

Status of Project of JRF/SRF/Research Associate


Date: 28/04/2023

Subject: Certificate for the status of project of Junior Research Fellow/Senior Research Fellow/Research Associate

The following table shows the details of JRF/SRF/Research Associate with status of their project/funding, duration of the project/funding, and Project Investigator/Supervisor.

Sr. No.	Name of JRF/SRF/ Research Associate	Name of Project Investigator/Supervisor	Duration of Project/Funding	Status
1	JAYMIT MANOJKUMAR SURVE	Dr. Rajendrasinh Jadeja	July 2021- July 2024	Ongoing
2	MIRA JILKUMAR VAISHNANI	Dr. Vicky Jain	July 2021- July 2023	Ongoing
3	DHAVAL KISHORVAN	Dr. Aditya Saran	July 2021- July 2023	Ongoing
4	RIDDHI BHARATBHAI JOSHI	Dr. Gaurav Sanghvi	July 2021- July 2023	Ongoing



Dean – Research
Marwadi University

Registrar
Marwadi University



Date: 24/04/2023

Progress Evaluation Report

Name of Student JAYMIT MANOJKUMAR SURVE
Enrollment No 92100832073
Title of the Research Work Rescue Support Robotics for Earthquake Situations

Status of the Project: Ongoing

The following points were observed by the evaluation committee:

Mr. JaymitSurve joined Ph.D. in Academic Year 2021-22.

He has prepared the design/IPR on "**Flexible and Compact Snake Robot Mechanism for Rescue Support Missions**".

He has submitted the following manuscript to the doctoral supervisor "**Survivor Detecting Search and Rescue Ground Mechanism for Earthquake Events based on CNN-based human pose detection**". The article will be submitted to a quality journal after the review.

1. Name of PI – Dr. Rajendrasinh Jadeja

2. Name of Co-PI – Dr. Tapankumar Trivedi

3. Internal Expert – Dr. Shobhitkumar Patel

Progress Report

On

Rescue Support Robotics for Earthquake Situations

By: Jaymit Surve (92100832073)

Under Supervision of

Dr. Rajendrasinh Jadeja

Dr. Tapankumar Trivedi



Faculty of Engineering and Technology

Rajkot-Morbi Highway, Gauridad

Rajkot, Gujarat - 360003

1. Introduction

Natural catastrophes such as earthquakes, wildfires, floods, storms, drought, volcanic activities, etc. killed about 1.27 people worldwide between 2000 and 2022 and among this around 800K deaths are due to earthquakes [1]. There is an urgent need for disaster recovery technology, as the frequency of catastrophic occurrences like hurricanes is expected to rise and the population density of the world is expected to increase, both of which might result in more deaths. In the event of a calamity, robots are seen as a potentially helpful resource. Potential future roles for these robots include serving as stand-ins for people who can't safely enter an area, helping humans improve their senses and dexterity, and exploring hazardous environments where humans can't go. As early as 2001[2], robots were being used in disaster relief operations, thanks to decades of progress in robotic platform development. However, there are still many obstacles faced by individual robots in the field that may be addressed with the help of a multi-robot system.

The majority of earthquakes and other natural disasters, such as the earthquake that occurred recently in central and southern Turkey and northern and western Syria in February 2023, the earthquake that occurred in western Turkey in August 1999, the earthquake that occurred in Gujarat, India in 2001, 2010 Haiti earthquake and the earthquake and tsunami that occurred in Japan in 2011, caused many people to be buried under the rubble. The procedure of rescuing persons trapped in a structure that has fallen needs to be completed within a very short amount of time. In such a scenario, finding a technique to extract the buried persons in a prompt and efficient manner becomes of utmost importance[3]. The typical human being only lived for the first three days and three nights after the earthquake. After that, the likelihood will decline by around 8% after 120 hours owing to dehydration or heat [4]. The probability will drop by 19% after 72 hours due to the same factors. Therefore, rescue teams in these kinds of operations require a quick instrument that can discover persons who are trapped under rubble [5].

2. Related Work

Habib et al. have presented a paper that discussed the rescue robotic challenges and necessary technical specifications and functionalities and also briefly described the rescue robotics project [6]. They have briefly discussed about service robots which can be applicable as the helpers of elderly or infants. Later, they covered the role and requirements of robots working

in a harsh, dangerous condition which can be applied for search and rescue operations with different types of robots such as Unmanned Aerial Vehicle (UAV), Unmanned Ground Vehicle(UGV), Under Sea Vehicle(USV), space robots, and medical robots. An example of UGV is the SR-10 inspector developed by PIAP is equipped with a crawler drive with variable geometric structure as shown in Fig. 1 (a). The developed robot can move under difficult terrain conditions, inside of rooms, and also on stairs with a maximum speed of over 16 km/h. And at last, they concluded with a list of challenges in the application domains of robotics for disaster missions and risky intervention.

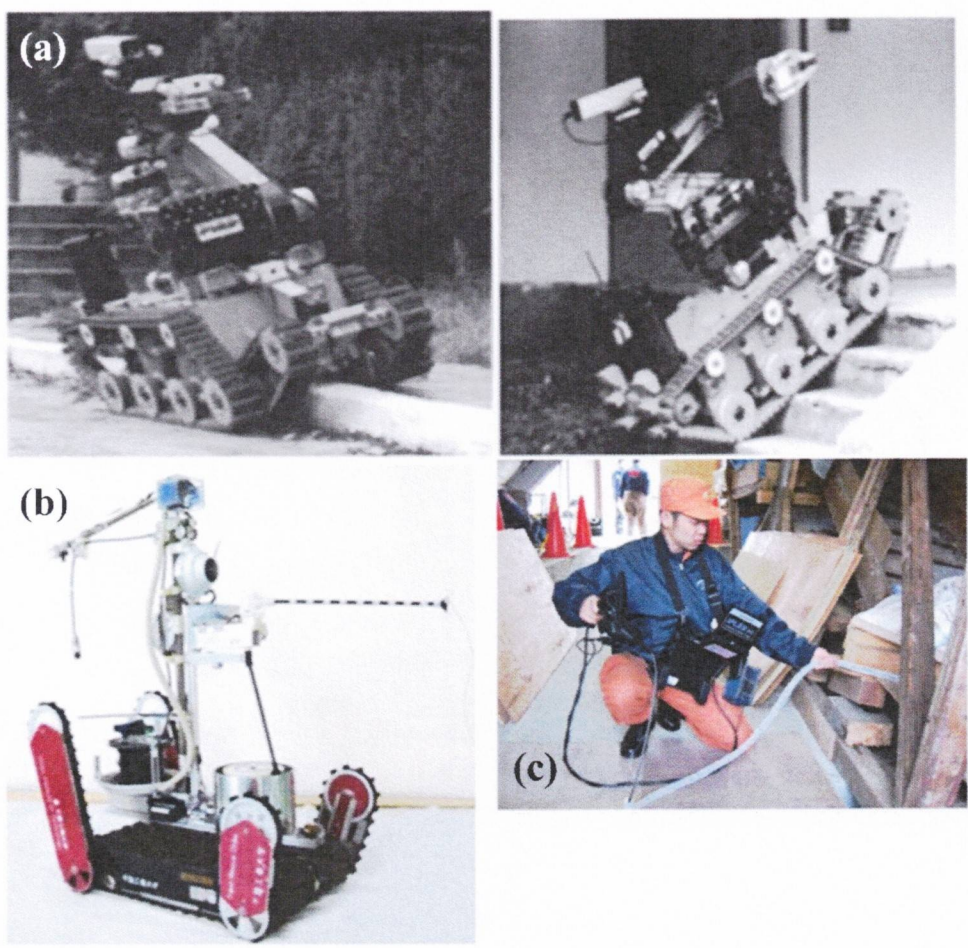


Fig. 1(a) SR-10 Robot, (b) Quince robot, (c) ASC – a serpentine robot

Restas presented a paper on drone applications in disaster management supporting role [7]. He reported the usage of UAVs during different kinds of natural or human-made disasters including floods, earthquakes, forest fires to nuclear accidents. S. Tadoloro presented challenges

of disaster robotics [8]. The great eastern Japan earthquake was the first instance where robotics systems were used for disaster assistance. This paper discussed the state of art disaster robotics and the current gap in the field. The quince robot shown in Fig. 1 (b) was used in Nuclear Reactor buildings at the Fukushima-Daiichi Nuclear Power Plant accident in 2011. Image, radiation dose rate, sampled dust, temperature and humidity taken by Quince contributed significantly to planning of cool-shutdown and decommissioning of the reactors. Active Scope Camera (ASC) a serpentine robot was applied to for forensic investigation of structural collapse during construction in Jacksonville, 2008 for search and rescue in debris. It captured video image 8 m deep and gave important data of cause of accident as illustrated in Fig. 1 (c).

3. Proposed Mechanism

As shown in fig. 2 we have proposed a snake robot mechanism which will asses the affected area by covering the earthquake affected site and the snake robot will be consisted of a audio visual system and it will communicate all the information to the control station which will be operated nearby at a earthquake site with a information of a survivor location. This all information will help the rescue team to make a well educated and informed decision to carry out the search and rescue operation and as a result many valuable lives will be saved.

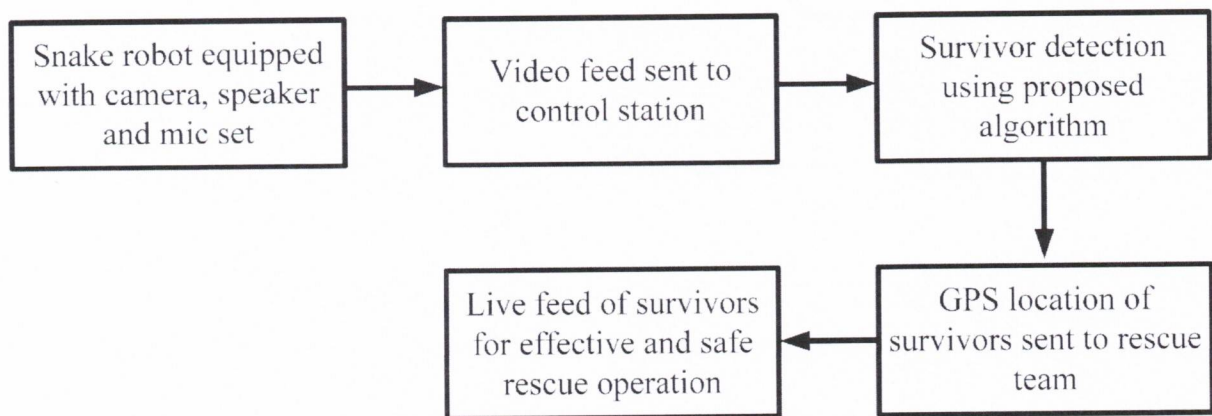


Fig. 2 Proposed mechanism for safe and effective search and rescue operation

4. Work Carried Out

- A literature review to identify the gap has been carried and from that a hybrid search and rescue mechanism has been proposed

- Optimal and compact structure of snake robot is designed and the design has been applied for a patent
- For the detection of survivor trapped under the debris a deep learning based Convolutional Neural Network based human pose detection architecture has been trained and based on this a journal publication is under progress
 - Tentative title: Survivor Detecting Search and Rescue Ground Mechanism for Earthquake Events based on CNN based human pose detection
- Fabrication process of snake robot is under progress

5. Future Work

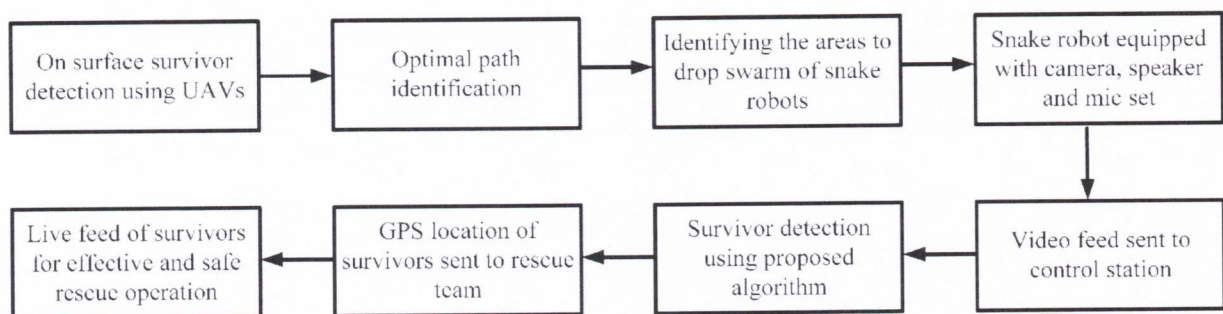


Fig. 3 Final mechanism for more efficient and time saving search and rescue operation

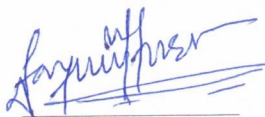
We understand the snake robot will require comparatively more time to access the whole area in case a earthquake affected size is very large. In this scenario, we are proposing a hybrid system of UAV and snake robot. First the UAV will scan the area and for that we will define the optimal path in which the UAV will scan the area and will provide the location of survivors who are easily detectable on the surface and then we will identify the areas where the probability of survivors is high and in that order a swarm of snake robots will be dropped at those location using UAV and the live feed will be communicated to the control station through the UAVs using bridge communication in case of a larger area. This approach will save a lot of time and will yield a time efficient and thorough search and rescue search operation.

References

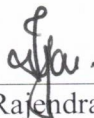
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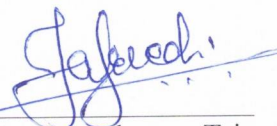
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Jaymit Surve
(92100832973)



Dr. Rajendrasinh Jadeja
Principal Investigator
Professor & Dean-Research,
Marwadi University, Rajkot



Dr. Tapankumar Trivedi
Co-PI & Associate Professor,
Faculty of Engineering and
Technology,
Marwadi University, Rajkot

Date: 21 March 2023

Progress Evaluation Report

Name of Student: Ms. Mira Jil Vaishnani

Enrollment No: 91800832026




Title of Project: Synthesis, Characterization and Biological Evaluation of Novel Heterocyclic compounds

Status of the Project: On going

Following points were observed by the experts:

She has joined her Ph.D. in academic year 2018-19. She has submitted her research in the below journals.

1. Rasayan Journal of Chemistry- Manuscript accepted.
2. Polycyclic Aromatic compounds- Manuscript submitted (submission Id- 235389705).
3. Bioorganic chemistry- Manuscript submitted (Manuscript ID- BMCHEM-D-23-00366)

1. Guide : Dr. Vicky Jain 
2. Internal Expert : Dr. Gaurav Sanghvi 
3. Dean Of Research : Dr. RAJENDRASINH BAHADURSINH JADEJA 

Synthesis, Characterization, and Biological Evaluation of Some Heterocyclic Compounds

Progress Report

By

Mira Jil Vaishnani (91800832026)

Guide name: Dr. Vicky Jain

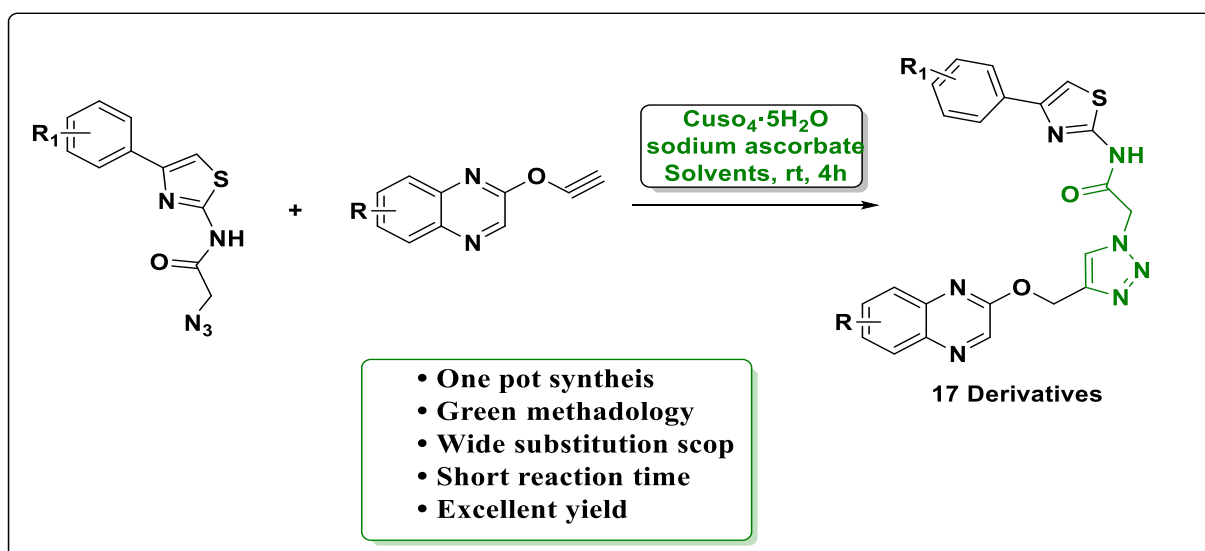


MARWADI UNIVERSITY Rajkot
Morbi Road, At & Po. Gauridad,
Rajkot 360003, Gujarat, India.

Synthesis, Characterization, and Biological Evaluation of Some Heterocyclic Compounds

1.1 Green synthesis of 1,4- disubstituted 1,2,3- triazole acetamide derivatives by using the click chemistry approach

The synthesis of nitrogen and sulphur containing heterocycles is an important building block in numerous drug molecules. Cascade reactions, coupling reactions, and cycloaddition reactions are employed to achieve heterocyclic analogues. In this work, we describe the facile and effective synthesis of 1,4-disubstituted 1,2,3-triazole acetamide from simple aromatic Thiazole amines. A click chemistry green chemistry approach is used in the reaction of Thiazole azides and terminal quinoxaline alkynes yielding triazole adduct. A library of substituted triazoles acetamides linked with quinoxaline derivatives is feasibly synthesized and characterized via analytical spectroscopic techniques.



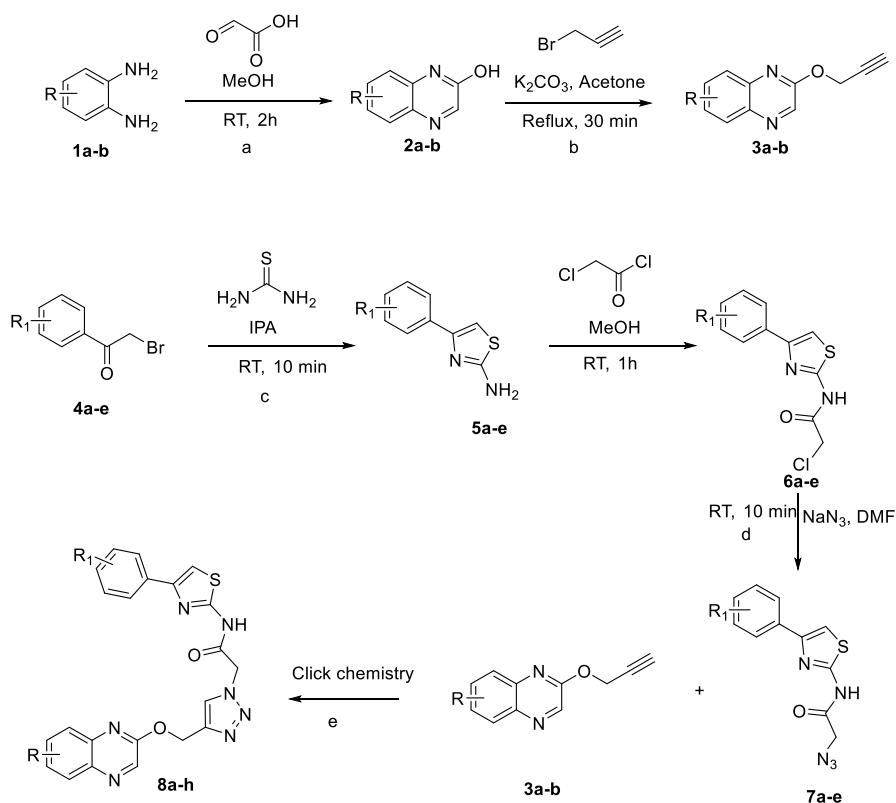
Different aryl and heterocyclic derivatives, however, might well be coupled to the 1,2,3-triazole scaffold through an acetamide linker, as shown by the lead structures of several biologically active molecules.²³⁻²⁵ Considering these data points, and as a continuation of our work toward synthesizing bioactive scaffolds, we provide the following. We have planned to design and make a new 1,4-disubstituted 1,2,3-triazole-containing acetamide derivative. In addition, the design of several currently available drugs has been augmented with a thus 1,2,3-triazole nucleus.

Thus, immersive areas found interest to develop novel regio-selective positional conversion methods. Hence, that is necessary to develop, a suitable and regionally controlled procedure for the preparation of triazoles. Due to the significance of triazole derivatives, many changes were made to resolve the above problems and increase yield. The difficulty in removing the catalyst from the reaction mixture and the inability to reuse it in subsequent reactions are the two issues with homogeneous catalysis and solvent combinations. Therefore, we decided our objective to provide a single-step synthesis of nitrogen triazole heterocyclic in one pot synthetic method.

Synthetic Scheme:

A general method for 1,2,3-triazoles synthesis

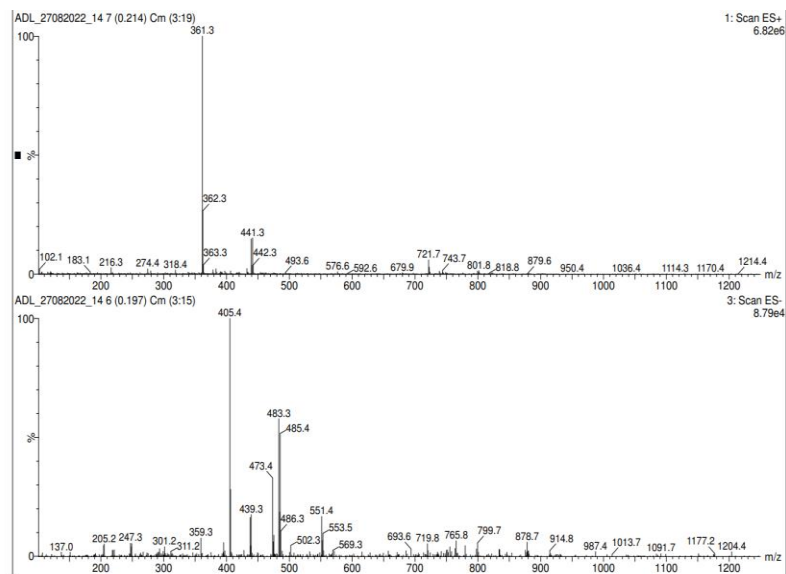
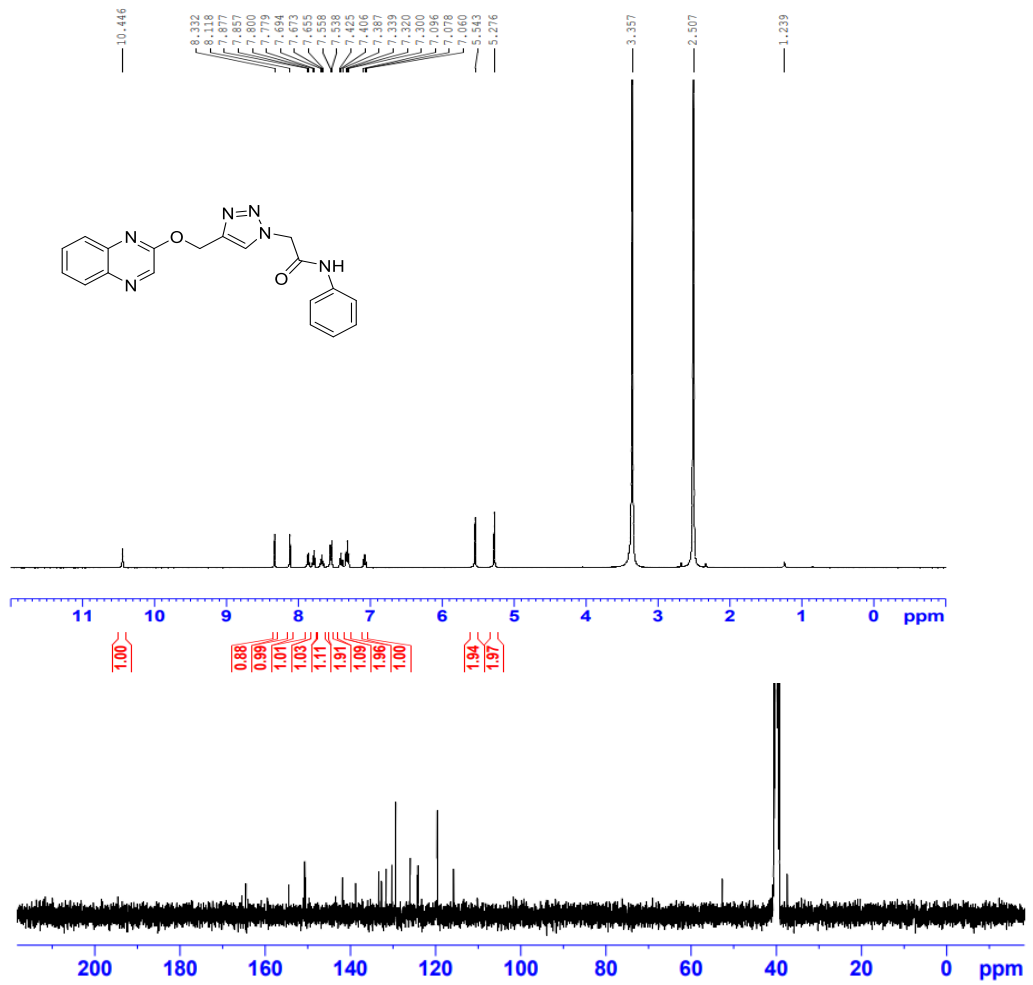
Stir solution of various thiazole azide (1.0 eq) in water: tert-butanol (1:1), alkyne (1.2 eq), $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ (40 mol %), and L-sodium ascorbate (0.1 eq) was added at room temperature. The reaction mixture was stirred at room temperature for 4 to 5 hrs. Reaction progress was monitored by TLC. After completion of the reaction, the reaction mixture was poured into cold water and the solid was filtered and dried by vacuo. The crude precipitate was triturated with n-hexane and solid filtered and dried in vacuo to afford the desired product.



Reagents and conditions: (a) Glyoxylic acid, methanol, 2.0 h, 80-85%; (b) Propargyl bromide, K_2CO_3 , acetone, 30 min, 75-78%; (c) $\text{SC}(\text{NH}_2)_2$, IPA, 10 min, 60-80%; (d) ClCH_2COCl , methanol, 1 h, 90-95%; (e) NaN_3 , DMF, 10 min, 90%; (e) $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, Sodium ascorbate, H_2O :t-butanol = 1:1, 4-5 h, 90-97%

Results and discussion

Analytical data



Conclusion: In conclusion, we have successfully synthesized a total of 17 compounds that consist of triazole acetamide linked with quinoxaline using the green approach of click chemistry. The compounds were characterized by ¹H NMR, ¹³C NMR, and mass spectrometry. We were able to access 1,4-disubstituted 1,2,3-triazole acetamide easily, affordably, and with excellent yield. The reaction displayed excellent functional group tolerance, and gentle reaction conditions, and used green solvents such as water and n-butanol. The synthesized compounds have great potential for future studies and applications, which are currently being explored.

Planning for Forthcoming Report

As I continue to work on expanding my research portfolio, I am now planning for a forthcoming review. My goal is to submit a more papers to a high impact and reputed journal. To achieve this, I am taking a methodical approach to the planning and execution of my review.

Research output:

1. Green synthesis of 1,4- disubstituted 1,2,3- triazole acetamide derivatives by using the click chemistry approach

Paper published in Rasayan Journal of Chemistry

RASAYAN
Journal of Chemistry
AN International Quarterly Research Journal of Chemical Sciences
ISSN (Print) 0274-1074 (Online) 2278-9914 (E-ISSN) 2278-9914

Prof. Sanjay K. SHARMA, FRSC
Editor-in-Chief
E-mail: editor@rasayanjournal.com

Dr. Pratima SHARMA
Managing Editor

Date: 5/3/ 2023

Acceptance Letter

Dear Mr. / Ms. / Dr. V. D. Jain,

We are glad to inform you that your manuscript, entitled-

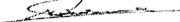
M/S. No. RJC-2271. **GREEN SYNTHESIS OF 1,4- DISUBSTITUTED 1,2,3- TRIAZOLE ACETAMIDE DERIVATIVES BY USING THE CLICK CHEMISTRY APPROACH**
M. J. Vaishnani and V. D. Jain

has been reviewed and subsequently accepted for publication in **RASAYAN Journal of Chemistry**. The paper will be published in RJC, Vol.16, No.2, 2023 issue of the journal.

Article(s) will be published online on the website www.rasayanjournal.com prior to the printed version of **RASAYAN Journal of Chemistry**.

Thanks for your interest in our journal.

Sincerely Yours,


Prof. Sanjay K. Sharma, FRSC
Editor-in-Chief

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managing@rasayanjournal.com, subscriptions@rasayanjournal.com


Abstracted in: Since 2008



2. Design, synthesis, and evaluation of novel triazole acetamide linked with phenyl piperazine derivatives as anticancer agent against Breast cancer: Invitro and Molecular Modelling study

Manuscript under review in Bioorganic Chemistry

3. Biological importance and synthesis of 1,2,3-Triazole: a review

Manuscript submitted to Polycyclic Aromatic Compounds


Mrs. Mira Jil Vaishnani
Enrollment No. 91800832026


Dr. Vicky Jain
Supervisor
Associate Professor & Head,
Department of Chemistry
Marwadi University, Rajkot

Date: 21 March 2023

Progress Evaluation Report

Name of Student: Mr. DHAVAL KISHORVAN VAN

Enrollment No: 91900832032




Title of the Research Work: Isolation and characterization of novel microbes for degradation of polycyclic aromatic hydrocarbons from polluted Gujarat coastline.

Status of the Project: On going

Following points were observed by the experts:

He has joined her Ph.D. in academic year 2019-20.

1. Screening and Isolation of Bacteria, Archaea and Fungi have been done.
2. Degradation of polyaromatic hydrocarbons has been confirmed.
3. DNA sequencing for identification of fungal samples is recommended.

- | | | |
|---------------------|---------------------------------------|---|
| 1. Guide | : Dr. Aditya Saran |  |
| 2. Internal Expert | : Dr. Gaurav Sanghvi |  |
| 3. Dean Of Research | : Dr. RAJENDRASINH BAHADURSINH JADEJA |  |

Isolation and characterization of novel microbes for degradation of polycyclic aromatic hydrocarbons from polluted marine area of Gujarat coastline

Progress Report

Student Name: Dhaval Van

Enrolment Number: 91900832032

Guide: Dr. Aditya Saran



MARWADI UNIVERSITY Rajkot

Morbi Road, At &Po. Gauridad,

Rajkot360003, Gujarat,India.

Polycyclic aromatic hydrocarbons (PAHs) are natural, ubiquitous substances in the marine environment. The PAHs are a large group of diverse substances, ranging from two-ring

naphthalene and naphthalene derivatives to complex ring structures containing up to 10 rings. Polycyclic Aromatic Hydrocarbons assimilates in the environment by biogenic, pyrogenic, petrogenic, diagenic and by different human activities.

The objective of the study

1. Screening and isolation of microbes from polluted marine eco system
2. Study of Broth culture for the degradation of polycyclic aromatic compound by microbes at laboratory to pilot scale.
3. Extraction and characterization of bioactive molecules.

Research Progress

Isolation of polycyclic aromatic hydrocarbon degrading microorganism

Polluted soil samples were collected from 03 different locations across polluted region fishing harbor site of Porbandar district of Gujarat, India. Isolation of polycyclic aromatic hydrocarbon degrading microorganisms is carried out on Zobell Marine broth as well as on BG-11 media. The isolates were purified by streak-plate technique. Total 16 bacteria were found positively responding to the 1% crude oil concentration.



Figure 1: Sampling areas

Evaluation of ability of wood degrading fungi for the degradation of polycyclic aromatic hydrocarbon

Wood degrading fungus *Pleurotus ostreatus* was selected and evaluated against 1% crude oil in the media. The fungus responded positively. Additionally a simulated environment was build and it was found that the wood degrading fungi was able to tolerate the 1% concentration of crude oil easily. The fungus was able to grow upto 6% of the crude oil concentration.



Figure 2: Growth of *Pleurotus ostreatus* on 1% crude oil extract simulated media

Study of Microbial Characteristics

Colony and cell morphology of positively responded microorganisms has been studied. Many bacteria were found to express pigmentation.

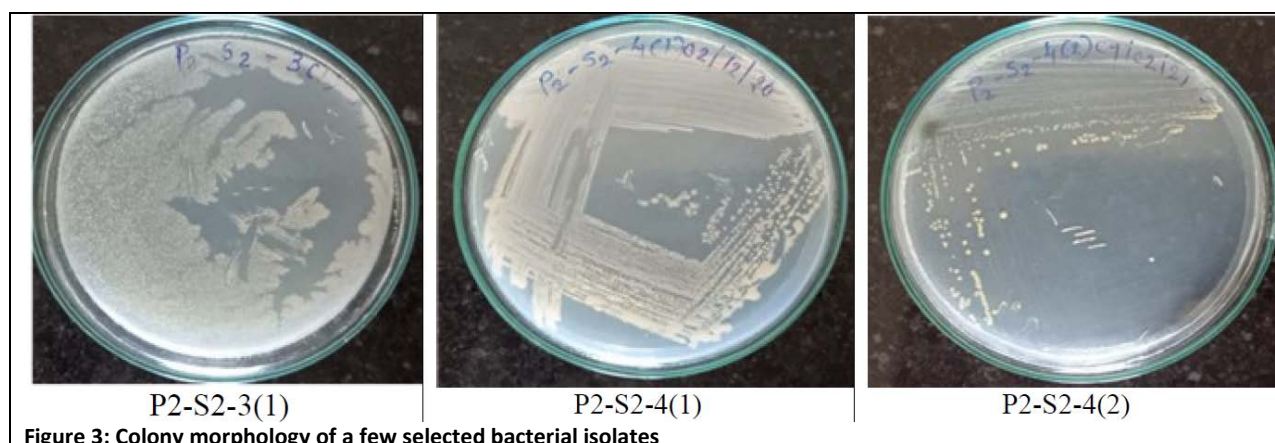


Figure 3: Colony morphology of a few selected bacterial isolates

Study on Broth Culture

At present study on the broth is going on. The degradation of polycyclic aromatic hydrocarbons has been studied. The study on the enzymes produced by the microorganism in response to the polycyclic aromatic compounds is being studied.

Mr. Dhaval Kishorvan Van
Enrollment no: 91900832032
Department of Microbiology

Dr. Aditya Saran (PhD Supervisor)
Assistant Professor
Microbiology
Marwadi University

Date: 21 March 2023

Progress Evaluation Report

Name of Student: Ms. Joshi Riddhi Bharatbhai

Enrollment No: 92000832003

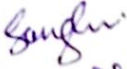


Title of Project: Histology of wood decay and screening of commercially important enzymes and bioactive metabolites from wood rot fungi

Status of the Project: On going

Following points were observed by the experts:

She has joined her Ph.D. in academic year 2020-21.

1. Objectives need to be more broadened.
2. DNA sequencing for identification of fungal samples is recommended.
3. More basidiomycetes group of fungi can be screened for availing better results.

- | | | |
|---------------------|---------------------------------------|---|
| 1. Guide | : Dr. Gaurav Sanghvi |  |
| 2. Internal Expert | : Dr. Ashok Kumar Bishoyi |  |
| 3. Dean Of Research | : Dr. RAJENDRASINH BAHADURSINH JADEJA |  |

**HISTOLOGY OF DECAY WOOD AND SCREENING OF
COMMERCIALY IMPORTANT ENZYMES AND BIOACTIVE
METABOLITES FROM WOOD ROT FUNGI**

Progress Report

by

Name – Joshi Riddhi Bharatbhai

Enrollment No. **92000832003**

Guide Name: Dr. Gaurav Sanghvi



MARWADI UNIVERSITY Rajkot

Morbi Road, At & Po. Gauridad,

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Introduction:

Wood, naturally occurring polymer composite, is composed of cellulose, lignin, hemicelluloses and extractive materials, that could be ideal raw material for a future ligno-chemical industry that could replace the petrochemical industry, in providing all kind of chemical products, food and textile products [1]. Due to its biological nature, unprotected wood is susceptible to biological attacks, which reduces its mechanical and physical properties [2].

According to a recent report in market research, it is estimated that the technical enzymes market will increase at a 6.6% CAGR to reach \$1.5 billion in 2015 with the highest sales in the leather market and bioethanol market (BCC Research, 2011). Some of the fungal enzymes, such as amylase (Maltogenase) and lipase (Lipolase) were the first biotech enzymes marketed in the 80's. Enzymes are widely used and are available in different forms, it is still only about 25% of them, which have actually been industrialised and commercialised. Also microorganisms which damage trees, the same organisms found to be producer of important commercial enzymes like amylase, xylanase which has high industrial applicability [3, 4]. In Addition, these organisms are the novel source of secondary metabolites.






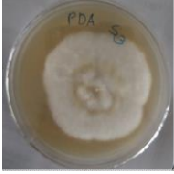


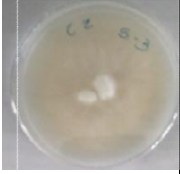
Objectives of the study

- To provide an insight into the fungal pathogenesis within the host and ascertain the mechanism of action via histological methods.
- To find out the paths of fungal movements and invading the wood cells. Study early events of pathogenesis i.e. initiation, spread, penetration mechanism, and response of the host plant to pathogen at cellular and sub-cellular level.
- Screening of isolated pathogen (fungi) for production and characterization of industrially important enzymes like cellulases, hemicellulases, pectinases and also lignocellulosic enzymes.
- Use this enzyme for different application in order to cope up with the industrial demand. For e.g. biobleaching effect, biopulping, saccharification process etc., for hemicellulolytic enzymes and biodegradability of xenobiotic compounds for lignocellulolytic enzymes.

Results

Growth Media	pH Range	Growth of isolates			
		S-1	S-2	S-3	S.W.
Potato - carrot agar	5.5	+	+++	+++	+++
Potato Dexrose Agar	5.7	No growth	++	++	++
Beet root Agar	5.4	No growth	No growth	+	+
French bean Agar	5.0	No growth	+	++	+
Czapek'sDox Agar	5.2	No growth	++	++	++

Work done so far


Growth Media	Potato - carrot agar	Potato Dextrose Agar	Beet root Agar	French bean Agar	CZapek DoxAgar	Mycelia Characteristic
Isolate S-2			No Growth			In this isolate PDA and PCA transparent
Isolate S-3						In this isolate PDA and PCA Colony white to pale cream, dense, aerial mycelium,

Planning for Further work:

1	After completion of primary screening of strains will do Molecular characterization of the four fungal strain. Identification of the fungal strain.
2	After that The best suitable isolate will be further used for production of extracellular industrial important enzymes in different production media either by submerged fermentation or solid state fermentation.

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