic association called SCIENCE ASSOCIATION which consists of a study circles in all the 8 departments. Under this association, many innovative programmes like science exhibitions, special lectures from eminent scholars are conducted. Students are motivated towards making research as their carrier by inspiring them to participate and present their research innovations in exhibitions, seminars, conferences etc. Many students have bagged awards and honours for their outstanding contribution. Study circles in each department conducts regular innovative activities for the students and teachers.

3. **Gymkhana:** College has a separate sports wing called GYMKHANA which consists of 13 departments through which extra-curricular activities like all kinds of sports and cultural activities are conducted. Our students participate sports and cultural activities and bagged many awards and prizes. National festivals, founder's day etc. are celebrated under the banner of cultural department. Various competitions like essay writing, debating, elocution etc. are organized to bring out the hidden potentials of students under the banner of Debate and Wall paper department.
4. **NSS & NCC:** N.S.S. conducted various activities in innovative ways, tree plantation, Swachh Bharat Abhiyan , awareness programmes about cleanliness, construction of toilets in near-by villages and educating rural folk about the demerits of open depiction. All these activities are done by our NSS volunteers in association with the villagers. NCC wing of our college pays god of honour to the principal and the Vice-Chancellor during National festivals. Both the wings of our college organize blood donation camps and conducts many environment awareness programmes during Covid-19 pandemic and distributed masks and sanitizers to the public.
5. **AKKA Ladies Association:** Ladies Association is a very good platform for girl students to express themselves. Activities conducted by it are helpful to build the confidence in them. Girl students are counselled for their grievances. They celebrate National Girl Child Day, World Women's Day etc. They do invite many lady doctors and counsellors to address specific issues.
6. **Staff club:** Staff club of our college is a recreation centre for teachers. Facility is created for the teachers for many indoor games like carom, chess, table tennis etc. The college an innovative practices of felicitating our college retired teachers after their superannuation under the auspices of staff club.
7. **ICT: College has provided all ICT facilities to all the departments which will enable the teachers to utilize online resources.** Workshops and seminars are conducted using the available ICT facilities. IQAC has initiated webinar series during Covid-19 pandemic by inviting resource persons from India and abroad using ICT. College also has a digital library in the campus which has the membership for many digital repositories. Access to e-resource has been provided to all the students and teachers. This has enabled the staff and the students to utilize the resources at free of cost. College also has provided the free internet and Wi-Fi facility in every department.



December 14, 2020

TO WHOM IT MAY CONCERN

Supporting Letter for Dr. Kalkhambkar

I am writing in strong support of Dr. Rajesh G. Kalkhambkar's application for research support. The requested funding is instrumental in enabling him to continue his research projects, to train graduate students, and to continue our ongoing collaborative research between UNF, USA and Karnatak Science College, Dharwad, India.

Dr. Kalkhambkar successfully completed a Postdoctoral Research study in Synthetic Organic Chemistry under my supervision at University of North Florida-USA during April 2010-June 2011 period resulting in five peer-reviewed publications in Tetrahedron Letters.

After successfully securing an Assistant Professor position back in India, we began a new phase of collaborative research, which has proven to be very productive over the past decade, resulting in over 22 peer-reviewed publications thus far in high impact journals.

Sincerely,

Kenneth Laali

Kenneth Laali
Presidential Professor
Department of Chemistry
University of North Florida
E-mail: Kenneth.Laali@unf.edu
Tel: 904-6201503

Research Collaboration



Department of Basic Science Department

From,

Dr. Deepak R. Kasai
Assistant Professor
Basic Science Department
Faculty of Engineering and Technology
Jain (Deemed-To-Be University), Jakkasandra,
Bangalore-562112

Subject: Research collaboration Reg.

With reference to the above-mentioned subject, I am Dr. Deepak Kasai, assistant Professor Happy to declare that, Dr. Saraswati Masti, Associate Professor, Karnataka Science College, Dharwad, doing collaboration work from 2020 to 2025 with Faculty of Engineering and Technology, Jain (Deemed-To-Be University). Both the institutions using reasonable endeavours to carry out the research work to high standards and in accordance with the mutual agreement.

Sincerely

Dr. Deepak Kasai



Contents lists available at ScienceDirect

Tetrahedron Letters

journal homepage: www.elsevier.com/locate/tetlet

Facile one-pot synthetic access to libraries of diversely substituted 3-aryl (Alkyl)-coumarins using ionic liquid (IL) or conventional base/solvent, and an IL-mediated approach to novel coumarin-bearing diaryl-ethynes

Pavankumar Prabhala^a, Hemantkumar M. Savanur^a, Suraj M. Sutar^a, Shruti S. Malunavar^a, Rajesh G. Kalkhambkar^{a,*}, Kenneth K. Laali^{b,*}

^a Department of Chemistry, Karnatak University's Karnatak Science College, Dharwad, Karnataka 580001, India

^b Department of Chemistry, University of North Florida, 1 UNF Drive, Jacksonville, FL 32224 USA

ARTICLE INFO

Article history:

Received 11 February 2020

Revised 13 March 2020

Accepted 16 March 2020

Available online xxxxx

Keywords:

3-aryl(alkyl)coumarins

Coumarin-bearing diaryl-ethynes

Salicylaldehydes and aryl(alkyl)-acetic acids

Carbonyldiimidazole

Ionic liquids

ABSTRACT

The *in-situ* formed carbonylimidazole derivatives of Ar(alkyl)-CH₂COOH react at r.t. with substituted salicylaldehydes in [BMIM][PF₆] or [BMIM][BF₄] as solvent, and [PAIM][NTf₂] as basic-IL, to produce libraries of 3-aryl(alkyl)coumarins. Whereas these reactions can also be performed with similar efficiency in THF by employing DBU, the IL approach offers easier work-up and recycling of the IL solvent. An IL-mediated approach to the synthesis of novel coumarin-bearing diaryl-ethynes by the Sonogshira reaction is also reported, and the potential for recycling/reuse of the IL solvent is shown.

© 2020 Elsevier Ltd. All rights reserved.

Coumarins are important constituents of biologically active natural products and valuable building blocks in synthetic and medicinal chemistry [1–4], that have also found application in materials chemistry [5]. Substituted 3-arylcoumarins are of particular interest due to their diverse biological activity notably as anti-Alzheimer agents [6,7].

Drawbacks and limitations associated with the classical methods such as Pechman and Perkin reactions, have prompted the development of newer strategies for the synthesis of 3-arylcoumarins. These methods include oxidative (KMnO₄/AcOH) arylation of coumarins using arylboronic acids [8], Pd-catalyzed Suzuki coupling starting with 3-chlorocoumarins in DMF/H₂O/reflux [9], decarboxylative coupling using N-hydroxyphthalimide esters with Ir(ppy)₃/DMSO/TFA [10], and condensation of alkenes with phenols and anisoles employing TfOH/DCE [11]. Among the methods that employ salicylaldehydes as reaction partner are condensation of salicylaldehydes with ynamides employing ZnBr₂ [12], reaction of N-acylbenzotriazoles with salicylaldehydes via acylation/cyclization [13], reaction of salicylaldehydes with phenylacetic acid using POCl₃/pyridine to form the benzyl ester followed by a

base-catalyzed cyclization (KOH/pyridine) [14a], reaction of salicylaldehydes with substituted phenylacetic acids using cyanuric chloride/N-methylmorpholine/DMF/reflux [14b], and condensation of salicylaldehydes with aryl-substituted 1,1-dibromo-1-alkene [15].

In continuation of our studies on synthetic and catalytic chemistry in ILs [16], we sought to develop a simple IL-based one-pot method using readily available low cost reagents that enables the assembly of a library of 3-arylcoumarins under very mild conditions. By using [PAIM][NTf₂] as the basic-IL [16e-g] and [BMIM][PF₆] or [BMIM][BF₄] as solvent, the *in-situ* formed carbonylimidazole derivatives of Ar(alkyl)-CH₂COOH, formed by reaction with carbonyldiimidazole (CDI), smoothly reacted with salicylaldehyde at r.t. to furnish 3-aryl(alkyl)coumarins (Fig. 1). Following an initial feasibility study, the scope of the reaction was examined by employing diversely substituted salicylaldehydes and substituted phenylacetic acids, and the results are gathered in Table 1, Fig. 2.

Further feasibility studies showed that this transformation could also be achieved with similar efficiency at r.t. by using DBU in THF; therefore the scope of the reaction was reexamined in order to provide a broader side-by-side comparison (Table 2).

Whereas the IL-based method and the conventional base/solvent method appear to have similar efficiency, the IL method is advantageous from a practical point of view due to easier

* Corresponding authors.

E-mail addresses: rgkalkhambkar@gmail.com (R.G. Kalkhambkar), Kenneth.Laali@UNF.edu (K.K. Laali).<https://doi.org/10.1016/j.tetlet.2020.151854>

0040-4039/© 2020 Elsevier Ltd. All rights reserved.

Please cite this article as: P. Prabhala, H. M. Savanur, S. M. Sutar et al., Facile one-pot synthetic access to libraries of diversely substituted 3-aryl (Alkyl)-coumarins using ionic liquid (IL) or conventional base/solvent, and an IL-mediated approach to novel coumarin-bearing diaryl-ethynes, Tetrahedron Letters, <https://doi.org/10.1016/j.tetlet.2020.151854>