Indian Institute of Technology Delhi

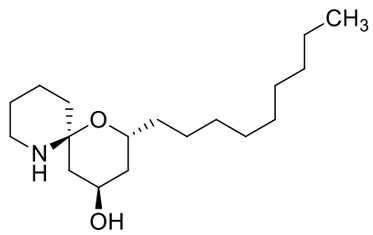
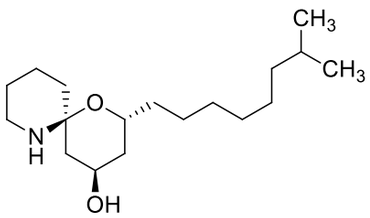
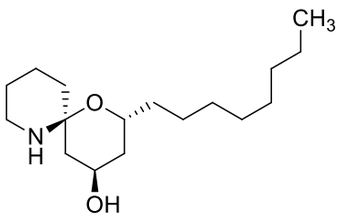
School of Interdisciplinary Research (SIRe)

SIRe Project Number

2025-02-07

(will be assigned by SIRe)

Project Proposal for Ph.D.

Project Details: (The research problem must clearly indicate the need for an interdisciplinary approach).	
Project Title	Total syntheses of spirohemiaminals and related bioactive natural products and their biological studies.
Project Summary (Minimum 500 and maximum 2000 characters)	Natural products and natural product derivatives have been found to be excellent templates for the development of novel biologically active compounds for centuries. They have historically made a significant contribution to pharmacotherapy, particularly for cancer and infectious diseases, also other therapeutic areas, including cardiovascular diseases and multiple sclerosis. Natural products offer unique features in comparison with conventional synthetic molecules, which confer both advantages and challenges for the drug discovery process. However, most biologically active natural products of interest are found only in low concentrations when isolated from their natural source. Hence, their structural elucidation and quantitative structure-activity relationship (SAR) are found to be complicated. The scarcity from nature, their potential to be promising therapeutic agents for many illnesses, and their mode of action for biological function make it essential to develop new synthetic strategies and methods towards such compounds. Spirohemiaminals are significant structural motifs found in nature and varied array of natural products, displaying diverse biological activities. Spiroaminals have a spirocyclic structure in which two rings are fused at a single carbon atom. Accomplishing their stereoselective total synthesis is a highly essential and interesting work in synthetic chemistry due to their complex molecular frameworks. Spiroketals are isolated from several naturally available sources, including plants, insects, fungi, microbes and marine organisms, The growing pharmacological importance of compounds comprising spiroketal assemblies has generated intense attention in both their chemical reactivity and synthesis. The aim of this project is to develop a highly efficient general synthetic route to the spirohemiaminals class of natural products termed the streptoaminals and their analogues for extensive biological studies. After synthesizing them we would like to investigate antimicrobial activity of streptoaminals and its synthetic analogues. Spirohemiaminal moiety which is rarely found in natural products and they good antimicrobial activity. Notably, spirohemiaminal is the only function to construct the bulky 3D architecture of streptoaminals, which might contribute to the broad-spectrum antimicrobial activity. This proposal details studies directed toward the total synthesis of streptoaminal-9n **1**, streptoaminal-9i **2** and streptoaminal-8n **3.**  streptoaminal-9n **1**  streptoaminal-9i **2**  streptoaminal-8n **3**

Ph.D. Supervisors+
(Supervisor 1 and Supervisor 2 cannot be from the same department of IITD)

Role	Name of Faculty	Academic Unit in IITD/Institute/University	Email ID (Official)
Supervisor 1*	Dr. Shivajirao L. Gholap	Department of Chemistry Indian Institute of Technology Delhi, New Delhi	slgholap@chemistry.iitd.ac.in,
Supervisor 2	Prof. Hariprasad. P.	CRDT, Indian Institute of Technology Delhi, New Delhi	phari@rdat.iitd.ac.in,

*Supervisor 1 must be from IIT, Delhi.
+All cells in this table are mandatory fields that need to be filled by faculty for consideration of proposal.

[$]The date of superannuation of supervisors should be at least three years from the date of registration of selected candidates.

Project requirements (Student qualifications, experience required, etc) ***The candidate will be shortlisted based on common shortlisting criteria decided by ScRC (SIRe)**
Education qualifications: M.Sc. in Organic chemistry, Experience in synthetic organic chemistry, Skills on purification and analysis of organic compounds, basic knowledge of medicinal chemistry, CSIR or UGC qualified for admission in Ph.D.

Source of fellowship/funding and project number (CSIR/UGC/DBT/ICMR/ICAR/NEET-PG/DST-INSPIRE/IRD/FITT Project details, if any)
Institute Assistantship

Role of Faculty Members involved:	
Supervisor-1	Dr. Shivaji, with extensive experience in synthetic organic chemistry, will guide on the synthesis of natural products and bioactive molecules.
Supervisor-2	Prof. Hariprasad will guide the candidate to screen the synthesized natural products and bioactive molecules for their pharmaceutical importance and biological studies. .

Note: -

1. **Approval from the respective DRC/CRC/ScRC of your Department/Centre/School will be required for using the "Full-time Institute Assistantship (Category-wise) (FIA)" for selecting the students in SIRe.**
2. **Declaration: - Faculty members, please ensure that you have at least 3 years of service left before superannuation along with adequate sitting space & lab facilities for the SIRe student.**
3. **PI/s are also encouraged to submit joint proposals with AIIMS, NII, JNU and institutes with which IITD has an existing MoU. If the Co-PI (Supervisor 2) is from outside IITD, kindly share his/her detailed CV.**
4. **If a research scholar is to be considered for selection under the project fellowship, then the project should have a minimum of two-year duration remaining.**
5. **A candidate applying with a valid JRF/INSPIRE/any national level fellowship should have at least two-year validity from the date of joining the Ph.D. program.**
6. **The third supervisor's name (if required) can be added only after the formation of Student Research Committee (SRC) subject to a strong recommendation of SRC and subsequent approval from the competent authority.**
7. **If Institute fellowship is being sought, then DRC approval of the parent department of Supervisor 1 is required at the time of selection.**