Pravara Rural Education Society's

Arts, Commerce and Science College, Satral

Tal. Rahuri, Dist. Ahmednagar- 413711

Affiliated to Savitribai Phule Pune University, Pune.

Self-Study Report: 2024 (3rd Cycle)

Criterion-3
Research, Innovations and Extension

Key Indicator: 3.5
Collaboration

Metric: 3.5.1 (QnM)

Number of functional MoUs/linkages with institutions/ industries in India and abroad for internship, on-the-job training, project work, student / faculty exchange and collaborative research during the last five years

Submitted to

NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL BENGALURU

3.5.1 Number of functional MoUs/linkages with institutions/ industries in India and abroad for internship, on-the-job training, project work, student / faculty exchange and collaborative research during the last five years

List and Copies of Documents Indicating the Functional MoUs/linkage/Collaborations activity-wise and Year-wise

Academic Year: 2018-19

INDEX

Submitted to

NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

BENGALURU

7.	Department of Physics, Savitribai Phule Pune University, Pune. (MS) hod@physics.unipune.ac.in	2015	Dr. N. S. Kanhe Sharing research facility for the completion of Ph.D. degree in Physical Science	113
8.	Padmashri Vikhe Patil College of Arts, Science and Commerce Pravaranagar, Rahata, Dist.-Ahmednagar Maharashtra 413736 pvpcollege@gmail.com	2014	Dr. V. G. Shinde Sharing research facility for the completion of Ph.D. degree in Commerce	115
9.	K. R. T. Arts, B. H. Commerce and A. M. Science, College Nashik. Maharashtra srcollege.kthm@mvp.edu.in	2015	Mrs. D. D. Agarkar Sharing research facility for the completion of M. Phil. Degree in Chemical Science	117
10.	Padmashri Vikhe Patil College of Arts, Science and Commerce Pravaranagar, Rahata, Dist.-Ahmednagar Maharashtra, 413736 pvpcollege@gmail.com	2018	Mr. D. N. Ghane Sharing research facility, pursuing Ph. D. degree in Commerce	119

Arts, Commerce & Science College ACSC SATRAL At. Rahuri, Dist. Ahmednagar

Principal
PRINCIPAL
Art's, Commerce & Science College
Satral, Tal.Rahuri, Dist. Ahmednagar.

Submitted to

NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL

BENGALURU

Functional MoU Copies

Pravara Sahakari Bank Loni, Tal-Rahata, Dist.- Ahmednagar, Maharashtra, 413736

PRAVARA SAHAKARI BANK LTD.
(SCHEDULED BANK)
H. O. LONI : 413736, TAL. : RAHATA, DIST. : AHMEDNAGAR. (MAH.)
TEL. : (02422) 273450, 273471, 273516-17-18, 273715-16 FAX : (02422) 273715
E-Mail:psb_ho@rediffmail.com
प्रवरा बँक
EST.1974
REG.NO.132

Ref.No. 43 HRD/020-18
6

Date : 22/06/2018

MEMORANDUM OF UNDERSTANDING

BETWEEN THE TWO INSTITUTIONS:-

1. *THEPRINCIPAL,*
   ARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL,
   TAL- RAHURI, DIST- AHMEDNAGAR-413711.

AND

2. *PRAVARA SAHAKARI BANK LTD. (SCHEDULED), LONI, TAL.RAHATA, DIST.AHMEDNAGAR, MAHARASHTRA (INDIA), PIN CODE : 413736*
   TAL: RAHATA DIST : AHMEDNAGAR MAHARASHTRA STATE (INDIA)
   PIN CODE : 413712

WITNESSETH THAT:

WHEREAS, DEPARTMENT OF COMMERCE ofARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST- AHMEDNAGAR-413711 and*PRAVARA SAHAKARI BANK LTD. (SCHEDULED), LONI, TAL.RAHATA, DIST.AHMEDNAGAR, MAHARASHTRA (INDIA), PIN CODE : 413736*desire to promote the enrichment of their teaching and learning, research and discovery and engagement missions; and

WHEREAS, DEPARTMENT OF COMMERCE, ofARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST- AHMEDNAGAR-413711 and*PRAVARA SAHAKARI BANK LTD. (SCHEDULED), LONI, TAL.RAHATA, DIST.AHMEDNAGAR, MAHARASHTRA (INDIA), PIN CODE : 413736*desire to strengthen and expand the mutual contacts between the two organizations; and

WHEREAS, DEPARTMENT OF COMMERCE of ARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST- AHMEDNAGAR-413711 and*PRAVARA SAHAKARI BANK LTD. (SCHEDULED), LONI, TAL.RAHATA, DIST.AHMEDNAGAR, MAHARASHTRA (INDIA), PIN CODE : 413736*desire to provide for a vibrant collaboration between the two organizations on the terms and conditions hereinafter set forth;

NOW THEREFORE, it is mutually agreed as follows:

I. **Scope of Agreement -** The Agreement, shall include, but not be limited to, the following types of collaboration:
   A. Seek mutual advice and support in planning and executing programs promoting excellence in respective areas of research and education.
   B. Assist in Student, Teacher training regarding Sericulture, Horticulture, Soil and water analysis.
   C. Placement assistance.

Art's,Commerce & Science College, Tal.Rahuri, Dist.A'Nagar, Satral

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D. Collaborative Research and Discovery, Learning and Teaching, and Engagement.
E. Encourage the faculty members and scientist of either institute to attend lectures, seminars, workshops and conferences in the respective areas of interest.
F. Share the library and scientific literature facilities mutually by giving access to library and other resources of either institute to the scientist/students/research personnel of other institute.
G. Other mutually agreed educational programs.

II. **Definitions** – As used herein the terms "host organization" and "home organization" shall have the following meanings

A. Host organization – the organization accepting the faculty member/scientist or student.
B. Home organization – the organization providing the faculty member/scientist or student.
Period of Agreement – This MOU shall remain in force for Five years from the date of the last signature. Prior to the expiration date, this agreement may be reviewed for possible renewal for a further Five-year period. Either party may terminate this MOU by providing 60 days advance written notice to the other party.

III. In this case. Personnel already participating in the exchange shall serve out their terms under the conditions specified at the time of their appointment.

IV. **Activities Under This Agreement** – It isexpected that activities taking place under this agreement will be initiated primarily in coordination with their respective administrative units concerned with such activities. All activities undertaken must conform to the policies and procedures in place at each institution.

V. **Planning and Management of Activities** – Each distinct collaboration program or activity will be described in separate Activity Agreement drawn up jointly by the collaborating units, and signed by the heads of these units. Such agreements will specify the names of those individuals on each institution responsible for the implementation of the program.

VI. **Funding of Activities** - Activity Agreement's should make financial costs and obligations explicit. Collaborating units are encouraged to work together to identify and secure any outside funding which may be needed. Projects requiring funding must be approved by both institutions.

VII. **Limitation and Warranties:**

- Each party shall ensure that the other is not put to any liability for any act of the respective party under this MoU.
- Each party represents that they have full power and authority to enter into this MOU in general.

VIII **Commercials:**

The training, field visit shall be conducted at the host facility in a time bound manner as per availability and schedule at host facility.

IX **General:**

- Both the parties may receive information proprietary to other party (the "Confidential Information") in the course of performance of their obligations under this MOU. Confidential Information is not meant to include any information which (a) is publicly available (b) is rightfully received by the parties from third parties without accompanying secrecy obligations; (c) is already in either party's possession and was lawfully received from sources other than the parties or (d) is independently developed by the parties. The two bodies understand and acknowledge that the Confidential Information is valuable and confidential and agrees that it will

at all times be kept in trust, to be disclosed only to such persons as have a "need to know" the same for the effective implementation of this MOU and that it will only be used by the parties for the benefit of others.

- Both the parties understand and agrees that all written or other tangible data and documentation developed or procured by the other party in performing its obligations under this MOU, whether in printed or electronic form, belongs to other party and that other party will have all rights, title and interest therein.
- Both parties shall not use the name and brand of the other party in any advertisement or make any public announcement without the prior written approval of the other.
- Any and all disputes or differences arising out of or in connection with this MoU or its performance shall, so far as it is possible, be settled by negotiations between the Parties amicably through consultation & understanding.

X. Indemnification:

Both the parties shall indemnify and hold each other harmless from and against any claim, loss, liability, or expense, including, but not limited to, damages, patent and trademark infringement, costs and attorneys' fees, arising out of or in connection with any acts or omissions of their agents or employees.

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XI. **NON-DISCRIMINATION – WHEREAS, DEPARTMENT OF COMMERCE OF ARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST-AHMEDNAGAR-413711 AND PRAVARA SAHAKARI BANK LTD. (SCHEDULED), LONI, TAL.RAHATA, DIST.AHMEDNAGAR, MAHARASHTRA (INDIA), PIN CODE : 413736** agree that no person shall on the grounds of race, color, national origin, gender, sexual orientation, or creed be excluded from participation under the terms of this Agreement.

XII Modification – The terms of this Agreement may be changed or modified only by written amendment signed by authorized agents of the parties hereto.

IN WITNESS THEREOF, WHEREAS, DEPARTMENT OF COMMERCEof***PRAVARA SAHAKARI BANK LTD. (SCHEDULED), LONI, TAL.RAHATA, DIST.AHMEDNAGAR, MAHARASHTRA (INDIA), PIN CODE : 413736***have executed this Agreement as of the date first above written.

FOR, PRAVARA RURAL EDUCATION SOCIETY'S ARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST-AHMEDNAGAR-413711

FOR, *PRAVARA SAHAKARI BANK LTD. (SCHEDULED), LONI, TAL.RAHATA, DIST.AHMEDNAGAR, MAHARASHTRA (INDIA), PIN CODE : 413736*

PRAVARA SAHAKARI BANK LTD.
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E-Mail:psb_ho@rediffmail.com

EST.1974
REG.NO.132

AUTHORIZED SIGNATORY NAME:

PRIN. SINGAR JAYSHREE R.

DESIGNATION: PRINCIPAL

I/C PRINCIPAL
Art,Commerce & Science College
Satral,Tal. Rahuri, Dist. A'Nagar

Date: 22/06/2018

AUTHORIZED SIGNATORY NAME:

DESIGNATION: Deputy General Manager

Date: 22/06/2018

PRAVARA SAHAKARI BANK LTD.
(SCHEDULED BANK)

H. O. LONI : 413736, TAL. : RAHATA, DIST. : AHMEDNAGAR. (MAH.)
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Ref:No. 43/6 HRD/2020-21/

Date : 22/06/2020

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FOR, *PRAVARA SAHAKARI BANK LTD. (SCHEDULED), LONI, TAL.RAHATA, DIST.AHMEDNAGAR, MAHARASHTRA (INDIA), PIN CODE : 413736*

PRAVARA SAHAKARI BANK LTD.
(SCHEDULED BANK)

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AUTHORIZED SIGNATORY NAME:

PRIN. SINGAR JAYSHREE R.

DESIGNATION: PRINCIPAL

I/C PRINCIPAL
Art,Commerce & Science Collage
Satral,Tal. Rahuri, Dist. A'Nagar

Date: 22/06/2020

AUTHORIZED SIGNATORY NAME:

DESIGNATION: Deputy General Manager

Pravara Sahakari Bank Ltd. Loni H.O.

Date: 22/06/2020

Date:01/02/2019

To,

The Principal,

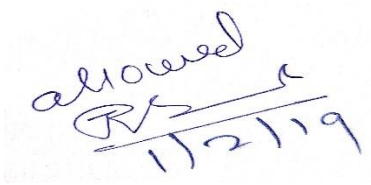
Arts, Commerce and Science College, Satral.

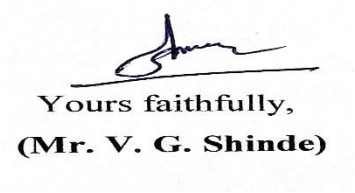
Subject: - Permission to organize Bank Visit for T. Y. B. Com student.

Respected Sir,

With reference to the above-mentioned subject, the final year's students of B. Com. need to visit Pravara Sahakari Bank Ltd., Songaon. The Bank Visit will provide hands-on experience. It will be the opportunity for our students for gaining practical experience with Pravara Sahakari Bank Ltd., (Scheduled Bank) Songaon. The Bank Visit program will organize on 6th February, 2019.

Thanking you.





Yours faithfully,

(Mr. V. G. Shinde)

Date- 04/02/2019

To,
The Manager,
Pravara Sahakari Bank Ltd.,
(Scheduled Bank)
Songaon Branch.

Subject: - To get permission for the bank visit to the students.

Respected Sir,

With reference to the above-mentioned subject, Savitribai Phule Pune University has introduced 'Bank Visit' for Third Year B. Com. Students. The purpose of the Bank Visit will to be provide hands-on training and experience to the students about various aspects of business and commercial activities. A Bank Visit will give students an idea of how the staff will work. In view of this, I request you to provide following students of our college (List enclosed) with an opportunity for Bank Visit in your organization.

Thanking you,

Principal
Principal
Arts,Commerce and Science College
At/Po.Satral,Tal.Rahuri,
Dist.Ahmednagar.413711

Date: 05/02/2019

Student Notice

All the T. Y. B. Com students are hereby informed that the department is going to organize a **Bank Visit** on 06th February 2019 on 10.30 am at Pravara Sahakari Bank Ltd., (Scheduled Bank) Songaon. Attendance for this visit is mandatory.

Note :-

- Students are required to have dress code and college ID cards.
- Students are also encouraged to bring notebooks and pens to take notes during the visit

Arts, Commerce & Science College ACSC SATRAL Tal. Rahuri, Dist. Ahmednagar

Principal

Principal
Arts,Commerce and Science College
At/Po.Satral,Tal.Rahuri,
Dist.Ahmednagar.413711

Arts, Commerce and Science College, Satral

Department of Commerce

BANK VISIT REPORT – 2018-19

Name of the Visit	Bank Visit
Place to Visit	Pravara Bank A/P- Songaon,Tal-Rahuri,Dist-Ahmednagar.
Date	06/02/2019
Name of Guide	Mr.P. S. Dethe(Branch Manager, PSB Bank)
Objectives of Visit	• To study banking method. • To study of loan disbursement method. • To study the account opening process. • To study the online banking system.
Name of Coordinator	Mr. V. G. Shinde
No. of Participants	46

On 06thFebruary2019,the Department of Commerce visited PravaraSahakari Bank Ltd.,Songaon.About 46students from Commerce Departmentvisited PravaraSahakari Bank, Branch Songaon. A total of46 students, including 27 boys and 19 girls, visited the bank and studied theday-to-day operations of the bank. Forexample, account opening process, cheque clearing method and safe deposit vault information under the guidance of Mr. P. S. Dethe(Branch Manager, PSB)Mrs. JayashreeSingar, Principal of the College and Mr. D. N. Ghane (HoD), Mr.V.G. Shinde andDr. U. A. Tajanewere contributoryin the successful completion of this bank visit which will definitely benefit to the students in the future.

Guidance given by Mr. P. S. Dethe, Branch Manager (PSB) to the students

Mr. V. G. Shinde
(Coordinator)

HOD
H.O.D.
Department of Commerce
Arts,Commerce & Science College,Satral.

Principal
Principal
Arts,Commerce and Science College
At/Po.Satral,Tal.Rahuri,
Dist.Ahmednagar.413711

Pravara Rural Education Society's

Arts, Commerce and Science College, Satral

Department of Commerce

Bank Visit Program – Pravara Sahakari Bank Ltd. (Scheduled Bank)
Songaon Branch

T.Y. B.Com Student List-2018-19

Sr. No.	Name of Student	Sign
1.	Dhage Ganesh Prakash	
2.	Dighe Mayuri Appasaheb	
3.	Dighe Nilesh Rajendra	
4.	Dokhe Aarti Ramesh	
5.	Dokhe Komal Maruti	
6.	Gagare Amol Kailas	
7.	Gagare Ashutosh Arun	
8.	Gagare Punam Bapusaheb	
9.	Gagare Vikas Savaleram	
10.	Gholap Sanket Sampat	
11.	Ghorpade Swapnil Uttam	
12.	Gulave Sachin Shravan	
13.	Harde Aarti Appasaheb	
14.	Harde Shubhangi Dnyandeo	
15.	Harde Sulochana Vishnu	
16.	Kadu Akshay Ramesh	
17.	Kadu Sagar Ashok	
18.	Kambale Satish Digambar	
19.	Kamble Laxman Baban	
20.	Khaladkar Abhishek Dashrath	
21.	Khemnar Baban Kushaba	
22.	Khemnar Sonali Annasaheb	
23.	Kolapkar Nikhil Mukund	

Arts, Commerce & Science College ACSC SATRAL Tal. Rahuri, Dist. Ahmednagar

24.	Musmade Nilesh Arun	
25.	Nimase Amol Macchindra	
26.	Pathare Dhananjay Haushiram	
27.	Patole Snehal Sunil	
28.	Sabale Swapnil Kailas	
29.	Salkar Pradip Sanjay	
30.	Shaikh Eptisam Nabab	
31.	Shaikh Mubeen Sultan	
32.	Shaikh Ruksar Javed	
33.	Shinde Rupali Bhausaheb	
34.	Shinde Sagar Sanjay	
35.	Shinde Suraj Vilas	
36.	Shinde Tushari Vinayak	
37.	Sinare Yogesh Bhimraj	
38.	Sonawane Prajakta Vilas	
39.	Suryawanshi Asutosh Sanjay	
40.	Vikhe Dhananjay Rajaram	
41.	Vyas Radhika Bhagwan	
42.	Waghchaure Dipali Gopal	
43.	Waghchaure Shivani Bhausaheb	
44.	Wakchaure Komal Vitthal	
45.	Wani Gayatri Machhindra	
46.	Wani Prashant Rohidas	

Arts, Commerce & Science College ACSC SATRAL Tal. Rahuri, Dist. Ahmednagar

HoD
H.O.D.
Department of Commerce
Arts, Commerce & Science College, Satral.

Functional MoU Copies

Padmashri Dr. Vitthalrao Vikhe Patil Sahakari Sakhar Karkhana Limited, Pravaranagar, Tal-Rahata, Dist.- Ahmednagar, Maharashtra, 413736

रजि.नं. : जी.२५४, ता.३१/१२/४८ पॅन नं. : एएएपी ०८४८ ए व्हॅट टिन नंबर : २७१४०४१०६६६ व्ही
ईसीसी नं. : एएएपी ०८४८ एएक्सएम ००१ टॅन नं. : पीएनईपी ०९१६९ जी सीएसटी टिन नंबर : २७१४०४१०६६६ सी

पद्मश्री डॉ. विठ्ठलराव विखे पाटील सहकारी साखर कारखाना लिमिटेड

मु.पो.प्रवरानगर - ४१३ ७१२
ता.राहाता, जि. अहमदनगर
महाराष्ट्र राज्य (भारत)
रेल्वे स्टेशन - बेलापूर (CR)

दुरध्वनी : २५२३०१ ते २५२३०४ प्रवरानगर
फॅक्स : (०२४२२) २५३३९७ - प्रवरानगर
E-mail : pracarasugar@rediffmail.com
pravarasugar@yahoo.com

GSTNo.:27AAAAP0848A1ZZ
PAN No.:AAAAP0848A

0·M·H0/593

22/06/2018

MEMORANDUM OF UNDERSTANDING

BETWEEN THE TWO INSTITUTIONS:-

1. *THEPRINCIPAL,ARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST- AHMEDNAGAR-413711.*

AND

2. *PADMASHRI DR.VITTALRAO VIKHE PATIL SAHAKARI SAKHARI KARKHANA LIMITED.*
TAL: RAHATA DIST : AHMEDNAGAR MAHARASHTRA STATE (INDIA)
PIN CODE : 413712

WITNESSETH THAT:

WHEREAS, DEPARTMENT OF COMMERCEofARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST- AHMEDNAGAR-413711 and*PADMASHRI DR.VITTALRAO VIKHE PATIL SAHAKARI SAKHARI KARKHANA LIMITED. TAL: RAHATA DIST : AHMEDNAGAR MAHARASHTRA STATE (INDIA)*
PIN CODE : 413712 desire to promote the enrichment of their teaching and learning, research and discovery and engagement missions: and

WHEREAS, DEPARTMENT OF COMMERCE ofARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST- AHMEDNAGAR-413711 and*PADMASHRI DR.VITTALRAO VIKHE PATIL SAHAKARI SAKHARI KARKHANA LIMITED. TAL: RAHATA DIST : AHMEDNAGAR MAHARASHTRA STATE (INDIA)*
PIN CODE : 413712 desire to strengthen and expand the mutual contacts between the two organizations; and

WHEREAS, DEPARTMENT OF COMMERCE ofARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST- AHMEDNAGAR-413711 and*PADMASHRI DR.VITTALRAO VIKHE PATIL SAHAKARI SAKHARI KARKHANA LIMITED. TAL: RAHATA DIST : AHMEDNAGAR MAHARASHTRA STATE (INDIA)*

Art's,Commerce & Science College • Satral • Tal.Rahuri, Dist.A'Nagar

PIN CODE : 413712 desire to provide for a vibrant collaboration between the two organizations on the terms and conditions hereinafter set forth:

NOW THEREFORE, it is mutually agreed as follows:

I. **Scope of Agreement** - The Agreement, shall include, but not be limited to, the following types of collaboration:

A. Seek mutual advice and support in planning and executing programs promoting excellence in respective areas of research and education.
B. Assist in Student, Teacher training regarding Sericulture, Horticulture, Soil and water analysis.
C. Placement assistance.
D. Collaborative Research and Discovery, Learning and Teaching, and Engagement.
E. Encourage the faculty members and scientist of either institute to attend lectures, seminars, workshops and conferences in the respective areas of interest.
F. Share the library and scientific literature facilities mutually by giving access to library and other resources of either institute to the scientist/students/research personnel of other institute.
G. Other mutually agreed educational programs.

II. **Definitions** – As used herein the terms "host organization" and "home organization" shall have the following meanings

A. Host organization – the organization accepting the faculty member/scientist or student.
B. Home organization – the organization providing the faculty member/scientist or student.

Period of Agreement – This MOU shall remain in force for Five years from the date of the last signature. Prior to the expiration date, this agreement may be reviewed for possible renewal for a further Five-year period. Either party may terminate this MOU by providing 60 days advance written notice to the other party.

III. In this case. Personnel already participating in the exchange shall serve out their terms under the conditions specified at the time of their appointment.

IV. **Activities Under This Agreement** – It isexpected that activities taking place under this agreement will be initiated primarily in coordination with their respective administrative units concerned with such activities. All activities undertaken must conform to the policies and procedures in place at each institution.

V. **Planning and Management of Activities** – Each distinct collaboration program or activity will be described in separate Activity Agreement drawn up jointly by the collaborating units, and signed by the heads of these units. Such agreements will

specify the names of those individuals on each institution responsible for the implementation of the program.

VI. **Funding of Activities** - Activity Agreement's should make financial costs and obligations explicit. Collaborating units are encouraged to work together to identify and secure any outside funding which may be needed. Projects requiring funding must be approved by both institutions.

VII. **Limitation and Warranties:**

- Each party shall ensure that the other is not put to any liability for any act of the respective party under this MoU.
- Each party represents that they have full power and authority to enter into this MOU in general.

VIII **Commercials:**

The training, field visit shall be conducted at the host facility in a time bound manner as per availability and schedule at host facility.

IX **General:**

- Both the parties may receive information proprietary to other party (the "Confidential Information") in the course of performance of their obligations under this MOU. Confidential Information is not meant to include any information which (a) is publicly available (b) is rightfully received by the parties from third parties without accompanying secrecy obligations; (c) is already in either party's possession and was lawfully received from sources other than the parties or (d) is independently developed by the parties. The two bodies understand and acknowledge that the Confidential Information is valuable and confidential and agrees that it will at all times be kept in trust, to be disclosed only to such persons as have a "need to know" the same for the effective implementation of this MOU and that it will only be used by the parties for the benefit of others.
- Both the parties understand and agrees that all written or other tangible data and documentation developed or procured by the other party in performing its obligations under this MOU, whether in printed or electronic form, belongs to other party and that other party will have all rights, title and interest therein.
- Both parties shall not use the name and brand of the other party in any advertisement or make any public announcement without the prior written approval of the other.
- Any and all disputes or differences arising out of or in connection with this MoU or its performance shall, so far as it is possible, be settled by negotiations between the Parties amicably through consultation & understanding.

X. **Indemnification:**

Both the parties shall indemnify and hold each other harmless from and against any claim, loss, liability, or expense, including, but not limited to, damages, patent and trademark infringement, costs and attorneys' fees, arising out of or in connection with any acts or omissions of their agents or employees.

NON-DISCRIMINATION – WHEREAS, DEPARTMENT OF COMMERCE of ARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST- AHMEDNAGAR-413711 and, agree that no person shall on the grounds of race, color, national origin, gender, sexual orientation, or creed be excluded from participation under the terms of this Agreement.

XII **Modification** – The terms of this Agreement may be changed or modified only by written amendment signed by authorized agents of the parties hereto.

IN WITNESS THEREOF, WHEREAS, DEPARTMENT OF COMMERCE of ARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST- AHMEDNAGAR-413711 and*PADMASHRI DR.VITTALRAO VIKHE PATIL SAHAKARI SAKHARI KARKHANA LIMITED. TAL: RAHATA DIST : AHMEDNAGAR MAHARASHTRA STATE (INDIA) PIN CODE : 413712* have executed this Agreement as of the date first above written.

FOR, PRAVARA RURAL EDUCATION SOCIETY'S ARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST- AHMEDNAGAR-413711

AUTHORIZED SIGNATORY NAME:

PRIN. SINGAR JAYSHREE R.

DESIGNATION: PRINCIPAL

I/C PRINCIPAL
Art,Commerce & Science Collage
Satral,Tal. Rahuri, Dist. A'Nagar

Arts Commerce & Science College Satral Tal.Rahuri Dist.A'Nagar

FOR, KRISHI VIGYAN KENDRA; BABHALESHWAR, TAL: RAHATA,DIST:AHMEDNAGAR, PIN-413737

AUTHORIZED SIGNATORY NAME:

Mr. Dhone. P.R.

DESIGNATION: MANAGING DIRECTOR
Padmashri Dr. Vitthalrao Vikhe Patil
Sah. Sakhar Karkhana Ltd; Pravaranagar

Date: 22|06|2018

रजि.नं. : जी.२५४, ता.३१/१२/४८
ईसीसी नं. : एएएपी ०८४८ एएक्सएम ००१
पॅन नं. : एएएपी ०८४८ ए
टॅन नं. : पीएनईपी ०९१६९ जी
व्हॅट टिन नंबर : २७१४०४१०६६६ व्ही
सीएसटी टिन नंबर : २७१४०४१०६६६ सी

पद्मश्री डॉ. विठ्ठलराव विखे पाटील सहकारी साखर कारखाना लिमिटेड

मु.पो.प्रवरानगर - ४१३ ७१२
ता.राहाता, जि. अहमदनगर
महाराष्ट्र राज्य (भारत)
रेल्वे स्टेशन - बेलापूर (CR)

दुरध्वनी : २५२३०१ ते २५२३०४ प्रवरानगर
फॅक्स : (०२४२२) २५३३९७ - प्रवरानगर
E-mail : pracarasugar@rediffmail.com
pravarasugar@yahoo.com

GSTNo.:27AAAAP0848A1ZZ
PAN No.:AAAAP0848A

0·M·M0/593

22/06/2020

MEMORANDUM OF UNDERSTANDING

BETWEEN THE TWO INSTITUTIONS:-

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(1)

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(2)

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FOR, PRAVARA RURAL EDUCATION SOCIETY'S ARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL, TAL- RAHURI, DIST- AHMEDNAGAR-413711

AUTHORIZED SIGNATORY NAME:

PRIN. SINGAR JAYSHREE R.

DESIGNATION: PRINCIPAL

I/C PRINCIPAL
Art,Commerce & Science Collage
Satral,Tal. Rahuri, Dist. A'Nagar

Date: 15/06/2020

Arts Commerce & Science College Satral Tal.Rahuri Dist.A'Nagar

FOR, KRISHI VIGYAN KENDRA, BABHALESHWAR, TAL: RAHATA,DIST:AHMEDNAGAR, PIN-413737

AUTHORIZED SIGNATORY NAME:

Mr. Dhone. P.R.

DESIGNATION:

MANAGING DIRECTOR
Padmashri Dr. Vitthalrao Vikhe Patil
Sah.Sakhar Karkhana Ltd;Pravaranagar

Date: 22|06|2020

Pravara Rural Education Society's

ARTS, COMMERCE AND SCIENCE COLLEGE, SATRAL

DEPARTMENT OF COMMERCE

Industrial Visit

Academic Year: 2018-19

Date: 04/03/2019

To,

The Principal,

Arts, Commerce and Science College, Satral.

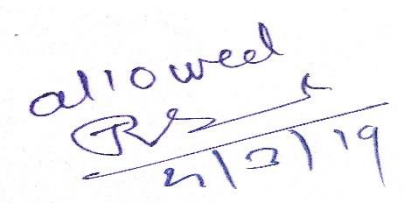
Subject: Seeking permission to the Industrial Visit.

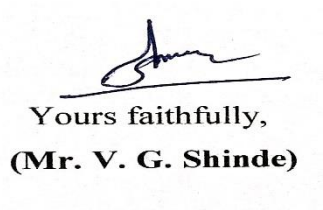
Respected Sir,

The Department of Commerce is organizing an Industrial Visit for the Commerce students. This visit will schedule on Friday, 08th March, 2019. The purpose of this Industrial Visit is to provide students with an opportunity to gain first- hand experience of the industry and to apply the theoretical knowledge they have acquired in the classroom. You are kindly requested to permit us for the said visit.

We look forward to your approval.

Thanking you,





Yours faithfully,

(Mr. V. G. Shinde)

Date: 06/03/2019

To,
The Manager,
Padmashri Dr. Vitthalrao Vikhe Patil Sahakari Sakhar Karkhana Limited, Pravaranagar.

Subject: Seeking permission to the Industrial Visit.

Respected Sir,

The Department of Commerce is organizing an Industrial Visit for the Commerce students. This visit will schedule on Friday, 08th March, 2019. The purpose of this Industrial Visit is to provide students with an opportunity to gain first-hand experience of the industry and to apply the theoretical knowledge they have acquired in the classroom. You are kindly requested to permit us for the said visit.
We look forward to your approval.

Thanking you,

Principal
Principal
Arts,Commerce and Science College
At/Po.Satral,Tal.Rahuri,
Dist.Ahmednagar.413711

Date-07/03/2019

Student Notice

All the T. Y. B. Com students are hereby informed that the department is going to organize an **Industry Visit** on 08th March 2019 at 10.30 am at Padmashri Dr. Vitthalrao Vikhe Patil Sahakari Sakhar Karkhana Limited, Pravaranagar. Attendance for this visit is mandatory.

Note: -

- Students are required to have dress code and college ID cards.
- Students are also encouraged to bring notebooks and pens to take notes during the visit

Arts, Commerce & Science College ACSC SATRAL Tal. Rahuri, Dist. Ahmednagar

Principal

Principal
Arts,Commerce and Science College
At/Po.Satral,Tal.Rahuri,
Dist.Ahmednagar.413711

Report on Industrial Visit

Name of the Visit	Industrial Visit
Place to Visit	Pravara Sahakari Sakhar Karkhana, Pravaranagar
Date	08/03/2019
Objectives of Visit	• To get experiential learning. • To provide students with a first-hand exposure to the intricacies of sugar production
Name of Coordinator	Mr. V. G. Shinde
No. of Participants	42

On 08th March 2019, the last year's students of B. Com. visited Pravara Sahakari Sakhar Karkhana, a leading sugar factory located in Pravaranagar. The primary objective of this visit was to provide students with a first-hand exposure to the intricacies of sugar production and to bridge the gap between theoretical knowledge and practical applications. Our Industrial Visit to Pravara Sahakari Sakhar Karkhana culminated with a sense of profound satisfaction and newfound knowledge in various departments of the factory. It was an informative and enriching experience.

We also learned about the environmental considerations that are taken into account by the Sugar Factory. We extend our heartfelt gratitude to the management and staff of the Sugar Factory for their warm hospitality and for providing us with this invaluable learning experience. The insights gained from this visit will undoubtedly enrich our understanding of the Sugar Factory and contribute to our academic endeavors. Mrs. Jayshree Singar, Principal of the College and Mr. D. N. Ghane (HoD), Mr. V. G. Shinde and Dr. U. A. Tajane were contributory in the successful completion of this Industrial Visit which will definitely benefit to the students in the future.

Guidance given by sugar factory staff to the students

Students carefully observing internal structure of sugar factory

Mr. V. G. Shinde
(Coordinator)

HOD
H.O.D.
Department of Commerce
Arts,Commerce & Science College,Satral.

Principal
Principal
Arts,Commerce and Science College
At/Po.Satral,Tal.Rahuri,
Dist.Ahmednagar.413711

Pravara Rural Education Society's

Arts, Commerce and Science College, Satral

Department Of Commerce

Industry Visit Program – Padamshri Dr.Vitthalrao Vikhe Patil Sahakari Sakhar Karkhana Ltd., Pravaranagar.

T.Y. B.Com Student List-2018-19

Sr. No.	Name of Student	Sign
1.	Dhage Ganesh Prakash	
2.	Dighe Mayuri Appasaheb	
3.	Dighe Nilesh Rajendra	
4.	Dokhe Aarti Ramesh	
5.	Dokhe Komal Maruti	
6.	Gagare Amol Kailas	
7.	Gagare Ashutosh Arun	
8.	Gagare Punam Bapusaheb	
9.	Gagare Vikas Savaleram	
10.	Gholap Sanket Sampat	
11.	Ghorpade Swapnil Uttam	
12.	Gulave Sachin Shravan	
13.	Harde Aarti Appasaheb	
14.	Harde Shubhangi Dnyandeo	
15.	Harde Sulochana Vishnu	
16.	Kadu Akshay Ramesh	
17.	Kadu Sagar Ashok	
18.	Kambale Satish Digambar	
19.	Kamble Laxman Baban	
20.	Khaladkar Abhishek Dashrath	
21.	Khemnar Baban Kushaba	
22.	Khemnar Sonali Annasaheb	
23.	Kolapkar Nikhil Mukund	

Arts, Commerce & Science College • ACSC SATRAL • Tal. Rahuri, Dist. Ahmednagar

24.	Musmade Nilesh Arun	Musmade N. A
25.	Nimase Amol Macchindra	Nimse . A. M
26.	Pathare Dhananjay Haushiram	Pathare . D . H
27.	Patole Snehal Sunil	Patolessl .
28.	Sabale Swapnil Kailas	Sabales
29.	Salkar Pradip Sanjay	
30.	Shaikh Eptisam Nabab	
31.	Shaikh Mubeen Sultan	Mubeen
32.	Shaikh Ruksar Javed	Shaik
33.	Shinde Rupali Bhausaheb	Rupali
34.	Shinde Sagar Sanjay	Shinde . S . S .
35.	Shinde Suraj Vilas	Shindesus .
36.	Shinde Tushari Vinayak	Shinde . T . V
37.	Sinare Yogesh Bhimraj	
38.	Sonawane Prajakta Vilas	Sonwane . P . V
39.	Suryawanshi Asutosh Sanjay	Asuth
40.	Vikhe Dhananjay Rajaram	
41.	Vyas Radhika Bhagwan	Vyas . R . B
42.	Waghchaure Dipali Gopal	waghchaure .

Arts, Commerce & Science College ACSC SATRAL Tal. Rahuri, Dist. Ahmednagar

HoD
H.O.D.
Department of Commerce
Arts,Commerce & Science College,Satral.

NAAC Re-accreditation - 'B'
Rayat Shikshan Sanstha's
SHRI SADGURU GANGAGEER MAHARAJ SCIENCE, GAUTAM ARTS & SANJIVANI COMMERCE COLLEGE
KOPARGAON - 423 601 Dist. Ahmednagar (M.S.) India.
Estd. : June 1965
"Best College Award Winner"
ISO 9001 - 2008 Certified

Dr. K. N. Shelke
M.A., M.Phil., Ph.D.
(Principal)

☎ : 02423
Office : 223155, 223755
Resi. : 329462
P.B.No. 13 Pin No. - 423 601

Id. No. PU/AN/ASC/09/1965
HSC. Code No. Jr. 12.04.001
Fax - 02423 - 223155
E-mail - ssgmcoll.kop@gmail.com

Ref. No. : 772/2013-14

Date : 28/11/2013

To,
Mr./Ms: **Kadnor Vijay Annasaheb,**
Department of Chemistry,
Arts, Commerce and Science College, Satral ,
Tal. Rahuri, Dist: Ahmednagar (MS)

Subject: **Confirmation of Admission to the Ph.D. Programme in CHEMISTRY.**
Reference: **PGS/Ph.D./7974, dated-3-10-2013.**

Dear Mr./Ms: **Kadnor Vijay Annasaheb**

I am happy to inform you that the Research and Recognition Committee in **CHEMISTRY** has approved your research topic: **"Synthesis of Some Bioactive Carbazole derivatives and Their Sar Study."**

Your admission is now confirmed as per Ph.D. Rule II.3. The details of your admission are:

1. Subject : **Chemistry**
2. Faculty : **Science**
3. Guide : **Dr.Shelke S. N.**
4. Co-guide : ----------
5. Date of Registration :**17-01-2013**
6. Period of Registration : **5 years**

Please note that your admission will be governed by Rules of Degree of Doctor of Philosophy (Ph.D.) with effect from 29 Aug 2011. Please also note that will have to pay the fees prescribed as per the schedule. The first instalment will have to be paid within a month from the date on which your admission is confirmed. The successive instalments will have to be paid within a month from the date of completion of each year. In case of failure to pay prescribed fees as per the schedule mentioned a late fee of Rs. 100/- per month from the due date of payment shall be charged.

Thanking you,

Sincerely yours,

Principal
S. S. G. M. Science, Gautam Arts &
Sanjivani Commerce College, Kopargaon

Head, Place of Research

Copy to:
1. The Asstt. Registrar, (P. G. Admission), Ph. D. Unit, University of Pune, Pune-411 007.
2. The Guide: Dr. Shelke S. N.

Research Collaboration: Shri Sadguru Gangageer Maharaj Science, Gautam Arts and Sanjivani Commerce College, Kopargaon, Ahmednagar, Maharashtra

Research Publications

Sr. No	RESEARCH PAPER DETAILS
1	Synthesis and antimicrobial activity of novel substituted 2-(9-ethyl-9H-carbazol-3-yl)-4H-chromen-4-one derivatives, **Vijay A. Kadnor**, Gopinath D. Shirole, Sharad N. Shelke, ***Iranian Journal of Organic Chemistry, (Iran. JOC)***,10 (2), **2018**, 2343-2351, ISSN-2008-3599, **IF-0.222,**
2	One pot synthesis of 1, 2, 3- triazoles and 1,4dihydropyridines catalyzed by Ni-fe_3O_4 Nanocatalyst, **V. A. Kadnor,** R. K. Manjul, S. N. Shelke, ***International Journal of Chemi Physical Sciences, (IJCPS),*** 7, **2018**, 227-233.ISSN:2319-6602
3	Synthesis, antimicrobial and antimalarial activityof1, 4-benzothiazepine and Pyrazolines derivatives incorporating carbazole moiety, **Vijay A. Kadnor** and Sharad N. Shelke ***Bulgarian Chemical Communications***, (***Bulg. Chem. Commun.***), 51(02), **2019**, 234-241. DOI: DOI:10.34049/bcc.51.2.4921, **ISSN- 0324-1130,IF-0.879**
4	Synthesis and Antimicrobial Evaluation of Novel Carbazole Based β-diketones and its Pyrazole Derivatives, **Vijay A. Kadnor**, Ganesh R. Mhaske, Sharad N. Shelke, ***CroaticaChemicaActa, (Croat. Chem. Acta)***, 91(3), **2018**, 367–375, **IF-1.22** DOI: 10.5562/cca3353, ISSN-0011-1643

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Synthesis and antimicrobial activity of novel substituted 2-(9-ethyl-9*H*-carbazol-3-yl)-4*H*-chromen-4-one derivatives

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Abstract: A series of novel carbazole tethered chromone derivatives were synthesized from 3-(9-ethyl-9*H*-carbazol-3-yl)-1-(2-hydroxyphenyl)prop-2-en-1-one. The structures of newly synthesized compounds were confirmed by their IR, ^{1}H NMR, ^{13}C NMR and mass spectral data. The synthesized compounds were evaluated for their *in vitro* antimicrobial activity. Notably, compound **5a** with a broad antimicrobial spectrum was the only compound exhibiting activities against all test bacterial and fungal strains as compared to standard drug ampicillin. Most of the newly synthesized compounds (**4**, **5**, and **6**) have moderate to good antimicrobial activities.

Keywords: Carbazole, Chromone, Thiopyrimidine, Iminopyrimidine, Antimicrobial activity.

Introduction

Chromones are oxygen based heterocyclic compounds display a broad spectrum of biological properties such as anticancer [1], antimicrobial [2], antiviral [3] and anti-tobacco mosaic virus [4] activities. They are suitable molecules because their chemical reactivity towards nucleophiles provides a useful route for the preparation of a variety of heterocyclic systems [5, 6]. The use of chromone compounds to synthesize heterocyclic systems via ring opening and ring closure sequences with suitable nucleophiles is well known [7-9]. Chromones possessing heterocyclic substituents at 2 and 3 position possess coronary dilatory [10], muscle relaxant property [11] and antimicrobial activities [12]. Recently an efficient route for the synthesis of derivatives of tetrahydrochromeno [2,3-b] carbazoles has been developed [13], also 3-hydroxy carbazole chromones have been synthesized and displayed an effective antimicrobial activity [14]. On the other hand, carbazole derivatives are an important class of heterocyclic compounds have been created considerable attention to these structures due to their capability to accommodate the substituents around the carbazole frame [15], biological activities and potential application as pharmacological agents [16, 17]. Pyrimidine and thiopyrimidine are one of an important class of heterocyclic compounds for new drug development that fascinated much attention due to their extensive spectrum of biological potential. [18-20], a recent study has shown carbazole pyrimidine derivatives display a new class of anticancer agents [21]. Therefore, the carbazole is shown to be a useful starting material for physiologically or pharmacologically important products. Bioactivity associated with carbazole moiety in association with chromone and pyrimidine nucleus and our contribution in this field [22-25], we report the series of new substituted 2-(9-ethyl-9*H*-carbazol-3-yl)-4*H*-chromen-4-one derivatives (Scheme **1**) and reported their *in*

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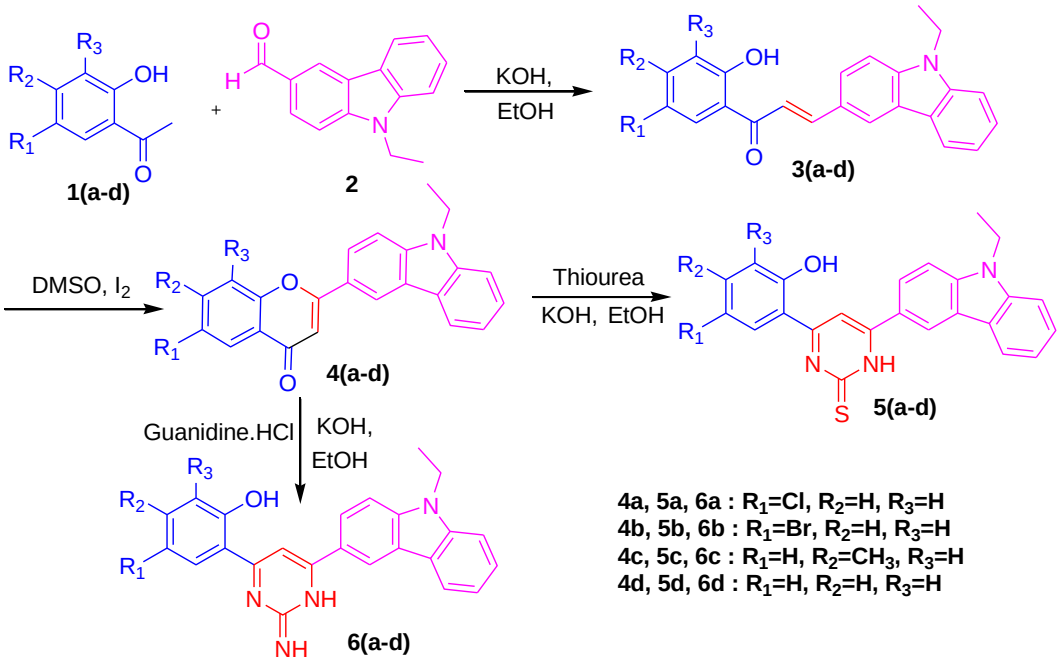
vitro antimicrobial activities against several test microorganisms.

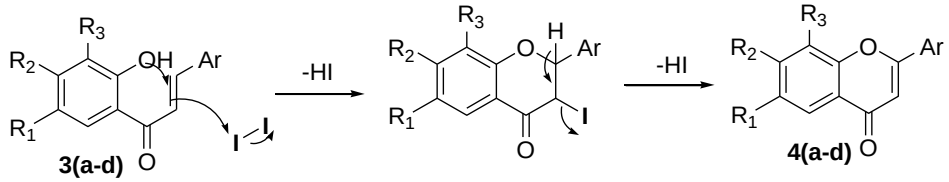


Scheme 1: Synthesis of 2-(9-ethyl-9*H*-carbazol-3-yl)-4*H*-chromen-4-one derivatives

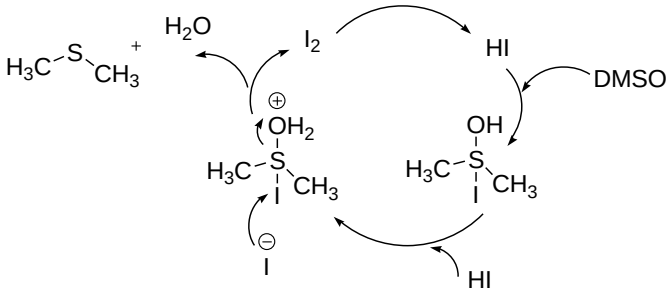
Results and discussion

Chemistry

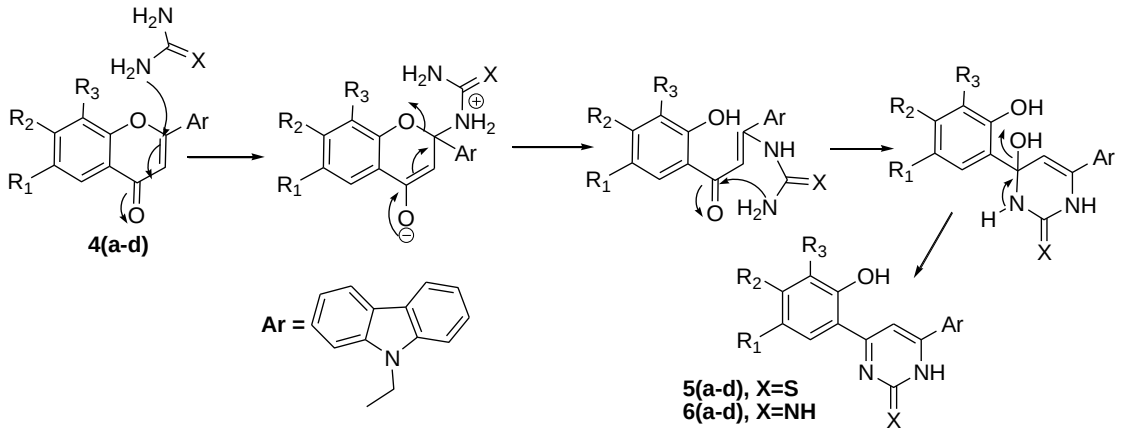
The structures of carbazole derivatives were confirmed on the basis of IR, ^{1}H NMR, ^{13}C NMR and mass technique. The IR spectra of **4(a-d)** exhibited in all cases C=O stretch vibrations in the range 1643-1625 cm^{-1}. The ^{1}H NMR spectra of were similar except for the aromatic protons. The chromone protons C_3 of **4(a-d)** has merged with aromatic part as multiplet in the range of δ 7.20-7.26ppm. The ^{13}C NMR spectra displayed aromatic carbon signals in the region δ 109.49-156.42 ppm. The IR spectra of **5(a-d)** and **6(a-d)** reveal OH and NH stretching bands appeared in the region of 3395-3378 and 3072-3050 cm^{-1}, respectively. In addition to this IR spectra of **5(a-d)** shows the thioketone band in the region 1270-1190 cm^{-1}. The ^{1}H NMR spectra of representative **5a** displayed singlet at δ 6.87 and 9.10 ppm due to thiopyrimidine ring and NH proton respectively, whereas **6a** showed three singlets at δ 5.36, 8.62 and 8.92 ppm because of iminopyrimidine ring and NH protons. The ^{13}C NMR spectra of **5(a-d)** and **6(a-d)** showed aromatic carbon signals in the region δ109.10-154.68 ppm**.** The mass spectra of **4, 5** and **6** displayed, in all cases, peaks corresponding to molecular ions which confirmed their molecular weights.



Scheme 2: Plausible mechanism for the synthesis of compounds **4**



Scheme 3: DMSO mediated regeneration of I_2



Scheme 4: Plausible mechanism for the synthesis of compounds **5** and **6**

Biology:

Antimicrobial activity of newly synthesized compounds **4**, **5** and **6** was evaluated against two gram negative (*Escherichia coli*, *Pseudomonas putide*), two gram positive (*Bacillus subtilis*, *Streptococcus lactis*) bacterial strains, and three (*Aspergillus niger*, *Penicillium sp*,*Candida albicans*,) fungal strains by the agar diffusion method using ampicillin as standard drug. The inhibition zone diameter (mm) and activity index (AI) of all synthesized compounds are enclosed in Table **1.** Graphical representations Figure **1** and **2**, inhibition zone diameter (mm) against a compound number (**4**, **5** and **6**), exhibiting moderate to a promising activity against tested bacterial and fungal strains. It was found that compounds **4(a-d)**, **4b** and **4d** exhibited strong activities (0.86 AI) against gram positive bacteria *Streptococcus lactis* comparable to that of the positive control, also **4a** and **4c** could inhibit the growth of most tested bacterial strains. As for antifungal activities compound **4b** and **4d** inhibit the growth of *Penicillium sp* and *Candida albicans*, fungal strain with (0.92 AI) activity index. Compounds **5(a-d),5a** with a 6 chlorothiopyrimidine derivative attached to the carbazole backbone gave nearly equipotent (0.90-1.00 AI) antibacterial broader bioactive spectrum against gram negative *Pseudomonas putide* and gram positive *Bacillus subtilis* and *Streptococcus lactis* as compared with standard drugs, compounds **5a** and **5c** could inhibit growth of *Penicillium sp* fungal strain to that of the positive control. Compounds **6b** and **6c** exhibited a broad spectrum against *Streptococcus lactis* bacterial strain with (0.81 AI), while compounds **6a**, **6b** and **6d** showed promising antifungal activities against three tested fungal strains. From structure-activity relationship (SAR) studies, it was indicated that the incorporation of chromone, thiopyrimidine and iminopyrimidine to carbazole moiety caused enhanced activities against most tested microorganisms. The results also suggested that the antimicrobial activities of the carbazole derivatives were distinctly influenced by the aromatic substituents. Compounds with electron withdrawing substituent (Cl and Br) in the aromatic ring were more active against all test microbes than compounds with electron donating ones.

Table 1: Antimicrobial activities of compounds **4**, **5** and **6**

Compds	[a]Inhibition zone diameter, mm, (activity index)[b]						
	Gram -ve bacteria		Gram +ve bacteria		Fungi		
	Escherichia coli	*Pseudomonas putide*	*Bacillus subtilis*	*Streptococcus lactis*	*Aspergillus niger*	*Penicillium Sp*	*Candida albicans*
4a	12 (0.50)	16 (0.80)	15 (0.78)	14 (0.63)	14 (0.58)	09 (0.64)	12(0.85)
4b	14 (0.58)	15 (0.75)	16 (0.84)	19 (0.86)	17 (0.70)	11(0.78)	13 (0.92)
4c	11 (0.45)	13 (0.65)	15 (0.78)	17 (0.77)	16 (0.66)	11(0.78)	11(0.78)
4d	16 (0.66)	15 (0.75)	15 (0.78)	19 (0.86)	17 (0.70)	13 (0.92)	10(0.71)
5a	18 (0.75)	19 (0.95)	19 (1.00)	20 (0.90)	18 (0.75)	12(0.85)	10(0.71)
5b	14 (0.58)	13 (0.65)	16 (0.84)	19 (0.86)	12 (0.50)	11(0.78)	08 (0.57)
5c	11 (0.45)	14 (0.70)	12 (0.63)	16 (0.72)	11(0.45)	12(0.85)	09 (0.64)
5d	12 (0.50)	14 (0.70)	13 (0.68)	14 (0.63)	12 (0.50)	10 (0.71)	10 (0.71)
6a	13 (0.54)	12 (0.60)	13 (0.68)	15 (0.68)	16 (0.66)	11(0.78)	12 (0.85)
6b	14 (0.58)	14 (0.70)	17 (0.89)	18 (0.81)	15(0.62)	12 (0.85)	11 (0.78)
6c	14 (0.58)	13 (0.65)	16 (0.84)	18 (0.81)	14 (0.58)	11 (0.78)	11 (0.78)
6d	12 (0.50)	11 (0.55)	13 (0.68)	12 (0.54)	14 (0.58)	12 (0.85)	09 (0.64)
Ampicillin	24	20	19	22	24	14	14
Control (1%DMSO)	No activity	No activity	No activity	No activity	No activity	No activity	No activity

[a]Inhibition zone diameters were measured for stock solutions with a concentration of 100µg/mL.
[b]Activity index (AI) =Inhibition zone of test compounds (mm) /inhibition zone of standard (mm).

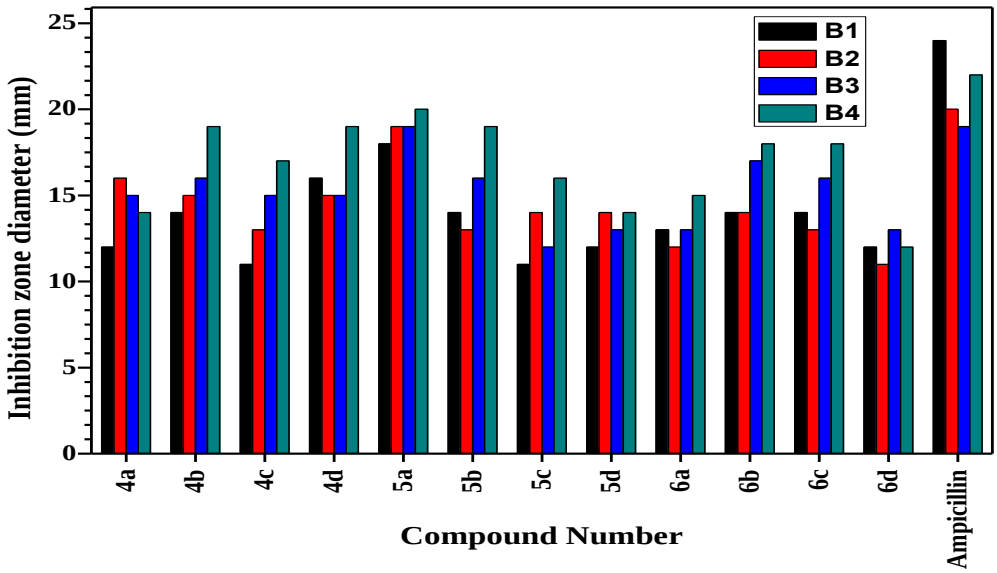


Figure 1: Antibacterial activities of compounds **4**, **5** and **6**.

B1=*Escherichia coli*, **B2**= *Pseudomonas putide*, **B3**= *Bacillus subtilis*, **B4**= *Streptococcus lactis*

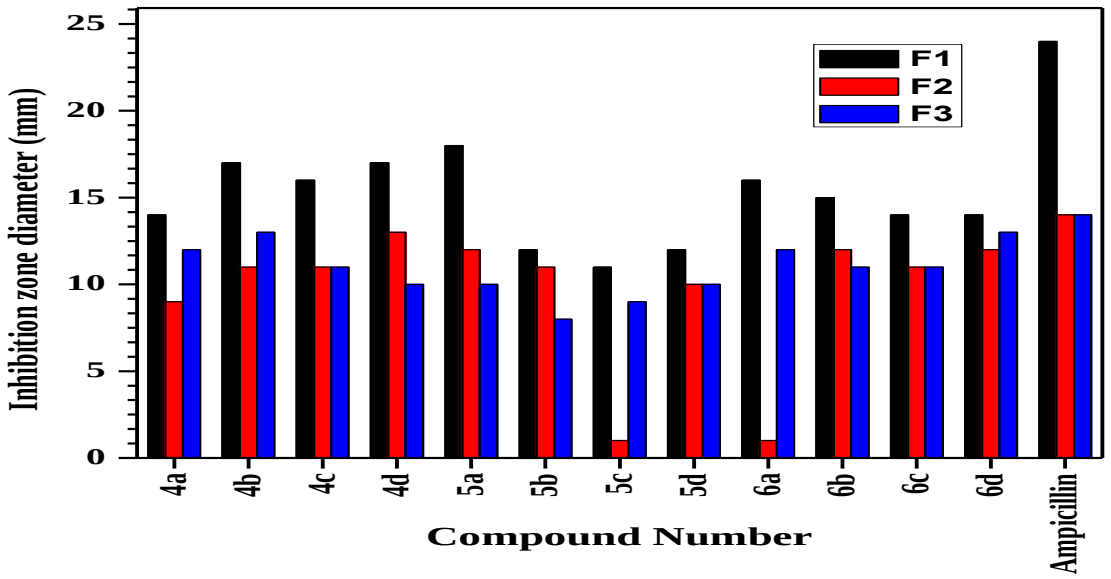


Figure 2: Antifungal activities of compounds **4**, **5** and **6**.

F1= *Aspergillus niger*, **F2**= *Penicillium sp*, **F3**= *Candida albicans*

Conclusion

A series of novel 2-(9-ethyl-9*H*-carbazol-3-yl)-4*H*-chromen-4-one derivatives (**4, 5** and **6**) were synthesized from 3-(9-ethyl-9*H*-carbazol-3-yl)-1-(2-hydroxyphenyl)prop-2-en-1-one in approach of new antimicrobial agents. All compounds were examined for their *in vitro* antimicrobial activities against four bacteria and three fungi, showed moderate to promising antimicrobial activity as compared with standard drug ampicillin. Structure activity relationship (SAR) study of all compounds (**4, 5** and **6**) were taken into interpretation, it was observed that synthesized compounds having electron withdrawing groups like chloro and bromo attached to the phenyl ring showed excellent potential of antimicrobial activity. Also compounds containing moderate electron releasing group, methyl was able to produce moderate growth inhibitory activity against bacterial and fungal strains.

Experimental

The recorded melting points were determined in an open capillary and are uncorrected. IR spectra were recorded on PerkinElmer FTIR spectrophotometer from KBr pellets. ^{1}H NMR spectra were recorded on a Bruker Avance II 400 MHz device in $CDCl_3$, and ^{13}C NMR spectra were recorded at 125 MHz in $CDCl_3$ using tetramethylsilane (TMS) as internal standard.

The mass spectra were obtained by Waters mass spectrophotometer. Thin layer chromatography (TLC) was carried out on precoated silica gel aluminum plates to check compound purity.

In vitro antimicrobial assay

The antimicrobial activity was evaluated by the agar well diffusion method [26]. The activity was determined by measuring the diameter of inhibition zone (in mm). The samples of the tested compound concentrations (10–200 μg/mL) were loaded into wells on the plates. All solutions were prepared in DMSO, and pure DMSO was loaded as a control. The plates were incubated at 37 ºC for 24 h. and then were examined for the formation of inhibition zone diameter in mm and calculate their activity index (AI).

General procedure for the synthesis of substituted 2-(9-ethyl-9H-carbazol-3-yl)-4H-chromen-4-one4:

Carbazole chalcones **3(a-d)** (1.70g, 5 mmol) in DMSO (10 mL)**,** a catalytic amount of I_2 (50 mg) was added. The mixture was heated at 140 $^{\circ}$C for 3h. The completion of the reaction was monitored by TLC. After completion of the reaction, the reaction mixture was poured into cold water. Product precipitated was filtered off, washed with sodium thiosulphate, dried and recrystallized from ethanol to obtain the compounds **4(a-d)** in pure form.

6-chloro-2-(9-ethyl-9*H*-carbazol-3-yl)-4*H*-chromen-4-one (4a): Pale yellow colored solid, Yield: 71 %, m.p.: 208-209 ºC, IR (KBr, cm^{-1}): 1627 (C=O), 1233 (C-O), 1134 (Ar-Cl). ^{1}H NMR (400 MHz, DMSO-d_6, δ, ppm): 1.40 (t, 3H, CH_3), 4.47 (q, 2H, N-CH_2), 7.24 (m, 1H, C_3 proton of chromone ring), 7.33-7.59 (m, 4H, Ar-H), 7.67-8.08 (m, 2H, Ar-H), 8.10-8.20 (m, 3H, Ar-H), 8.65 (s, 1H, Ar-H). ^{13}C NMR (125 MHz, DMSO-d_6, δ, ppm): 14.11, 37.83, 83.35, 109.49, 112.54, 121.17, 122.13, 122.50, 122.66, 123.61, 125.36, 128.11, 128.63, 129.81, 134.75, 134.84, 139.85, 142.48, 156.42, 168.33.170.67. MS (*m/z*): 374 (M+1).

6-bromo-2-(9-ethyl-9*H*-carbazol-3-yl)-4*H*-chromen-4-one (4b): Pale yellow colored solid, Yield: 68 %, m.p.: 182-183 ºC, IR (KBr, cm^{-1}): 1643 (C=O), 1232 (C-O), 1022 (Ar-Br). ^{1}H NMR (400 MHz, DMSO-d_6, δ, ppm): 1.39 (t, 3H, CH_3), 4.52 (q, 2H, N-CH_2), 7.21 (m, 1H, C_3 proton of chromone ring), 7.30-7.57 (m, 3H, Ar-H), 7.71-8.08 (m, 3H, Ar-H), 8.30-8.35 (m, 3H, Ar-H), 9.0 (s, 1H, Ar-H). ^{13}C NMR (125 MHz, DMSO-d_6, δ, ppm):14.21, 37.85, 83.45, 109.59, 112.55, 121.27, 122.23, 122.53, 122.62, 123.49, 125.34, 128.21, 128.53, 129.82, 134.73, 134.82, 139.87, 142.42, 156.49, 168.43, 170.89. MS (*m/z*): 418 (M+1).

2-(9-ethyl-9*H*-carbazol-3-yl)-7-methyl-4*H*-chromen-4-one (4c): Pale yellow colored solid, Yield: 69 %, m.p.: 148-149 ºC, IR (KBr, cm^{-1}): 1625 (C=O), 1230 (C-O).^{1}H NMR (400 MHz, DMSO-d_6δ, ppm): 1.36 (t, 3H, CH_3), 3.29 (s, 3H, Ar-CH_3), 4.49 (q, 2H, N-CH_2), 5.72 (s, 1H, C_3 proton of chromone ring), 7.34-7.73 (m, 2H, Ar-H), 8.00-8.62 (m, 4H, Ar-H), 8.97-9.81 (m, 4H, Ar-H). ^{13}C NMR (125 MHz, DMSO-d_6, δ, ppm):14.10, 37.81, 83.39, 109.38, 112.37, 121.37, 122.20, 122.51, 122.59, 123.37, 125.44, 128.35, 128.62, 129.75, 134.69, 134.52, 139.79, 142.45, 156.40, 168.41, 170.76.MS (*m/z*): 354 (M+1).

2-(9-ethyl-9*H*-carbazol-3-yl)-4*H*-chromen-4-one(4d): Pale yellow colored solid, Yield: 70 %, m.p.: 134-135 ºC, IR (KBr, cm^{-1}): 1640 (C=O), 1232 (C-O), ^{1}H NMR (400 MHz, DMSO-d_6, δ, ppm): 1.37 (t, 3H, CH_3), 4.50 (q, 2H, N-CH_2), 7.20 (m, 1H, C_3 proton of chromone ring), 7.45-7.52 (m, 5H, Ar-H), 7.62-7.78 (m, 3H, Ar-H), 8.21-8.64 (m, 3H, Ar-H). ^{13}C NMR (125 MHz, DMSO-d_6, δ, ppm):14.12, 37.82, 83.41, 109.42, 112.35, 121.27, 122.24, 122.55, 122.60, 123.43, 125.34, 128.25, 128.52, 129.85, 134.79, 134.82, 139.81, 142.40, 156.42, 168.43, 170.80. MS (*m/z*): 340 (M+1).

General procedure for the synthesis of 6-(9-ethyl-9H-carbazol-3-yl)-4-(2-hydroxyphenyl)pyrimidine-2(1H)-thione

A mixture of compounds **4(a-d)** (0.33g, 1mmol), thiourea (0.22g, 3mmol), and potassium hydroxide (0.27g, 5mmol) in ethanol (15 mL) was reflux for 4 h. Completion of reaction monitored by TLC, then the reaction mixture was allowed to cool and poured over crushed ice and neutralized with acetic acid, whereby a solid was precipitated, which was filtered off and recrystallized from ethanol to produce **5(a-d).**

4-(5-chloro-2-hydroxyphenyl)-6-(9-ethyl-9*H*-carbazol-3-yl) pyrimidine-2(1*H*)-thione (5a):
Green colored solid, Yield: 72 %, m.p.: 163-164 ºC, IR (KBr, cm^{-1}): 3388 (OH), 3062(NH), 1122 (Ar-Cl), 1256 (C=S).^{1}H NMR (400 MHz, $CDCl_3$, δ, ppm): 1.47 (t, 3H, CH_3), 4.50 (q, 2H, N-CH_2), 6.87 (s, 1H, thiopyrimidine ring), 7.06-7.20 (m, 1H, Ar-H), 7.47-7.52 (m, 2H, Ar-H), 7.66-8.12 (m, 3H, Ar-H), 8.21-8.45 (m, 4H, Ar-H), 9.10 (s, 1H, NH), 14.39 (s, 1H, Ar-OH). ^{13}C NMR (125 MHz,$CDCl_3$, δ, ppm):13.87, 37.92, 106.05, 108.99, 109.10, 119.18, 119.74, 120.06, 120.74, 121.75, 122.82, 123.44, 124.01, 125.06, 125.19, 126.74, 130.94, 133.62, 140.62, 141.96, 154.68, 165.07, 177.15.MS (*m/z*): 432 (M+1).

4-(5-bromo-2-hydroxyphenyl)-6-(9-ethyl-9*H*-carbazol-3-yl) pyrimidine-2(1*H*)-thione (5b):
Green colored solid, Yield: 71 %, m.p.: 170-171 ºC, IR (KBr, cm^{-1}): 3383 (OH), 3055 (NH), 1074 (Ar-Br), 1269 (C=S). ^{1}H NMR (400 MHz, $CDCl_3$, δ, ppm): 1.37 (t, 3H, CH_3), 4.49 (q, 2H, N-CH_2), 6.92 (s, 1H, thiopyrimidine ring), 7.24-7.37 (m, 3H, Ar-H), 7.48-7.51 (m, 2H, Ar-H), 7.58-7.76 (m, 3H, Ar-H), 8.08-8.20 (m, 2H, Ar-H), 8.76 (s, 1H, NH), 12.30 (s, 1H, Ar-OH). ^{13}C NMR (125 MHz,$CDCl_3$, δ, ppm):13.85, 37.90, 106.15, 108.90, 109.12, 119.15, 119.70, 120.04, 120.54, 121.65, 122.81, 123.42, 124.05, 125.07, 125.16, 126.70, 130.91, 133.60, 140.68, 141.92, 154.61, 165.02, 177.35.MS (*m/z*): 476 (M+1).

6-(9-ethyl-9*H*-carbazol-3-yl)-4-(2-hydroxy-5-methylphenyl) pyrimidine-2(1*H*)-thione (5c):
Green colored solid, Yield: 70 %, m.p.: 189-109 ºC, IR (KBr, cm^{-1}): 3385 (OH), 3053 (NH), 1233(C=S). ^{1}H NMR (400 MHz, $CDCl_3$, δ, ppm):1.35 (t, 3H, CH_3), 1.66 (s, 3H, Ar-CH_3), 4.44 (q, 2H, N-CH_2), 6.93 (s, 1H, thiopyrimidine ring), 7.23-7.39 (m, 2H, Ar-H), 7.56-8.01 (m, 3H, Ar-H), 8.16-8.68 (m, 5H, Ar-H),

8.83 (s, 1H, NH), 10.08 (s, 1H, Ar-OH). ^{13}C NMR (125 MHz,$CDCl_3$, δ, ppm):14.31, 37.89, 106.24, 108.91, 109.17, 119.16, 119.72, 120.14, 120.24, 121.62, 122.71, 123.42, 124.15, 125.17, 125.13, 126.74, 130.91, 133.62, 140.65, 141.90, 154.63, 165.12, 177.34.MS (*m/z*): 412 (M+1).

6-(9-ethyl-9*H*-carbazol-3-yl)-4-(2-hydroxyphenyl) pyrimidine-2(1*H*)-thione (5d):

Green colored solid, Yield: 68 %, m.p.: 141-142 ºC, IR (KBr, cm^{-1}): 3378 (OH), 3059 (NH), 1260 (C=S). ^{1}H NMR (400 MHz, $CDCl_3$, δ, ppm): 1.38 (t, 3H, CH_3), 4.50 (q, 2H, N-CH_2), 6.98 (s, 1H, thiopyrimidine ring), 7.25-7.49 (m, 3H, Ar-H), 7.55-8.21 (m, 4H, Ar-H), 8.50-8.78 (m, 4H, Ar-H), 8.89 (s, 1H, NH), 10.28 (s, 1H, Ar-OH). ^{13}C NMR (125 MHz,$CDCl_3$, δ, ppm):14.41, 37.79, 106.28, 108.81, 109.27, 119.36, 119.52, 120.34, 120.26, 121.64, 122.72, 123.44, 124.25, 125.15, 125.17, 126.76, 130.90, 133.64, 140.75, 141.91, 154.68, 165.32, 177.64.MS (*m/z*): 383 (M+1).

General procedure for the synthesis of 4-chloro-2-(6-(9-ethyl-9H-carbazol-3-yl)-1,2-dihydro-2-iminopyrimidin-4-yl)phenol

A mixture of compounds **4(a-d)** (0.33g, 1mmol),ethanol (10 mL), guanidine hydrochloride (0.19g, 2mmol) and potassium hydroxide (0.16g, 3mmol) were refluxed for 6 h. After completion of the reaction (monitored by TLC), cooled and poured over crushed ice, neutralized with acetic acid. The obtained precipitate was collected by filtration, dried and recrystallized from ethanol to afford pure compounds **6(a-d)**.

4-chloro-2-(6-(9-ethyl-9*H*-carbazol-3-yl)-1,2-dihydro-2-iminopyrimidin-4-yl)phenol (6a):

Brown color solid, Yield: 71 %, m.p.: 160-161 ºC, IR (KBr, cm^{-1}): 3385 (OH), 3062 (NH), 1330 (C=N), 1140 (Ar-Cl). ^{1}H NMR (400 MHz, $CDCl_3$, δ, ppm): 1.47 (t, 3H, CH_3), 4.42 (q, 2H, N-CH_2), 5.36 (s, 1H, iminopyrimidine ring), 6.93-7.17 (m, 3H, Ar-H), 7.26-7.49 (m, 4H, Ar-H), 7.56-8.29 (m, 3H, Ar-H), 8.62 (m, 1H, NH), 8.92 (s, 1H, NH), 13.02 (s, 1H, Ar-OH). ^{13}C NMR (125 MHz,$CDCl_3$, δ, ppm):13.83, 37.88, 105.99, 108.07, 109.10, 117.87, 119.20, 119.54, 119.73, 120.60, 120.84, 122.85, 123.49, 123.83, 125.19, 126.10, 126.10, 126.49, 127.91, 128.94, 133.65, 140.62, 143.14. MS (*m/z*): 415 (M+1).

4-bromo-2-(6-(9-ethyl-9*H*-carbazol-3-yl)-1,2-dihydro-2-iminopyrimidin-4-yl)phenol (6b):

Brown color solid, Yield: 69 %, m.p.: 156-157 ºC, IR (KBr, cm^{-1}): 3380 (OH), 3051 (NH), 1329 (C=N), 1022 (Ar-Br), ^{1}H NMR (400 MHz, $CDCl_3$, δ, ppm): 1.44 (t, 3H, CH_3), 4.43 (q, 2H,N- CH_2), 5.37 (s, 1H, iminopyrimidine ring), 6.92-7.20 (m, 3H, Ar-H), 7.24-7.48 (m, 4H, Ar-H), 7.54-8.28 (m, 3H, Ar-H), 8.60 (m, 1H, NH), 8.90 (s, 1H, NH), 13.01 (s, 1H, Ar-OH).^{13}C NMR (125 MHz,$CDCl_3$, δ, ppm):13.80, 37.84, 105.97, 108.17, 109.12, 117.88, 119.21, 119.55, 119.74, 120.63, 120.82, 122.81, 123.47, 123.85, 125.29, 126.12, 126.41, 126.69, 127.90, 128.92, 133.64, 140.61, 143.45. MS (*m/z*): 459 (M+1).

2-(6-(9-ethyl-9*H*-carbazol-3-yl)-1,2-dihydro-2-iminopyrimidin-4-yl)-4-methylphenol(6c):

Brown color solid, Yield: 67 %, m.p.: 148-149 ºC, IR (KBr, cm^{-1}): 3382 (OH), 3072 (NH), 1340 (C=N), ^{1}H NMR (400 MHz, $CDCl_3$, δ, ppm): 1.41 (t, 3H, CH_3), 2.30 (s, 3H, Ar-CH_3), 4.46 (q, 2H, N-CH_2), 5.39 (s, 1H, iminopyrimidine ring), 6.96-7.25 (m, 3H, Ar-H), 7.34-7.49 (m, 3H, Ar-H), 7.52-8.48 (m, 4H, Ar-H), 8.66 (m, 1H, NH), 8.89 (s, 1H, NH), 12.90 (s, 1H, Ar-OH).^{13}C NMR (125 MHz,$CDCl_3$, δ, ppm):13.79, 37.78, 105.90, 108.27, 109.12, 117.81, 119.27, 119.74, 119.83, 120.62, 120.81, 122.85, 123.59, 123.89, 125.29, 126.14, 126.34, 126.55, 127.90, 128.94, 133.62, 140.71, 143.84. MS (*m/z*): 395 (M+1).

2-(6-(9-ethyl-9*H*-carbazol-3-yl)-1,2-dihydro-2-iminopyrimidin-4-yl)phenol (6d):

Brown color solid, Yield: 70 %, m.p.: 123-124 ºC, IR (KBr, cm^{-1}): 3395 (OH), 3070 (NH), 1338 (C=N). ^{1}H NMR (400 MHz, $CDCl_3$, δ, ppm): 1.47 (t, 3H, CH_3), 4.49 (q, 2H, N-CH_2), 5.49 (s, 1H, iminopyrimidine ring), 6.91-7.23 (m, 4H, Ar-H), 7.34-7.48 (m, 4H, Ar-H), 7.50-8.49 (m, 3H, Ar-H), 8.65 (m, 1H, NH), 8.90 (s, 1H, NH), 12.89 (s, 1H, Ar-OH). ^{13}C NMR (125 MHz,$CDCl_3$, δ, ppm):13.77, 37.93, 105.89, 108.37, 109.22, 117.12, 119.25, 119.71, 119.80, 120.64, 120.84, 122.82, 123.52, 123.86, 125.24, 126.34, 126.84, 126.75, 127.91, 128.90, 133.60, 140.74, 143.89. MS (*m/z*): 381 (M+1).

Acknowledgements

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ONE POT SYNTHESIS OF 1, 2, 3- TRIAZOLES AND 1,4 DIHYDROPYRIDINES CATALYZED BY NI-Fe_3O_4 NANOCATALYST

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ABSTRACT

A series of 1-substituted-4-phenyl-1H-1,2,3-triazole and 1,4 dihydropyridines were efficiently synthesized by conventional and nonconvential way by use of Ni-Fe_3O_4 Nano catalyst with good yield.

Keywords: Ni-Fe_3O_4 Nano Catalyst, 1, 2, 3- Triazoles and 1,4 Dihydropyridines.

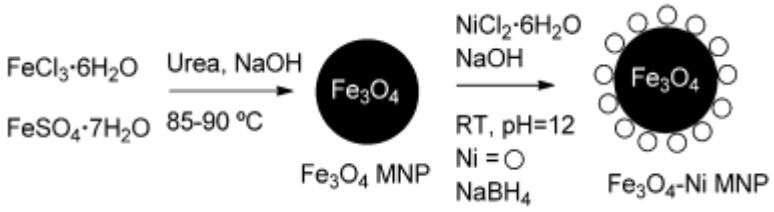
INTRODUCTION

Free nano Fe_2O_3 have been shown to be active, stable, and highly selective catalysts for various oxidations with high turnover number (TON) and excellent selectivity.[1-3] The reduction of nitro as well as carbonyl compounds[4] with hydrogen-transfer reagents is a much safer and more benign process than reactions involving molecular hydrogen, metal hydrides, or soluble metals. In continuation of researcher efforts to develop protocols for green raw materials[5-6] and heterogeneous catalysis for hydrogen transfer reactions and nano-catalysis,[7-10] researcher propose to use glycerol as hydrogen donor as well as solvent in the reduction of nitro and carbonyl compounds using a new, efficient, recyclable, and in expensive ferrite-nickel magnetic-nanoparticles (Fe_3O_4-Ni mnps). Recently 1,2,3 Triazoles were readily prepared from Cu(I)-catalyzed azide-alkyne 1,3-dipolar Cycloaddition (cuaac).[11-12] 1,2,3-triazoles have significant anti- proliferative activity against a wide variety of human cancer cell lines, including those that are multidrug resistant.[13-14] Cu(II)-Clay as a novel, environmentally benign, recyclable, efficient and heterogeneous catalyst for the one pot synthesis of 1,2,3-triazoles via a three component reaction of alkyl halides, sodium azide and terminal alkynes using H2O:etoh (1:1) mixture as solvent under ultrasonic conditions at room temperature.[15]

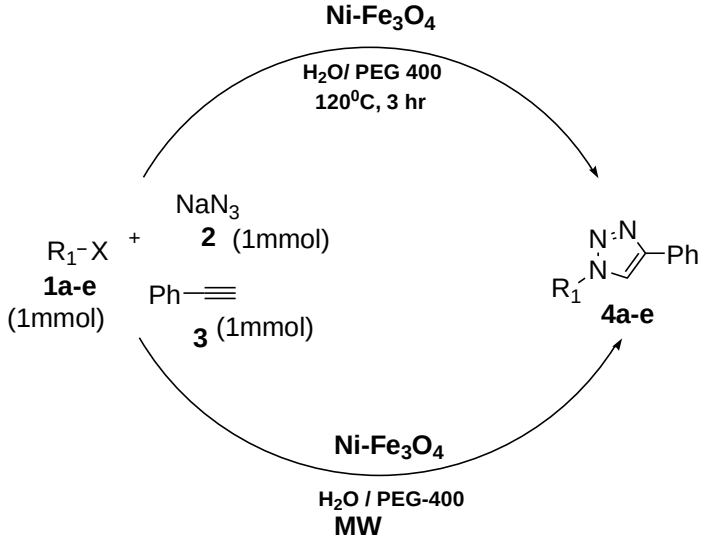
Recently 1,4-dihydropyridines prepared by direct condensation of aldehydes, malononitrile and barbituric acid in aqueous media has been reported under ultrasound irradiation,[16] or catalyzed by diammonium hydrogen phosphate.[17] 1,4-dihydropyridines compounds are most important classes of drug molecules and were introduced for medical use in 1911.[18] They have attracted much attention due to their antiviral,[19] antibiotic,[20] anti-inflammatory,[21] and antitumor[22-23] activities

EXPERIMENTAL

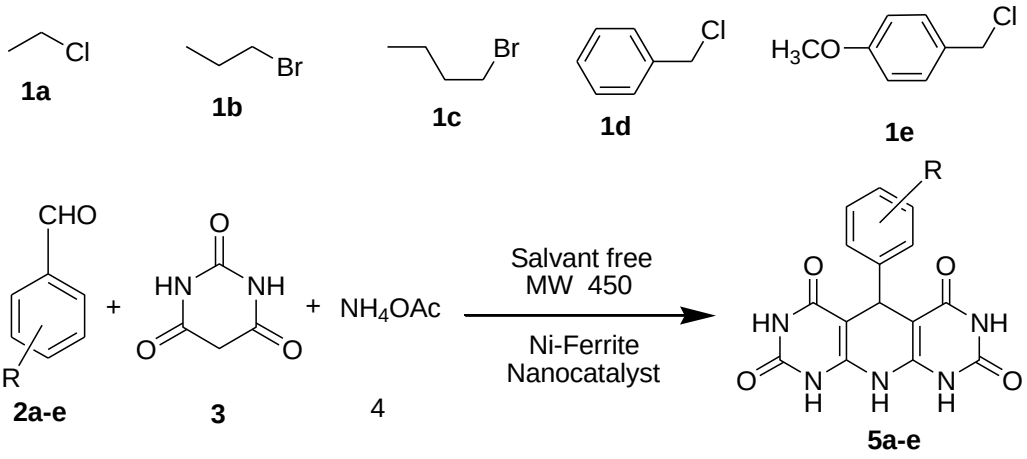
Solvents, reagents and chemicals were purchased from Aldrich, Fluka, Merck, SRL, Spectrochem and Process Chemicals generally used without further purification. IR spectra were recorded on a Perkin FT-IR spectrometer. The NMR spectra were measured with a 400 MHz Bruker Avance spectrometer at 400 and 100 MHz, for ^1H for ^{13}C, respectively, in $CDCl_3$ solution with TMS as an internal standard. Chemical shifts are given in ppm (δ) and are referenced to the residual proton resonances of the solvents. The synthesized Fe_3O_3-Ni MNPs were characterized by several techniques such as XRD, ICP-AES, TEM, and FEG-SEM-EDS. The progress of the reaction has been monitored by thin layer chromatography.



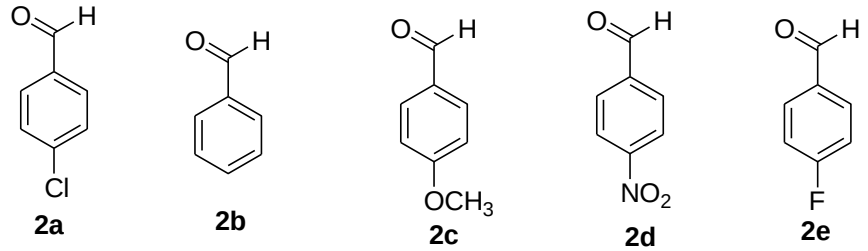
Scheme-I : Preparation of Fe_3O_4-Ni MNPs



Scheme-II: Synthesis of 1, 2, 3- triazoles



Scheme-III: Synthesis of 1,4-dihydropyridines



Preparation of Ferrites/Fe_3O_4

The ferrites magnetic Nanoparticle was prepared by reported procedure. The $FeCl_3 \cdot 6H_2O$ (5.41 g) and urea (3.6 g) were dissolved in water (200 mL) at 85 to 90^0C for 2 h. The solution turned to brown color. To the resultant reaction mixture cooled to room temperature was added $FeSO_4 \cdot 7H_2O$ (2.78 g) and then 0.1m NaOH until pH 10. The molar ratio FeIII to FeII in the above system was nearly 2.00. The obtained hydroxides were treated by ultrasound in the sealed flask at 30 to 35°C for 30 min. After ageing for 5 h, the obtained black powder of Fe_3O_4 was washed, and dried under vacuum.

General procedure for the synthesis of Fe_3O_4-Ni MNPs:

Ferrite magnetic nanoparticle Fe_3O_4 (2 g) and NiCl2·6H2O (10 wt % of nickel on ferrite) were stirred at room temperature in aqueous solution for 1 h. After impregnation, the suspension was adjusted to pH 12 by adding sodium hydroxide (0.5m) and stirred for 10 to 12 h. The solid was washed by distilled water (510 mL). The obtained metal precursors were reduced by adding an aqueous solution of 0.2m $NaBH_4$ drop wise under gentle stirring in an ice water bath for 30 min until no bubbles were observed in the solution. The resulting Fe_3O_3-Ni MNPs were ultrasonicated for 10 min and then washed with distilled water and subsequently with ethanol.

Synthesis of 1,2,3- triazoles catalyzed by $NiFe_3O_4$ catalyst by conventional method :

(4a-e)

Charged phenyl acetylene (1.5m mol), Alkyl halide/Ar-x (1.5m mole), NaN_3 (1.5 m mol), 1.46 mol % of Ni-Fe_3O_4 catalyst by using H_20 (5.0 ml) -PEG 400 (1gm) in sealed tube . Reaction mixture was heated at 150°C until the TLC analysis shows that the reaction is completion. Then reaction mixture was cooled to rt, Ni-Fe_3O_4 catalyst was isolated by an magnetic decantation, water was removed by rotary evaporation, the crude product was purified by column chromatography in 90 – 95 % yields.

Synthesis of 1, 2, 3-triazoles catalyzed by using $NiFe_2O_4$ catalyst by microwave irradiation : (4a-e)

Equimolar aliphatic and aromatic halide, sodium azide, phenyl acetylene and Ni- Fe_3O_4 catalyst in mixture of H_2O (5ml) and PEG-400 (1.g) charged in 10 ml RBF. The mixture was heated to 80°C under microwave irradiation (MW.480W) until TLC analysis shows that the reaction is complete. Then the reaction mixture was cooled to rt, Ni-Fe_3O_4 catalyst was isolated by using external permanent magnet, water was removed by rotary evaporation, the crude product was purified by column chromatography in 80-95 % yield.

4a- White solid, mp 54-56°C; IR ; 754, 805, 1040, 1455,1484, 3381 cm^{-1} ^{1}HNMR (400 MHz, $CDCl_3$) δ: 1.33 (t , 3H,), 4.35 (q , 2H), 7.2-7.8(5H) ,7.6(s, 1H) ^{13}C NMR (100 MHz, $CDCl_3$) δ: 15.50, 15.57, 45.23, 45.34, 119.02, 125.65, 128.06, 128.81, 129.78, 130.69, 147.74. MS (m/z): 173.9

4b. White solid, mp 62-64°C, IR: 1240, 1555, 1485, 3281 cm^{-1}. ^{1}H NMR (400 MHz, $CDCl_3$) δ: 0.85-0.98 (3H, t), 1.88-1.98 (2H, m), 4.30-4.35 (2H,t), 7.26-7.84 (5H, Ar), 7.75 (1H, s). ^{13}C NMR (100 MHz, $CDCl_3$) δ: 23.72, 29.68, 51.92, 119.52, 125.62, 128.01, 128.78, 130.70, 147.61. MS (m/z): 187.

4c. White solid, mp 48-50°C; IR: 1140, 1650, 1484, 3360 cm^{-1}. ^{1}H NMR (400 MHz, $CDCl_3$) δ: 0.96 (3H, t), 1.38 (2H, sextet), 1.92 (2H, quintet), 4.39 (2H, t), 7.26-7.82 (5H, Ar), 7.74 (1H, s). ^{13}C NMR (100 MHz, $CDCl_3$) δ: 13.57, 19.78, 32.37, 50.19, 119.48, 125.73, 128.12, 128.88, 130.79, 147.76. MS (m/z): 201.

4d. White solid, mp 126-128°C, IR: 694, 729, 768, 1049, 1076, 1223, 1358, 1466, 3121 cm^{-1}. ^1H NMR (400 MHz, $CDCl_3$) δ: 5.23(2H, s), 7.26-7.82(10H, Ar), 7.69(1H, s). ^{13}CNMR (100 MHz, $CDCl_3$) δ: 54.1, 119.7, 125.7, 128, 128.2, 128.7, 128.8, 129.1, 130.6, 134.7, 148.1, MS (m/z): 235.

4e. White solid, mp 132-136°C. IR: 794, 731, , 1055, 1076, 1223, 1356, 1464, 3131 cm^{-1}. ^1H NMR (400 MHz, $CDCl_3$) δ: 5.23 (s, 2H), 6.40 (s, 1H), 7.33 (d, 2H), 7.42 (d, 2H), 7.5 (s,1H), 6.90 (d, 2H), 6.61 (d, 2H), 3.54 (s, 3H).^{13}C NMR (100 MHz, $CDCl_3$) δ: 58.1, 54,112.4,126.7, 128.9, 127, 128.2, 128.7, 127.8, 129.1, 131.5, 134.7, 156.1. MS (m/z): 235.

Table-I: Preparation of 1, 2, 3-triazoles by microwave irradiation: (4a-e)

Entry	Time (hr)	Yield (%)
4a	3.00	85
4b	2.50	75
4c	3.15	78
4d	2.30	89
4e	2.10	90

General procedure for preparation 1,4-dihydropyridines: (5a-e)

Mixture of aromatic aldehyde (5 mmol), barbituric acid (10 mmol) and ammonium acetate (8 mmol) was irradiated in microwave instrument (450 W) for a certain period of time without solvent. After completion of the reaction (monitored TLC), reaction mixture was diluted with ethyl acetate (20 mL), washed organic layer with saturated $NaHCO_3$ solution (3 x 15 mL) and then with brine solution. Dried organic layer over anhydrous Na_2SO_4 and concentration under reduced pressure gave crude product, recrystallized from ethanol.

5a. mp: 300°C, IR: 3661, 3175, 1682, 1633, 1458, 776 cm^{-1}. ^1H NMR (400 MHz, DMSO-d_6): δ 10.10 (s, 1H), 3.5 (s, 1H), 5.93 (s, 1H), 7.18 (dd, J = 2.2 Hz, 2H), 7.04 (d, J = 7.8, 2H). ^{13}C NMR (125 MHz, DMSO-d_6): δ 168.11, 152.12, 129.37, 127.77, 126.30, 40.49, 91.22. EI-MS (m/z): 418 (M+1).

5b. mp: 298-300°C; IR: 3054, 1700, 1676, 1606, 1405, 1507 cm^{-1}. ^1H NMR (400 MHz, DMSO-d_6): δ 10.01 (s, 1H), 3.6 (s, 1H), 7.09 (t, 1H), 7.18 (dd, J = 2.2 Hz, 2H), 7.05 (d, J = 7.8, 2H).^{13}C NMR (125 MHz, DMSO-d6): δ 164.40, 150.10, 130.8, 128.12, 126.30, 38.20, 79.10
EI-MS (m/z): 378 (M+1).

5c. mp: 285-286°C; IR: 3056, 1676, 1606, 1405, 1507, 776 cm^{-1}. ^1H NMR (400 MHz, DMSO-d_6): δ 10.01 (s, 1H), 6.75 (dd, J = 2.2 Hz, 2H), 7.01 (d, J = 7.8, 2H), 3.76 (s, 3H), 3.30 (s, 1H). ^{13}C NMR (125 MHz, DMSO-d_6): δ 80.10, 152.40, 40.05, 152.10, 165.20, 135.30, 115.20, 132.10, 55.40. EI-MS (m/z): 406 (M+1)

5d. mp: 270-271°C; IR: 3135, 1689, 1605, 1458, 1528, 776 cm^{-1}, ^1H NMR (400 MHz, DMSO-d_6): δ 10.01 (s, 1H), 6.01 (s, 1H), 8.05 (dd, J = 2.2 Hz, 2H), 7.38 (d, J = 7.8, 2H), 4.40 (s, 1H). ^{13}C NMR (125 MHz, DMSO-d_6): δ 81.10, 150.40, 37.05, 150, 164.20, 150.30, 145.20, 120.10. EI-MS (m/z) : 420 (M+1)

5e. mp: 255-256°C; IR: 3661, 3175, 1682, 1633, 1458, 776 cm^{-1}. ^1H NMR (400 MHz, DMSO-d6): δ 10.01 (s, 1H), 6.01 (s, 1H), 6.82 (dd, J = 2.2 Hz, 2H), 7.08 (d, J = 7.8, 2H), 4.43 (s, 1H). ^{13}C NMR (125 MHz, DMSO-d6): δ 81.10, 150.40, 37.05, 150, 164.20, 150.30, 145.20, 120.10. EI-MS (m/z) : 391 (M+1).

RESULTS AND DISCUSSION

In the beginning, the synthesis of Fe_3O_4-Ni MNPs were prepared by the simple wet impregnation method followed by chemical reduction (**Scheme-I**) and characterized by X-ray diffraction (XRD), TOF-SIMS and transmission electron microscopy (TEM). The presence of Ni on the surface of ferrite was confirmed with time of flight secondary ion mass spectrometry (TOF-SIMS), which is the most surface sensitive (<1 nm) and widely used technique for surface characterization. The surface composition of the powder was determined from the characteristic XPS peak intensities of Ni, Fe, O and C, that is, Ni_2p, $Fe_2p^{3/2}$, O1s and C1s, respectively. Oxygen appears to be the most abundant element in the powder (49%) followed by carbon (33%), nickel (11%), and iron (7%). The characteristic peak of nickel (Ni 2p) is presented in Figure 1.7. The main contributions of Ni 2p3/2 and Ni $2p^{1/2}$ peaks are at 854.2 and 872.5 eV, respectively. A series of 1-ethyl-4-phenyl-1H-1, 2, 3-triazole and 1, 4 dihydropyridine were synthesized by conventional and microwave method analyzed by IR, ^{1}HNMR, ^{13}CNMR and mass spectroscopy.

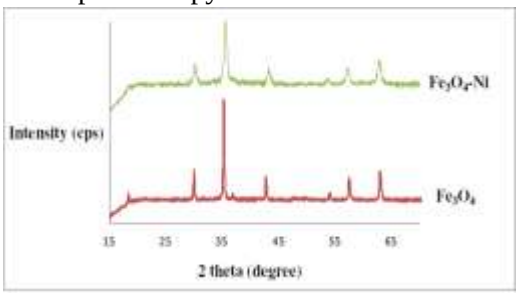


Fig.1.0 XRD pattern of the $NiFe_3O_4$ nanoparticles

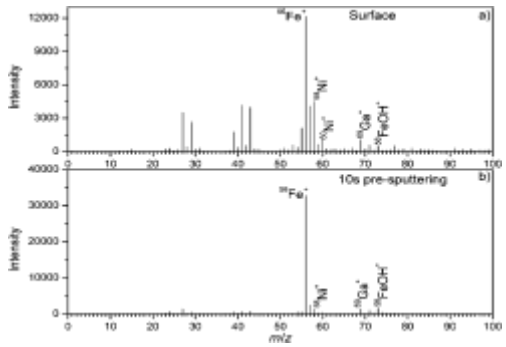


Fig.1.1 TOF-SIMS positive ion spectra (a) intact surface spectrum, (b) after pre-sputtering for 10 seconds in continues mode with Ga^+ ion beam at same impact energy of 10 keV

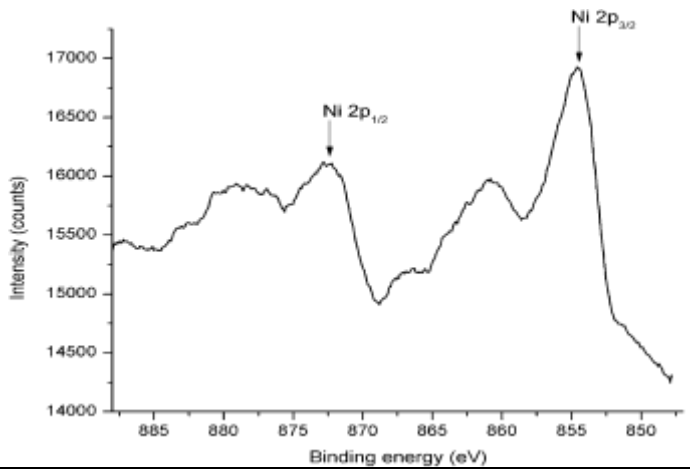


Fig.1.2 Ni_2p XPS line taken in FAT 22 mode with the energy step of 0.1 eV and acquisition time window of 24s

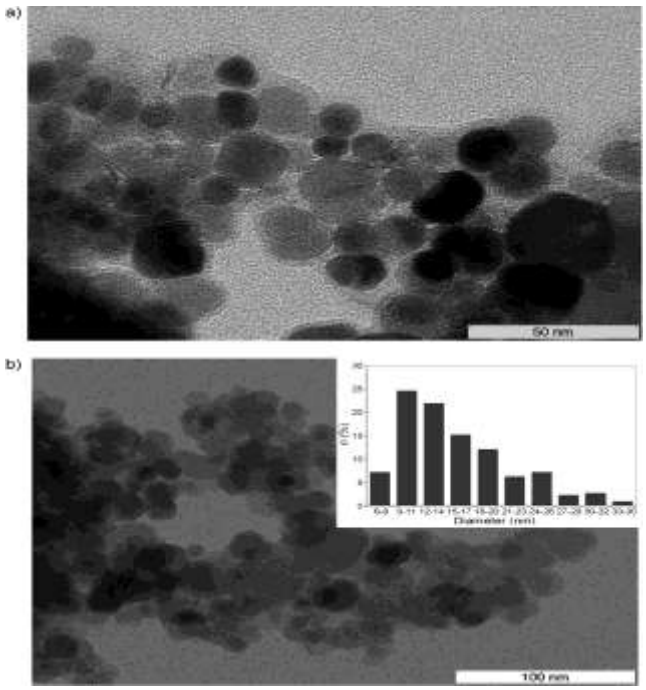


Fig.1.3 a) TEM images of Fe_3O_4Ni MNPs at different magnifications 50nm; b) 100nm showing particle size distribution; the corresponding histogram is superimposed onto image

CONCLUSION

We have reported a convenient, practical and an efficient method for the synthesis of 1-ethyl-4-phenyl-1H-1, 2, 3-triazole and 1, 4 dihydropyridine by using of Fe_3O_4-Ni MNPs by conventional and non-conventional method without use of solvent. This operationally simple procedure and provides a better scope than previously reported.

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Synthesis, antimicrobial and antimalarial activityof1, 4-benzothiazepine and pyrazolinederivatives incorporating carbazolemoiety

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A series ofcarbazole-based 1,4-benzothiazepine and pyrazoline derivatives weresynthesized and the structures of the newly synthesized compoundswere confirmed by FT-IR, ^{1}H NMR, ^{13}C NMR and mass spectral studies. All new derivatives **4(a-f)**and **5(a-e)**were screened for their*in vitro* antimicrobial activity, and also for their antimalarial activity.Compounds **4a, 4b, 4d, 5a, 5b** and **5c**exhibitedpromisingantimicrobial and antimalarial activities as compared to positive control. Notably, compounds **4a, 4b**and**4d**showedexcellent antifungal activity against *Penicillium sp.*comparable to that of a standard drug.

Key words: Carbazole, 1,4-Benzothiazepine,Pyrazoline,Antimicrobial andantimalarial activities

INTRODUCTION

A large number of natural and synthetic carbazole derivatives have been reported to exhibit diverse biological activities such as antimicrobial [1, 2], antiviral [3], antimalarial [4] and potential application as pharmacological agents [5, 6]. Recentlycarbazole-substitutedchalcone and its urea derivatives have been reported to exhibit antimicrobial, radical scavenger, cancer chemopreventive and polyphenol oxidase enzyme activities [7, 8]. Chalcones are also key precursors in the synthesis of many biologically important heterocyclic compounds such as benzothiazepines and pyrazolines.

Thiazepinesbelong to the important class of heterocyclic compoundsfor the synthesis of pharmaceutical agents, as well as biologically active compounds [9]. Benzothiazepinesplay an important role in drug discovery, as they show bioactivities such as anticonvulsant [10], endogenous natriuretic factors [11], potential central nervous system agents [12], antibiotics [13], antimicrobials [14], antihypertensive [15], antidiabetic [16] and cytotoxic agents [17].Novel carbazole assembled 1,4-thiazepine derivatives have been reported, which not only have significant antioxidant activities, but also exhibit remarkably selective cytotoxicity to carcinoma cell line HCT 116 [18]. Pyrazolines and their derivatives have been found to possess a wide spectrum of biological activities such as antimicrobial [19-22], antimalarial [23, 24], anti-inflammatory [25] and antioxidant [26].3-(substituted)-aryl-5-(9-methyl-3-carbazole)-1*H*-2-pyrazolines are reported as a novel class of anti-inflammatory and antioxidant agents [27], thus literature survey reveals that carbazole is a useful starting material for pharmacologically important products.

Therefore, in continuation of our efforts to synthesize biologically active heterocyclic compounds [28, 29], herein we report the synthesis of carbazole-containing 1,4-benzothiazepineand pyrazolinederivatives with their antimicrobial and antimalarial activities.

RESULTS AND DISCUSSION

Chemistry

In view of the emerging biological importance of carbazole, we synthesized a series of carbazolechalcones and its corresponding 1,4-benzothiazepine and pyrazolinederivatives from 3-formyl-9-ethyl carbazole**2** as shown in scheme1 on the hope of obtaining more antimicrobial and antimalarial agents. Thus, the starting compound 3-formyl-9-ethylcarbazole **2** was prepared byVilsmeier-Haack formylation of carbazole**1**. 3-formyl-9-ethylcarbazole **2** was obtainedbyClaisen-Schmidt condensation with various substituted 2-hydroxyacetophenones in ethanolic potassium hydroxide afforded carbazolechalcones**3.** The 1,4-benzothiazepine**4(a-f)**derivatives were synthesized by Michael addition of 2-aminothiophenol to carbazolechalcones**3**in acetic acid and ethanol. Carbazolepyrazolines**5(a-e)**were prepared from the compounds **3** on treatment with hydrazine hydrate in ethanol and acetic acid, the reaction most likely takes place through the intervention of an appropriate α,β-unsaturated hydrazone, which instantly cyclizes to give a pyrazoline ring, at reflux temperature cyclizing agent is acetic acid.

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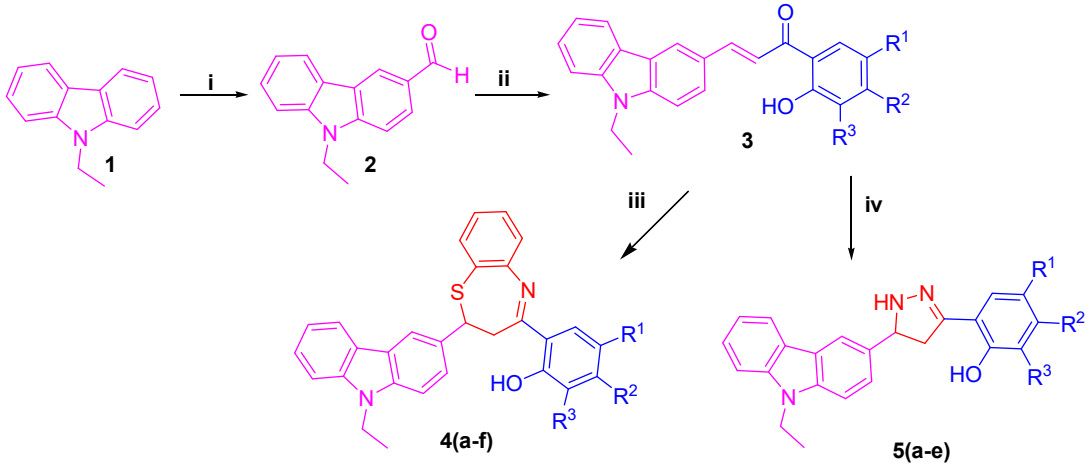

Scheme1. Reagents and conditions: (**i**) DMF, $POCl_3$, 80°C, 4h (**ii**) Substituted2-hydroxyacetophenones,KOH, EtOH, rt., 24-36 h. (**iii**) 2-Aminothiophenol, AcOH, EtOH, Reflux, 8h. (**iv**) $NH_2NH_2.H_2O$, EtOH, AcOH, reflux 6 h.

The structures of **4(a-f)** and **5(a-e)** were confirmed by FT-IR, ^1H and ^{13}C NMR, and mass spectroscopic technique.For example, the infrared spectra of compounds **4(a-f)** showed characteristic signals at 1688 and 3350cm^{-1} for C=N and hydroxyl group absorption, respectively.In general, three thiazepine protons of carbazole-based benzothiazepines showed similar patterns of signals in the^1H NMR spectra. They displayed a doublet of a doublet at C_{17} for two protons and a triplet at $C_{16}$for one proton. The methine proton at $C_{16}$of the thiazepine nucleus resonates at around δ 3.25 ppm as a triplet with coupling constant (*J*) of nearly 12.6 Hz. This signal is observed as a triplet instead of a doublet of a doublet because two *J*-values accidentally are the same and two inner lines of the quartet occur at the same point, appearing as a single line of double intensity [30]. The two methylene protons at C_{17}displayed two signals as a doublet of doublet at around δ3.45 ppm with coupling constantsof nearly 9.5 Hz and 3.8 Hz and a doublet of doublet at around δ5.16 ppm with coupling constants of nearly 9.4 Hz and 3.9 Hz. The ^{13}C NMR spectrum of compounds **4(a-f)** showedaromatic carbon signals in the region ofδ108.68-157.89 ppm. In the mass spectrum in all cases, peaks corresponding to molecular ions were observed which confirmed their molecular weights.

IR spectra of the compounds **5(a-e)** revealed a characteristic strong intensity band due to –OH and –NH stretching at 3668 and 3205 cm^{-1}respectively,whilea pyrazoline –C=N band was observed around 1614 cm^{-1}. The^1H NMR spectrum of these compounds exhibited an ABX pattern for the presence of two diastereotopic protons at C_{17} and one single proton at the C_{16} position. Asymmetric -CH proton displayed a triplet at δ 5.12 ppm with *J*=10.8 Hz,whereas the pro-chiral methylene (CH_2) protons appeared as two characteristic doublets of a doublet at δ 3.16 and 3.66 ppm with *J*=10.8 and 5.7 Hzwhich indicates the magnetic non-equivalence of the two protons. According to the high resolution mass spectrum (HRMS) of the representative compound **5a**calculated for $C_{23}H_{20}ON_3Cl_2$ $(M+H)^+$ws 424.0981, found 424.0978.

Antibacterial and antifungal evaluation

The synthesized carbazole-assembled 1,4-benzothiazepine**4(a-f)**and pyrazoline **5(a-e)**derivativeswere tested for their *in vitro* antimicrobial activity against two gram negative (*Escherichia coli, Pseudomonas putida*), two gram positive (*Bacillus subtilis, Streptococcus lactis*) bacterialstrains and three (*Aspergillus niger, Penicillium sp., Candida albicans*) fungal strains usingampicillin and greseofulvin as standard drugs, respectively.The inhibition zone diameters were measured in millimeters (mm)andminimal inhibitory concentration (MIC) was expressed as µg/mLof all synthesized compounds,the results obtained are enclosed in Table 1. Among the synthesized compounds, **4a**, **4b**, **4d**,**5a**, **5b** and **5c**could effectively inhibit the growth of most tested bacterial and fungal strains with considerable MIC (µg/mL) values. Carbazole-tethered 1,4-benzothiazepines **4(a-f)**, three derivatives**4a, 4b** and **4d** exhibited a significant activity against *P.putida* with MIC valuesof 50, 40 and 45 µg/mL, respectively as compared with positive control. Three compounds **4c, 4e** and **4f** also displayed moderate antibacterial activities (65-100 µg/mL) against all evaluated bacterial strains. Notably, compounds **4a**, **4b** and **4d** gave remarkable broader antifungal bioactive spectrum with MIC values in the range of 40-45 µg/mL against *Penicillium sp*. while two compounds **4c** and**4e**had satisfying activities against all screened fungal strains with

considerable MIC values. It was found that carbazole pyrazolines**5(a-e),** compounds **5a, 5b** and **5c**showed strong activities (45-65µg/mL) against gram positive *B. subtilis* and gram negative *P. putida* bacteria, while compounds **5d** and **5e** showedgood activities (70-110µg/mL) against allfour bacterial strains as compared with standard drug ampicillin. As for antifungal activities, compound**5a** exhibited significant activity against *Penicillium sp*. and *C. albicans*with MIC valuesof 55 and 60 µg/mL,respectively,while **5b**,**5c**, **5d** and **5e** showed moderate activities (70-100 µg/mL)against all testedfungal strainscompared to that of standard drug greseofulvin.

Antimalarial activity

The synthesized compounds **4** and **5**were also screened for their*in vitro* antimalarial activity against *Plasmodium falciparum*strain using chloroquine and quinine as reference drugs.The mean IC_{50}(µg/mL) values of the test compounds against the test microbe are presented in Table 2.The results revealed that the majority of the synthesized compounds showed significant degrees of inhibition against *P. falciparum* as compared with positive control quinine than that of chloroquine. Carbazole benzothiazepine derivatives **4(a-f)**, **4a** and **4b** showed moderate growth inhibition activities with IC_{50} values of 0.75 and 0.80 µg/mL as compared with standard drug quinine, while compounds **4c**, **4d**, **4e** and **4f** showed the lowest inhibition activities against *P. falciparum* comparable to that of reference compounds. The carbazole-pyrazoline derivatives **5(a-e)**, compound **5a** exhibiteda good antimalarial spectrum with IC_{50} value of 0.56 µg/mL as compared with standard drug quinine, the remaining four compounds **5b**, **5c**, **5d** and **5e**showed considerable inhibition activities withIC_{50} values in the range of 0.76-1.25 µg/mL.

CONCLUSION

As structure-activity relationships (SAR) of all compounds were taken into account, it was observed that compounds **4a, 4b**, **4d**, **5a**, **5b** and **5c**having electron withdrawing groups like chloro and bromo substituents on the phenyl ring showed excellent potential of antibacterial and antifungal activities. The antimalarial evaluation of **4(a-f)** and **5(a-e)**revealed that, as the electronegativity nature of the substituents attached to an aromatic ring decreased, activity also decreased. Two derivatives**4c**and **5d** containing electron releasing methyl and electron withdrawing chlorine groupattached to phenyl ring were able to display moderate growth inhibitory activity against all tested microorganisms. In addition, carbazole derivatives**4e**and **5e**containing methyl and methoxy group on the phenyl ring also inhibited thegrowth of the tested bacterial and fungal strains. Furthermore, compound**4f** without substituent in the phenyl ring showed the lowest activities against all tested bacterial, fungal and antimalarial strains. In general, all synthesized compounds **4** and **5** exhibited only moderate antimalarial activity IC_{50} values ranging 0.56-1.25 µg/mL.High potency and promising antimicrobial and antimalarial activity of the newly synthesized compounds **4(a-f)** and **5(a-e)**suggest that these compounds could serve as good leads for further optimization and development.

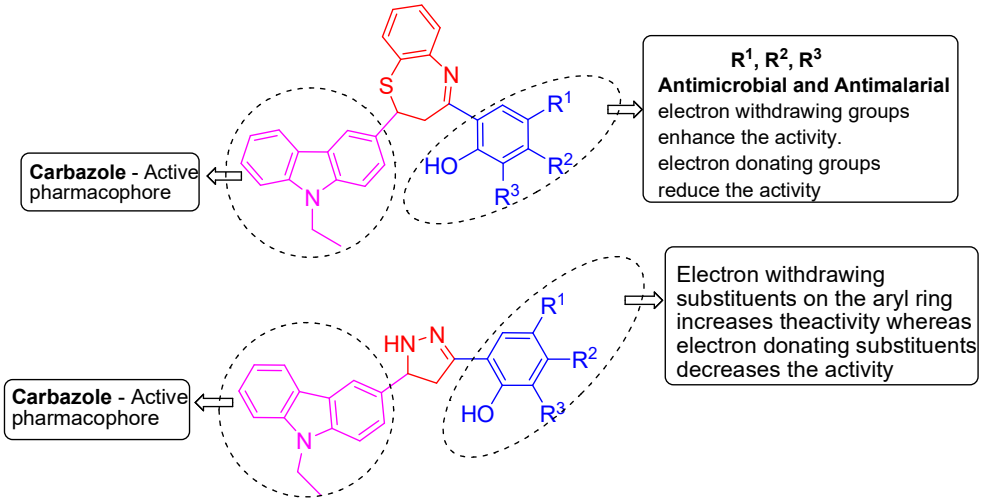

Figure 1. The structure- activity relationship in the target compounds

Table 1. Antimicrobial activities of the synthesized compounds **4** and **5** against pathological organisms expressed as:[a]inhibition zone diameter in millimeters (mm) and [b]MIC(µg/mL, between brackets)

Compounds	Microorganisms						
	Gram negative bacteria		Gram positive bacteria		Fungi		
	E. coli	*P. putida*	*B. subtilis*	*S. lactis*	*A. niger*	*Penicillium sp.*	*C. albicans*
4a	16(50)	18(50)	15(100)	20(110)	17(80)	14(45)	12(100)
4b	16(65)	17(40)	16(80)	16(80)	18(100)	14(40)	12(130)
4c	17(80)	16(65)	15(80)	19(100)	17(65)	13(100)	11(100)
4d	17(50)	18(45)	16(100)	15(110)	17(100)	14(40)	12(80)
4e	15(80)	14(80)	12(65)	17(80)	14(80)	11(80)	11(100)
4f	14(100)	13(80)	13(100)	13(100)	12(65)	12(80)	10(80)
5a	15(80)	16(45)	17(50)	18(45)	17(80)	12(55)	12(60)
5b	14(80)	16(50)	17(50)	16(50)	16(100)	12(70)	12(80)
5c	14(100)	15(65)	16(45)	14(65)	16(100)	11(90)	11(90)
5d	15(90)	14(80)	16(70)	18(80)	13(90)	11(100)	11(80)
5e	11(110)	12(100)	11(100)	15(80)	12(100)	09(100)	11(80)
Ampicillin	24(25)	20(25)	19(25)	22(25)	…	…	…
Greseofulvin	…	…	…	…	24(25)	14(25)	14(25)
Control (1% DMSO)	NA	NA	NA	NA	NA	NA	NA

[a]Inhibition zone diameters were measured for stock solutions (100µg/mL).NA- No activity
[b]Minimal inhibitory concentration (MIC) values. 1% DMSO was used as control.

Table 2. Substitution pattern and*in vitro* antimalarial activity of the target compounds **4** and **5**

Compounds	R^1	R^2	R^3	*P. falciparum* Mean IC_{50} (µg/mL)
4a	Cl	H	Cl	0.75
4b	Cl	H	H	0.80
4c	Cl	CH_3	H	0.85
4d	Br	H	H	0.90
4e	CH_3	H	H	1.10
4f	H	H	H	1.30
5a	Cl	Cl	H	0.56
5b	Cl	H	H	0.76
5c	Br	H	H	0.88
5d	Cl	CH_3	H	1.20
5e	H	OCH_3	H	1.25
Quinine	---	---	---	0.268
Chloroquine	---	---	---	0.020

EXPERIMENTAL

The recorded melting points were determined in an open capillary and are uncorrected. IR spectra were recorded on a PerkinElmer Fourier-transform infrared (FTIR) spectrophotometer with ATR. The ^{1}H NMRand ^{13}C NMR spectrawere recorded on a Bruker Avance II (400 MHz) and Bruker (125 MHz) spectrometer respectively, using TMS as internal standard.Mass spectra were recorded on a Waters, Q-Tof micromass spectrometer andhigh-resolution mass spectra (ESI) were recorded on a Thermo scientific Q-Exactive, Accela 1250 pump. The thin layer chromatography (TLC) was carried out on precoated silica gel aluminum plates to check compounds purity. Starting compound 9-ethyl-9*H*-carbazole is of Sigma Aldrich make.

In vitro antimicrobial assay

The antimicrobial activity was evaluated by the agar well diffusion method [31]. The activity was determined by measuring the diameter of inhibition zone (in mm). The samples of the tested compound concentrations (50 µL, 1mg /mL) were loaded into wells on the plates. All solutions were prepared in DMSO, and pure DMSO was loaded as a control. The plates were incubated at 37 ºC for 1-5 days and then were examined for the formation of inhibition zone. Each inhibition zone was measured three times to get an average value. The test was performed three times for each bacterium culture [32].

Minimal inhibitory concentration (MIC) measurement

The potato dextrose broths and microorganism susceptibility tests in nutrient media were used for the determination of MIC. Tested compounds stock 1000 µg/mL solutions, ampicillin and greseofulvin were prepared in DMSO followed by dilutions to 250-25 µg/mL concentrations. Inoculated microorganism suspensions were incubated at 37°C for 1-5 days for MIC determination.

Antimalarial activity

A stock solution of 5 mg/mL of each of the test samples, as well as standards was prepared in DMSO and subsequent dilutions were prepared with the culture medium. The diluted samples in 20 µL volumes were added to the test wells so as to obtain final concentrations (at five-fold dilutions) ranging between 0.4 and 100µg/mL in duplicate well containing parasitized cell preparation. The *in vitro* antimalarial assay was carried out in 96 well plates according to the micro assay protocol with minor modifications [33].The cultures of *P. falciparum*strain were maintained in a medium of RPMI 1640 supplemented with 25 mM HEPES, 1% D-glucose, 0.23% sodium bicarbonate and 10% heat-inactivated human serum. The asynchronous parasites of *P. falciparum* were synchronized after 5% D-sorbitol treatment to obtain only the ring stage parasitized cells. For carrying out the assay, an initial ring stage parasitaemia of 0.8-1.5% at 3% haematocrit in a total volume of 200 µL of medium RPMI-1640 was determined by Jaswant Singh Bhattacharya (JSB) staining[34]to assess the percent parasitaemia (rings) and uniformlymaintained with 50% RBCs (O^{+ve}). The culture plates were incubated at 37°C in a candle jar. After 36-40 h of incubation, thin blood smears from each well were prepared stained with JSB stain. The slides were microscopically observed to record maturation of the ring stage parasites into trophozoites and schizonts in the presence of different concentrations of the test agents. The test concentrations which inhibited the complete maturation in to schizonts were recorded as the minimum inhibitory concentrations (MIC). Chloroquine and quinine were used as the reference drugs.

General procedure for the synthesis of 3-formyl-9-ethylcarbazole(2)

9-ethyl carbazole **1** (1.95 g, 10 mmol) was dissolved in dry DMF (20 mL) under anhydrous conditions. It was cooled to 0°C, and $POCl_3$ (1.89 mL) was added dropwise and stirring continued for 4 h at 80°C. Completion of reaction was monitored by TLC.The reaction mass was poured over crushed ice, neutralized with $NaHCO_3$, the white colored precipitate was filtered off and purified through recrystallization using ethyl alcohol to afford compound **2.**

General procedure for the synthesis of benzothiazepine derivatives 4(a-f)

Chalcone **3** (2 mmol) was dissolved in a minimum quantity of ethanol. To this, 2-aminothiophenol (2 mmol) was added and the resulting reaction mixture was refluxed at 60–70 °C for 3 h. Then, the mixture was acidified with 5–6 drops of glacial acetic acid and heating was continued for further 4–5 h. After completion of the reaction (monitored by TLC), the reaction mixture was cooled and poured over crushed ice. The obtained solid was filtered and purified by recrystallization from methanol to afford compounds**4(a-f).**

*2,4-Dichloro-6-((E)-2-(9-ethyl-9H-carbazol-3-yl)-2,3-dihydrobenzo[b][1,4]thiazepin-4yl)phenol (**4a**):* Light yellow colored solid; Yield (69%);R_f = 0.54 (6% ethylacetate in n-hexane);m. p. 222-

223°C; IR $\tilde{\upsilon}_{max}$/ cm^{-1}: 3559 (OH), 2976 (CH), 1593 (C=N);^{1}H NMR ($CDCl_3$) δ / ppm: 1.42 (t, 3H, *J*=6.4 Hz, CH_3), 3.25 (t, 1H, *J*=12.5 Hz, thiazepine ring), 3.41 (dd, 1H, *J*=9.5 & 3.8 Hz, thiazepine ring), 4.40 (q, 2H, *J*=6.7 Hz, N-CH_2), 5.36 (dd, 1H, *J*=9.2 & 3.8 Hz, thiazepine ring), 7.22-7.30 (m, 2H, Ar-H), 7.35-7.42 (m, 3H, Ar-H), 7.48-7.55 (m, 4H, Ar-H), 7.70- 8.05 (m, 4H, Ar-H), 15.92 (s, 1H, Ar-OH);^{13}C NMR ($CDCl_3$) δ / ppm: 13.84, 37.68, 60.99, 108.68, 108.86, 117.85, 119.08, 119.54, 120.49, 122.40, 122.63, 122.97, 123.84, 124.00, 125.34, 125.74, 126.08, 126.62, 127.22, 130.09, 133.12, 133.56, 135.44, 139.71, 140.42, 147.48, 157.89, 172.25; MS (*m/z*):517$(M+H)^+$.

4-Chloro-2-((E)-2-(9-ethyl-9H-carbazol-3-yl)-2,3-dihydrobenzo[b][1,4]thiazepin-4-yl)phenol ***(4b)***: Light yellow colored solid;Yield (70%); R_f = 0.52 (6% ethylacetate in n-hexane);m. p. 226-228°C;IR $\tilde{\upsilon}_{max}$/ cm^{-1}: 3376 (OH), 3055 (CH), 1611(C=N);^{1}H NMR ($CDCl_3$) δ / ppm: 1.43 (t, 3H, *J*=7.0 Hz, CH_3), 3.24 (t, 1H, *J*=12.6 Hz, thiazepine ring), 3.42 (dd, 1H, *J*=8.8 & 4.5 Hz, thiazepine ring), 4.37 (q, 2H, *J*=7.0 Hz, N-CH_2), 5.32 (dd, 1H, *J*=8.2 & 4.4 Hz, thiazepine ring), 7.03 (m, 1H, Ar-H), 7.22-7.28 (m, 3H, Ar-H), 7.32-7.37 (m, 3H, Ar-H), 7.40-7.46 (m, 2H, Ar-H),7.51-7.53 (m, 2H, Ar-H), 7.69-8.06 (m, 3H, Ar-H), 14.63 (s, 1H, Ar-OH);^{13}C NMR ($CDCl_3$) δ / ppm: 14.19, 37.75, 60.80, 108.16, 108.60, 108.83, 109.25, 110.47, 119.80, 120.02, 120.76, 121.23, 122.10, 123.08, 123.31, 124.94, 126.04, 126.82, 127.48, 133.30, 137.03, 138.44, 140.98, 141.49, 142.39, 144.25, 145.45, 168.95, 169.25, 175.02;MS (*m/z*):483$(M+H)^+$.

4-Chloro-2-((E)-2-(9-ethyl-9H-carbazol-3-yl)-2,3-dihydrobenzo[b][1,4]thiazepin-4-yl)-5-methylphenol ***(4c)***: Light yellow colored solid; Yield (68%); R_f = 0.58 (6% ethylacetate in n-hexane);m. p. 196-197°C; IR $\tilde{\upsilon}_{max}$/ cm^{-1}: 3550 (OH), 2935 (CH), 1688 (C=N);^{1}H NMR ($CDCl_3$) δ / ppm: 1.48 (t, 3H, *J*=7.0 Hz, CH_3), 2.35 (s, 3H, Ar-CH_3), 3.20 (t, 1H, *J*=12.6 Hz, thiazepine ring), 3.44 (dd, 1H, *J*=8.8 & 4.5 Hz, thiazepine ring), 4.39 (q, 2H, *J*=7.0 Hz, N-CH_2), 5.30 (dd, 1H, *J*=7.8 & 4.4 Hz, thiazepine ring), 7.05 (m, 1H, Ar-H), 7.20-7.29 (m, 2H, Ar-H), 7.33-7.42 (m, 3H, Ar-H), 7.40-7.48 (m, 2H, Ar-H), 7.55-7.65 (m, 2H, Ar-H), 7.73-7.85 (m, 1H, Ar-H), 8.05-8,10 (m, 2H, Ar-H), 14.60 (s, 1H, Ar-OH);^{13}C NMR ($CDCl_3$) δ / ppm: 13.74, 37.50, 60.85, 108.66, 108.83, 117.77, 119.25, 119.58, 120.39, 122.55, 122.65, 122.90, 123.80, 124.10, 125.25, 125.72, 126.23, 126.68, 127.49, 130.08, 133.17, 133.47, 135.49, 139.75, 140.48, 147.40, 157.85, 170.85;MS (*m/z*):497$(M+H)^+$.

4-Bromo-2-((E)-2-(9-ethyl-9H-carbazol-3-yl)-2,3-dihydrobenzo[b][1,4]thiazepin-4-yl)phenol ***(4d)***: Light yellow colored solid; Yield (71%); R_f = 0.50 (6% ethylacetate in n-hexane);m. p. 188-189°C; IR $\tilde{\upsilon}_{max}$/ cm^{-1}: 3545 (OH), 2935 (CH), 1688 (C=N);^{1}H NMR ($CDCl_3$) δ / ppm: 1.45 (t, 3H, *J*=7.3 Hz, CH_3), 3.28 (t, 1H, *J*=12.3 Hz, thiazepine ring), 3.45 (dd, 1H, *J*=8.9 & 4.2 Hz, thiazepine ring), 4.32 (q, 2H, *J*=7.1 Hz, N-CH_2), 5.30 (dd, 1H, *J*=8.7 & 4.3 Hz, thiazepine ring), 7.05 (m, 1H, Ar-H), 7.20-7.29 (m, 3H, Ar-H), 7.34-7.38 (m, 3H, Ar-H), 7.43-7.49 (m, 2H, Ar-H),7.55-7.63 (m, 2H, Ar-H), 7.70-8.09 (m, 3H, Ar-H), 14.33 (s, 1H, Ar-OH);^{13}C NMR ($CDCl_3$) δ / ppm: 13.79, 37.59, 60.89, 108.62, 108.81, 117.88, 119.07, 119.52, 120.44, 122.47, 122.68, 122.92, 123.89, 124.09, 125.37, 125.72, 126.06, 126.63, 127.21, 130.08, 133.28, 133.59, 135.49, 139.72, 140.48, 147.41, 157.75, 172.85;MS (*m/z*):527$(M+H)^+$.

2-((E)-2-(9-ethyl-9H-carbazol-3-yl)-2,3-dihydrobenzo[b][1,4]thiazepin-4-yl)-4-methylphenol ***(4e)***:Light yellow colored solid; Yield (69%); R_f = 0.56 (6% ethylacetate in n-hexane);m. p. 215-216°C; IR $\tilde{\upsilon}_{max}$/ cm^{-1}: 3363 (OH), 2973 (CH), 1594 (C=N);^{1}H NMR ($CDCl_3$) δ / ppm: 1.44 (t, 3H, *J*=7.0 Hz, CH_3), 1.55 (s, 3H, Ar-CH_3), 3.23 (t, 1H, *J*=12.6 Hz, thiazepine ring), 3.42 (dd, 1H, *J*=8.8 & 4.5 Hz, thiazepine ring), 4.37 (q, 2H, *J*=7.0 Hz, N-CH_2), 5. 33 (dd, 1H, *J*=7.8 & 4.4 Hz, thiazepine ring), 7.01 (m, 1H, Ar-H), 7.25-7.27 (m, 3H, Ar-H), 7.32-7.40 (m, 3H, Ar-H), 7.42-7.44 (m, 2H, Ar-H), 7.45-7.51 (m, 2H, Ar-H), 7.53-7.70 (m, 1H, Ar-H), 8.02-8.06 (m, 2H, Ar-H), 14.59 (s, 1H, Ar-OH);^{13}C NMR ($CDCl_3$) δ / ppm: 13.78, 37.58, 60.87, 108.65, 108.80, 117.87, 119.04, 119.58, 120.49, 122.44, 122.67, 122.96, 123.88, 124.06, 125.39, 125.70, 126.03, 126.69, 127.29, 130.09, 133.27, 133.57, 135.48, 139.70, 140.44, 147.43, 157.72, 172.80;MS (*m/z*):463$(M+H)^+$.

2-((E)-2-(9-ethyl-9H-carbazol-3-yl)-2,3-dihydrobenzo[b][1,4]thiazepin-4-yl)phenol ***(4f)***: Light yellow colored solid; Yield (68%); R_f = 0.55 (6% ethylacetate in n-hexane);m. p. 226-227°C; IR $\tilde{\upsilon}_{max}$/ cm^{-1}: 3555 (OH), 2935 (CH), 1688 (C=N);^{1}H NMR ($CDCl_3$) δ / ppm: 1.28 (t, 3H, *J*=7.2 Hz, CH_3), 3.12 (t, 1H, *J*=12.8 Hz, thiazepine ring), 3.65 (dd, 1H, *J*=9.4 & 3.7 Hz, thiazepine ring), 4.41 (q, 2H, *J*=6.8 Hz, N-CH_2), 5. 45 (dd, 1H, *J*=9.4 & 3.9 Hz, thiazepine ring), 6.95-6.99 (m, 2H, Ar-H), 7.18 (m, 1H, Ar-H), 7.29 (m, 1H, Ar-H), 7.38-7.45 (m, 4H, Ar-H), 7.53-7.64 (m, 4H, Ar-H), 7.91 (m, 3H, Ar-H), 14.32 (s, 1H, Ar-OH); ^{13}C NMR ($CDCl_3$) δ / ppm: 13.74, 37.48, 60.92, 108.58, 108.83, 117.81, 119.06, 119.53, 120.45, 122.42, 122.67, 122.90, 123.80, 124.08, 125.35, 125.74, 126.07, 126.65, 127.20, 130.07, 133.10, 133.57, 135.46, 139.73, 140.47, 147.42, 157.80, 172.23;MS (*m/z*):449$(M+H)^+$.

General procedure for the synthesis of pyrazoline derivatives 5(a-e)

Chalcone**3** (2 mmol)was dissolved in ethanol (15 mL) under stirring. To this reaction mixture, 0.5 mL of hydrazine hydrate and 0.2 mL of acetic acid was added. The reaction mixture was heated at reflux temperature for 6 h. Completion of reaction was monitored by TLC. Thereaction mixture was cooled to room temperature. Then slowly 15 mL of cold water were added to the flask, the white solid obtained was washed with cold water several times.The crude compounds were recrystallizedfromethanol to afford the target compounds **5(a-e)**.

4,5-Dichloro-2-(5-(9-ethyl-9H-carbazol-3-yl)-4,5-dihydro-1H-pyrazol-3-yl)phenol 239 ***(5a)****:*White colored solid; Yield (65%); R_f = 0.48 (6% ethylacetate in n-hexane);m. p. 155-156°C; IR $\tilde{\upsilon}_{max}$/ cm^{-1}: 3668 (OH), 3205 (NH), 3051 (CH), 1614 (C=N); ^{1}H NMR ($CDCl_3$) δ / ppm: 1.36 (t, 3H, *J*=7.5 Hz, CH_3), 3.16 (dd, 1H, *J*=10.7 Hz &5.9 Hz, pyrazoline ring), 3.65 (dd, 1H, *J*=10.7&5.9 Hz, pyrazoline ring), 4.43 (q, 2H, *J*=7.5 Hz, N-CH_2), 5.12 (t, 1H, *J*=10.7 Hz, pyrazoline ring), 7.15-7.35 (m, 3H, Ar-H), 7.40-7.55 (m, 4H, Ar-H), 8.01 (m, 2H, Ar-H), 8.13 (m, 1H, NH), 12.02 (s, 1H, Ar-OH);^{13}C NMR ($CDCl_3$) δ / ppm: 13.82, 37.67, 41.70, 63.62, 108.67, 109.03, 118.25, 118.65, 119.10, 120.53, 122.05, 122.54, 123.22, 123.58, 123.77,125.48, 126.08, 129.85,131.72, 139.76, 140.76, 152.26; HRMS (ESI): calculated for $C_{23}H_{20}ON_3Cl_2$ $(M+H)^+$424.0981, found 424.0978.

4-Chloro-2-(5-(9-ethyl-9H-carbazol-3-yl)-4,5-dihydro-1H-pyrazol-3-yl)phenol ***(5b)****:*White colored solid; Yield (69%); R_f = 0.52 (6% ethylacetate in n-hexane);m. p. 141-142°C; IR $\tilde{\upsilon}_{max}$/ cm^{-1}: 3363 (OH), 3055 (NH), 2950 (CH), 1593 (C=N); ^{1}H NMR ($CDCl_3$) δ / ppm: 1.35 (t, 3H, *J*=8.5 Hz, CH_3), 3.18 (dd, 1H, *J*=12.5 Hz &6.5 Hz, pyrazoline ring), 3.69 (dd, 1H, *J*=12.5&6.5 Hz, pyrazoline ring), 4.45 (q, 2H, *J*=8.5 Hz, N-CH_2), 5.12 (t, 1H, *J*=12.5 Hz, pyrazoline ring), 7.16-7.29 (m, 2H, Ar-H), 7.41-7.48 (m, 3H, Ar-H), 7.50-7.55 (m, 2H, Ar-H), 8.10-8.23 (m, 4H, Ar-H, NH), 9.70 (s, 1H, Ar-OH);^{13}C NMR ($CDCl_3$) δ / ppm: 13.73, 37.98, 41.93, 62.96, 99.07, 108.61, 109.06, 111.14, 117.71, 118.38, 119.54, 120.78, 122.63, 123.74, 126.06, 126.57,127.26, 128.89, 131.43, 148.96, 154.79, 155.45, HRMS (ESI): calculated for $C_{23}H_{21}ON_3Cl$ $(M+H)^+$390.11856, found 390.11876.

4-Bromo-2-(5-(9-ethyl-9H-carbazol-3-yl)-4,5-dihydro-1H-pyrazol-3-yl)phenol ***(5c)****:*White colored solid; Yield (71%); R_f= 0.60 (6% ethylacetate in n-hexane);m. p. 183-184°C; IR $\tilde{\upsilon}_{max}$/ cm^{-1}: 3655 (OH), 3225 (NH), 3065 (CH), 1635 (C=N); ^{1}H NMR ($CDCl_3$) δ / ppm: 1.40 (t, 3H, *J*=7.5 Hz, CH_3), 3.12 (dd, 1H, *J*=10.7 Hz & 5.9 Hz, pyrazoline ring), 3.61 (dd, 1H, *J*=10.7& 5.9 Hz, pyrazoline ring), 4.44 (q, 2H, *J*=7.5 Hz, N-CH_2), 5.14 (t, 1H, *J*=10.7 Hz, pyrazoline ring), 7.11-7.35 (m, 4H, Ar-H), 7.48-7.75 (m, 4H, Ar-H), 8.10(m, 2H, Ar-H), 8.18 (m, 1H, NH), 12.10 (s, 1H, Ar-OH);^{13}C NMR ($CDCl_3$) δ / ppm: 14.82, 37.55, 41.68, 63.65, 108.77, 109.23, 118.25, 118.89, 119.63, 120.68, 122.45, 122.83, 123.26, 123.78, 123.89,125.69, 126.28, 129.79, 131.80, 139.76, 140.68, 154.10; HRMS (ESI): calculated for $C_{23}H_{21}ON_3Br$ $(M+H)^+$434.0478, found 434.0485.

4-Chloro-2-(5-(9-ethyl-9H-carbazol-3-yl)-4,5-dihydro-1H-pyrazol-3-yl)-5-methylphenol ***(5d)****:* White colored solid; Yield (67%); R_f = 0.46 (6% ethylacetate in n-hexane);m. p. 138-139°C; IR $\tilde{\upsilon}_{max}$/ cm^{-1}: 3650 (OH), 3238 (NH), 3029(CH), 1650 (C=N); ^{1}H NMR ($CDCl_3$) δ / ppm: 1.39 (t, 3H, *J*=7.5 Hz, CH_3), 2.30 (s, 3H, Ar-CH_3), 3.16 (dd, 1H, *J*=10.8 Hz & 5.9 Hz, pyrazoline ring), 3.67 (dd, 1H, *J*=10.8 & 5.9 Hz, pyrazoline ring), 4.45 (q, 2H, *J*=7.5 Hz, N-CH_2), 5.12 (t, 1H, *J*=10.8 Hz, pyrazoline ring), 7.24-7.40 (m, 3H, Ar-H), 7.51-7.75 (m, 4H, Ar-H), 8.10 (m, 2H, Ar-H), 8.25 (m, 1H, NH), 12.15 (s, 1H, Ar-OH);^{13}C NMR ($CDCl_3$) δ / ppm: 13.95, 37.55, 41.68, 63.69, 108.80, 109.23, 117.29, 118.78, 119.12, 120.68, 122.65, 122.83, 123.90, 124.80, 124.95,125.69, 126.78, 128.79, 131.80, 139.72, 140.68, 155.25; HRMS (ESI): calculated for $C_{24}H_{23}ON_3Cl$ $(M+H)^+$403.12514, found 403.12516.

2-(5-(9-Ethyl-9H-carbazol-3-yl)-4,5-dihydro-1H-pyrazol-3-yl)-5-methoxyphenol ***(5e)****:* White colored solid; Yield (68%); R_f = 0.55 (6% ethylacetate in n-hexane);m. p. 121-122°C; IR $\tilde{\upsilon}_{max}$/ cm^{-1}: 3325 (OH), 3056 (NH), 2973 (CH), 1678 (C=N); ^{1}H NMR ($CDCl_3$) δ / ppm: 1.36 (t, 3H, *J*=8.8 Hz, CH_3), 3.18 (dd, 1H, *J*=13.3 Hz &7.4 Hz, pyrazoline ring), 3.33 (s, 3H, Ar-OCH_3), 3.65 (dd, 1H, *J*=13.3 & 7.4 Hz, pyrazoline ring), 4.43 (q, 2H, *J*=8.8 Hz, N-CH_2), 5.14 (t, 1H, *J*=13.3 Hz, pyrazoline ring), 7.16-7.21 (m, 2H, Ar-H), 7.33-7.45 (m, 3H, Ar-H), 7.47-7.55 (m, 3H, Ar-H), 8.04-8.10 (m, 2H, ArH), 8.13 (s, 1H, NH), 12.00 (s, 1H, Ar-OH);^{13}C NMR ($CDCl_3$) δ / ppm: 13.96, 37.98, 44.77, 63.41, 68.08, 107.94, 110.03, 117.48, 120.24, 121.22, 122.10, 123.30, 123.76, 125.39, 125.61, 126.57,127.00, 128.47, 128.90, 129.35, 140.53, 141.95, 149.41, 157.31; HRMS (ESI): calculated for $C_{24}H_{24}O_2N_3$ $(M+H)^+$386. 1904, found 386.1908.

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240

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View supporting data here

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Synthesis and Antimicrobial Evaluation of Novel Carbazole Based β-diketones and its Pyrazole Derivatives

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Abstract: Novel 9-ethyl-9*H*-carbazole-3-carboxylic acid derivatives including ester, β-diketone and pyrazole were prepared and characterized by FT-IR, ^{1}H NMR, ^{13}C NMR and mass spectroscopic techniques. All synthesized compounds evaluated for their *in vitro* antimicrobial activities against four bacteria (*Escherichia coli, Pseudomonas putide, Bacillus subtilis,* and *Streptococcus lactis*) and three fungi (*Aspergillus niger, Penicillium sp* and *Candida albicans*). Among the compounds tested, **3a, 3b, 3c, 4a, 4b, 4c**, **5a** and **5b** exhibited pronounced antibacterial activity as compared with standard drug ampicillin. Notably, carbazole based pyrazole derivatives **5a** and **5b** showed potent antifungal activity against *C. albicans* comparable to reference drug greseofulvin.

Keywords: antimicrobial activity, carbazole, β-diketone, pyrazole.

INTRODUCTION

DISTINGUISHABLE interest of synthetic organic chemists have attracted considerable attention to carbazole frame because of its derivatives that can be easily reformed by introducing various functional groups.[1] These distinct characteristics results in the broad potential applications of carbazole-based derivatives as industrially and pharmacologically important products (Figure 1).[2] Many recent literatures have reported that carbazole derivatives exhibit a variety of biological activities such as antimicrobial,[3–5] antiviral,[6] anticancer,[7] anti-inflammatory,[8] antimala-rial,[9] antipsychotic[10] and are used in the treatment of obesity.[11]

The carbazole carboxylic acid derivatives are significant intermediate because the carboxylic group is one of the active functional group which display an important role in transformation of biological function, these compounds combining low toxicity with high antitumor activity.[12] Functionalized β-diketones are clinically important molecules showing antibacterial,[13] antiviral,[14] insecticidal,[15] antioxidant,[16] potential prophylactic antitumor[17] and pharmacophore of HIV-1 Integrase (IN) inhibitors.[18] The synthesis of β-diketones containing carbazole fragment and their complexes have already been reported, whereas β-diketone containing carbazole fragments still remain unknown, though such β-diketones should be very important and promising for use in optoelectronic materials.[19] β-diketones are important intermediates for the synthesis of medicinally important heterocycles such as pyrazole,[20,21] because of their derivatives represent one of the most active classes of compounds and possess a wide spectrum of biological activities.[22-24] Insight the literature, carbazole based pyrazole derivatives possesses potent antibacterial and antifungal activities.[25] In continuation of our studies in synthesizing various biologically active compounds,[26,27] in this study, we have synthesized and characterized the novel carbazole assembled esters, β-diketones and pyrazoles derivatives from 9-ethyl-9*H*-carbazole-3-carboxylic acid and evaluated for *in vitro* antibacterial and antifungal activities.

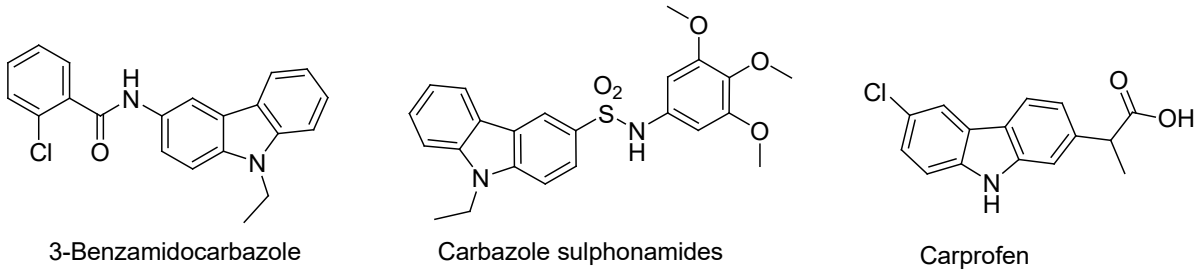


Figure 1. Biologically active synthetic carbazole derivatives.

RESULTS AND DISCUSSION

Chemistry

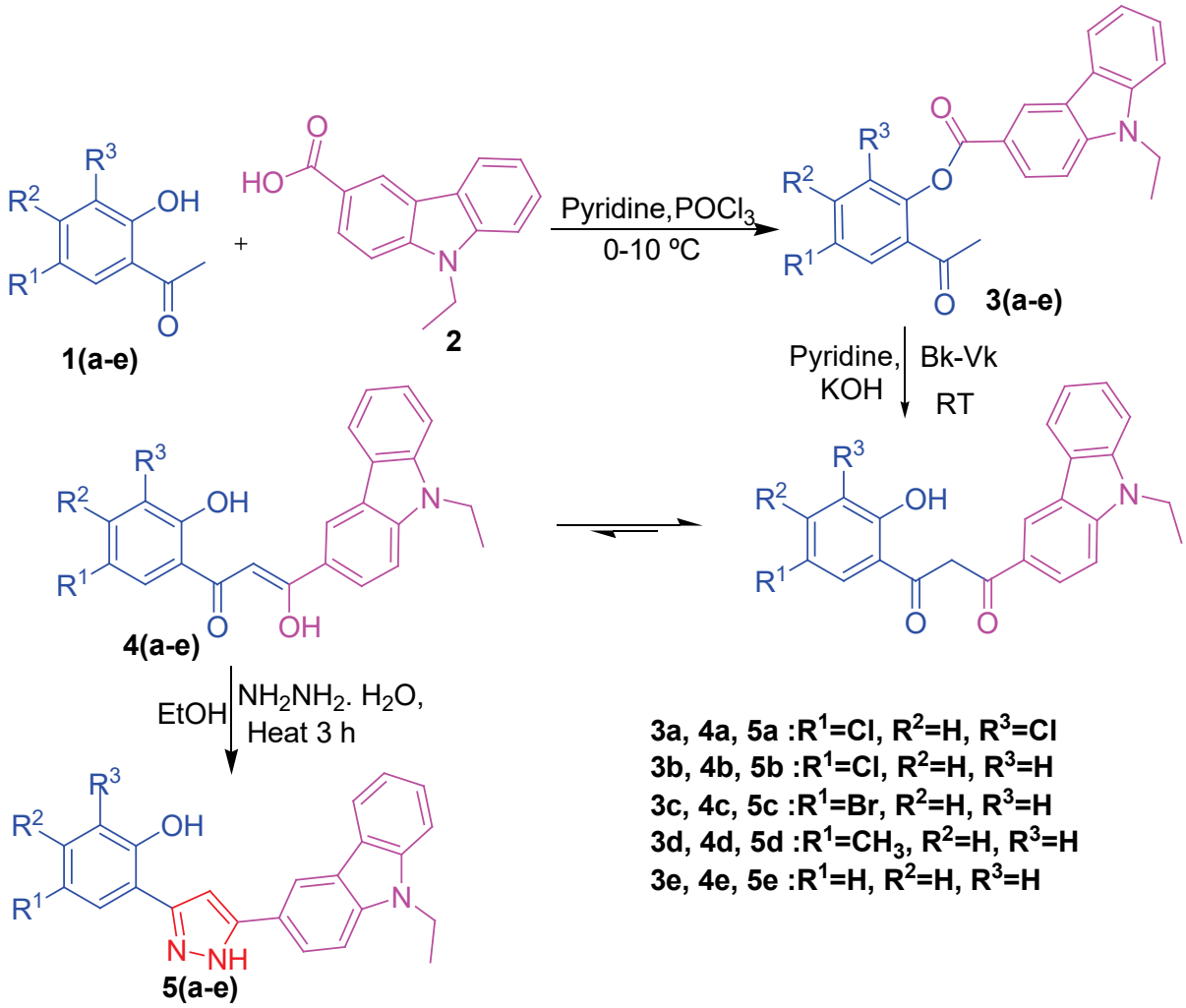
In view of the emerging biological importance of carbazole, it was of interest to synthesize some carbazole assembled esters, β-diketones and pyrazoles derivatives on the hope of obtaining more antimicrobial agents. Thus, starting compound, 9-ethyl-9*H*-carbazole-3-carboxylic acid **2** was prepared from oxidation of 9-ethyl-9*H*-carbazole-3-carbaldehyde by literature method.[28] In the present work 2-hydroxy acetophenones **1** were treated with 9-ethyl-9*H*-carbazole-3-carboxylic acid **2** in the presence of phosphorous oxychloride and pyridine to afford the corresponding esters **3(a-e)**. Carbazole esters **3(a-e)** treated with strong base like potassium hydroxide in the presence of pyridine bring an intramolecular Claisen condensation as per Baker-Venkataraman (Bk-Vk) transformation,[29–30] resulting in 1-(9-ethyl-9*H*-carbazol-3-yl)-3-(2-hydroxyphenyl) propane-1,3-dione **4(a-e)**. In the next step, cyclization of the β-diketones using hydrazine hydrate in ethanol at reflux temperature gave pyrazoles **5(a-e)** as shown in Scheme 1. The Baker-Venkataraman transformation proceeds via the formation of an enolate **3a** followed by an intramolecular acyl transfer Scheme 2.

The structures of **3(a-e)**, **4(a-e)** and **5(a-e)** were confirmed by FT-IR, ^{1}H and ^{13}C NMR, and mass spectra. For example, the infrared spectra of **3(a-e)** shows an intense absorption band at around 1735 cm^{-1} for –O–CO group occurs at higher frequencies than that of normal ketones because force constant of the carbonyl bond is increased by the electron attracting nature of adjacent oxygen atom and the ^{1}HNMR spectrum of **3a** contained characteristic singlet at δ 2.55 ppm for CO–CH$_3$ which confirmed the esterification of 9-ethyl-9*H*-carbazole-3-carboxylic acid **2**, aromatic protons resonated in the region δ 7.33–9.01 ppm. In the ^{13}C NMR spectra of **3(a-e)** showed aromatic carbon signals in the region of δ 108.47–145.59 ppm, whereas conjugated carbonyl ester appeared at δ 164.59 ppm and carbonyl carbon at δ 195.67 ppm. The mass spectrum of **3a** displayed a molecular ion peaks at *m/z* 426 [m+1], 427[m+2] and 429 [m+4] confirmed the compound **3a** contained two chlorine atoms.

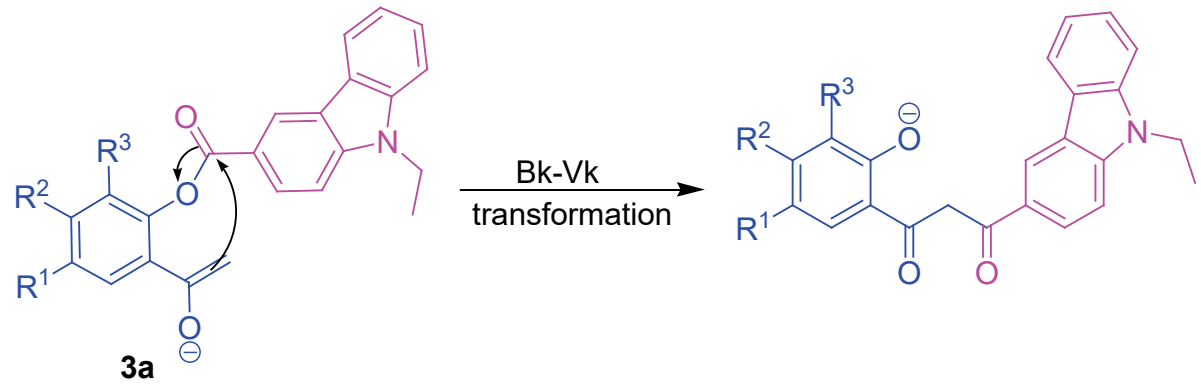
The infrared spectra of **4(a-e)** shows a strong and characteristic band for 1,3-diketone linkage at 1677–1590 cm^{-1} and 2979 cm^{-1} for –OH stretching. The representative ^{1}HNMR spectrum of **4b** shows disappearance of a singlet at around δ 2.55 ppm (corresponding to CO–CH$_3$) but it displayed two sharp singlets due to two protons at δ 16.27 ppm and δ 12.48 ppm, which confirm the presence of enolic proton (since enol form in β-diketone is more stable) and phenolic –OH adjacent to the carbonyl group respectively. ^{13}C NMR spectra showed a singlet at δ 203.07 ppm due to ketonic carbon and at δ 168.47 ppm due to enolic carbon confirming the keto-enol tautomerism in β-diketone **4b**. The negative test for ester, the presence of characteristic ^{1}HNMR and ^{13}C NMR peaks are consistent with the structure **4b** and aromatic carbon signals of compounds **4(a-e)** observed in the region of δ 109.25–142.53 ppm. The mass spectrum of **4b** displayed a molecular ion peak at *m/z* 392 [m+1]. The infrared spectrum of **5a** showed the appearance of absorption band at 3373, 3246 and 1455cm^{-1} corresponding to NH, OH and C=N functional group respectively. Also, its ^{1}HNMR spectrum supported its structure, as it revealed the pyrazole ring protons at δ 7.26 and two broad signals at δ 12.61 and 8.80 ppm assignable to OH and NH protons, respectively. The ^{13}C NMR spectrum of the compounds **5(a-e)** showed aromatic carbon signals in the region δ 109.20–140.25 ppm.

Antibacterial and Antifungal Evaluation

Antimicrobial activity of newly synthesized compounds **3**, **4** and **5** was evaluated against two gram negative (*E. coli, P. putide*), two gram positive (*B. subtilis, S. lactis*) bacterial strains, and three (*A. niger, Penicillium sp, C. albicans*) fungal strains using Ampicillin and Greseofulvin as a standard drugs respectively. The inhibition zone diameter (mm) and minimal inhibitory concentration (MIC) values of all synthesized compounds were noted in Table 1. Graphical representations Figure 2 and 3, inhibition zone diameter (mm) against a compound number (**3**, **4** and **5**), exhibiting moderate to a promising activity against tested



Scheme 1. Synthetic route of target compounds **3**, **4** and **5**.



Scheme 2. Mechanism of the Baker-Venkataraman (Bk-Vk) transformation.

bacterial and fungal strains as compared with standard drugs. It was found that compounds **3(a-d)**, **3a**, **3b** and **3c** gave stronger antibacterial efficacies and broader bioactive spectrum against *S. lactis,* and *B. subtilis* with the MIC

Table 1. Antimicrobial activities[a] of the synthesized compounds **3**, **4** and **5** against pathological organisms expressed as inhibition diameter zones in millimeters (mm) and [b] MIC (μg/mL, between brackets)

Compd.no	Microorganisms						
	Gram –ve bacteria		Gram +ve bacteria		Fungi		
	Escherichia coli	*Pseudomonas putide*	*Bacillus subtilis*	*Streptococcus lactis*	*Aspergillus niger*	*Penicillium sp*	*Candida albicans*
3a	14 (90)	12 (80)	16(40)	20(30)	18(80)	10(80)	11(45)
3b	18 (100)	15(90)	17(35)	20(30)	16(100)	10(100)	12(50)
3c	11(90)	14(80)	14(40)	18(40)	19(90)	11(55)	09(80)
3d	17(100)	18(75)	18(90)	17(80)	17(100)	12(90)	10(95)
3e	14(100)	12(100)	15(90)	18(100)	11(90)	11(100)	08(100)
4a	16 (100)	15(75)	14(80)	17(35)	12(90)	12(30)	09(85)
4b	12(90)	13(65)	12(80)	17(40)	17(80)	11(30)	12(90)
4c	11(100)	13(80)	14(90)	19(45)	13(100)	12(40)	11(80)
4d	12(110)	17(100)	11(100)	16(90)	12(100)	12(55)	NA
4e	16 (100)	14(100)	09(110)	15(100)	15(110)	11(80)	NA
5a	16(90)	13(45)	18(35)	21(45)	17(95)	10(85)	16(25)
5b	16(90)	16(55)	17(35)	21(50)	19(90)	10(90)	15(30)
5c	13(100)	14(90)	16(70)	19(100)	18(85)	11(100)	09(60)
5d	16(120)	18(100)	15(110)	15(90)	17(90)	12(90)	12(100)
5e	14 (110)	16(95)	15(110)	16(110)	11(100)	11(100)	11(90)
Ampicillin	24(25)	20(25)	19(25)	22(25)	-----	-----	-----
Greseofulvin	-----	-----	-----	-----	24(25)	14(25)	14(25)
Control (1%DMSO)	NA	NA	NA	NA	NA	NA	NA

[a] Inhibition zone diameters were measured for stock solutions (100μg/mL).

[b] Minimal inhibitory concentration (MIC) values. 1 % DMSO was used as control. NA- No activity.

values in the range (30–40 μg/mL) comparable to that of the positive control, also compounds **3d** and **3e** exhibit moderate to good inhibitory activities (75 and 90 μg/mL) against *P. putide* and *B. subtilis* bacterial strain respectively. Compounds **3a, 3b** and **3c** showed a broad spectrum of antifungal activities (45–55 μg/mL) against *C. albicans* and *Penicillium sp* as compared with standard drug greseofulvin. Among β-diketones **4(a-e)**, compounds **4a, 4b** and **4c** showed good inhibition activities (35–45 μg/mL) against *S. lactis* bacterial strains, remaining members could be able to prevent the growth of testing bacterial strains comparable to the standard drug ampicillin. Compounds **4a**, **4b, 4c 4d** and **4e** displayed significant inhibition activities with a MIC ≥ 30 μg/mL against all tested fungal strains, while compounds **4d** and **4e** are passive for *C. albicans* fungal strain. Carbazole based pyrazoles **5(a-e)**, compounds **5a** and **5b** shows remarkable antibacterial activity against tested pathogens namely *S. lactis, B. subtilis* and *P. putide* compared to standard drug ampicillin at lowest concentration ranging from (35–55 μg/mL) with nearly equipotent of inhibition zone, compounds **5d** and **5e** could not effectively inhibit the growth of all tested bacterial strains. Compounds **5a** and **5b** showed maximum antifungal activities with MIC value (25 and 30 μg/mL) against *C. albicans* as compared with commercial antibiotic greseofulvin. While most of the compounds **3, 4** and **5** were not satisfactorily inhibit the growth of *E. coli* bacterial strain as compared with positive control.

CONCLUSIONS

Novel 9-ethyl-9*H*-carbazole-3-carboxylic acid derivatives including ester, β-diketone and pyrazole were prepared investigated for their *in vitro* antimicrobial activities. Among the synthesized compounds, compounds **3a**, **3b**, **3c**, **4a**, **4b** and **4c** showed moderate to promising antimicrobial activities in comparison with standard drug. In addition to compounds **5a** and **5b** were identified as the most potent antibacterial and antifungal agents compared with reference compounds. As structure activity relationship

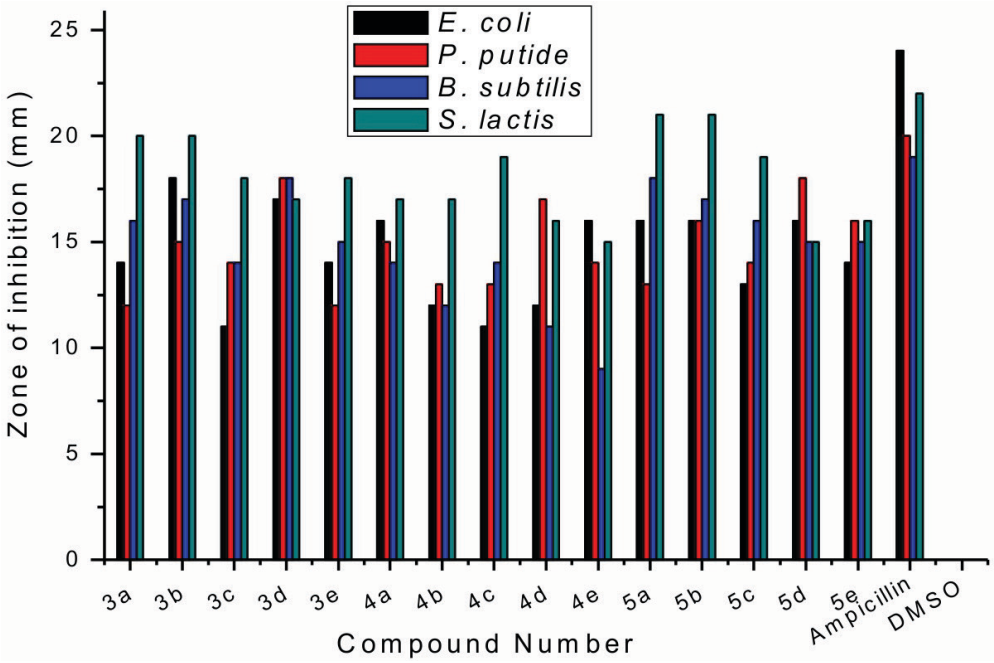


Figure 2. Antibacterial activities of the synthesized compounds **3**, **4** and **5**.

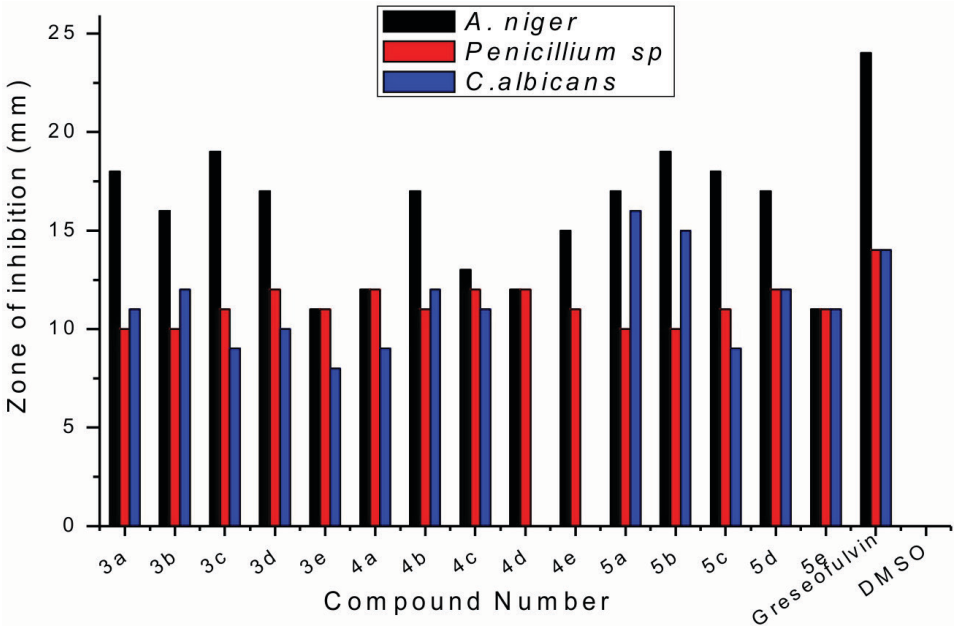


Figure 3. Antifungal activities of the synthesized compounds **3**, **4** and **5**.

(SAR) study of all compounds were taken into account, it was observed that the introduction of carbazole moiety to β-diketone, ester and pyrazole derivatives caused enriched activities against most test organisms. The results also suggested that the antimicrobial activities of the carbazole derivatives were distinctly influenced by the aromatic substituents. Compounds **3a**, **3b**, **3c**, **4a**, **4b**, **4c**, **5a**, **5b** and **5c** with electron withdrawing substituents (Cl and Br) in the

phenyl ring were more potent against most of the tested microorganisms than compounds with electron donating ones. Furthermore, compounds **3e**, **4e** and **5e** without substituent in the phenyl ring showed satisfactory activities against all tested bacterial and fungal strains. High potency and promising antimicrobial activity of newly synthesized compounds **3(a-e)**, **4(a-e)** and **5(a-e)** suggest that these compounds could serve as good leads for further optimization and development.

EXPERIMENTAL

The recorded melting points were determined in an open capillary and are uncorrected. IR spectra were recorded on Perkin Elmer Fourier-transform infrared (FTIR) spectrometer from KBr pellets. The ^{1}H NMR and ^{13}C NMR spectra were recorded on Bruker Avance II (400 MHz) and Bruker (125 MHz) spectrometer respectively, using TMS as internal standard. Mass spectra were recorded on a Waters, Q-TOF micromass, while HRMS were scanned on Bruker impact HD (ESI-Q-TOF) spectrophotometer. The thin layer chromatography (TLC) was carried out on precoated silica gel aluminum plates to check compound purity. The substituted 2-hydroxyacetophenones are commercially available.

In Vitro Antimicrobial Assay

The antimicrobial activity was evaluated by the agar well diffusion method. The activity was determined by measuring the diameter of inhibition zone (in mm). The samples of the tested compound concentrations (50µL, 1 mg/mL) were loaded into wells on the plates. All solutions were prepared in DMSO, and pure DMSO was loaded as a control. The plates were incubated at 37 ºC for 1-5 days and then were examined for the formation of inhibition zone. Each inhibition zone was measured three times to get an average value. The test was performed three times for each bacterium culture.[31]

Minimal Inhibitory Concentration (MIC) Measurement

The potato dextrose broths and microorganisms susceptibility tests in nutrient media were used for the determination of MIC. The tested compounds stock 1000 µg/mL solutions, Ampicillin and Greseofulvin were prepared in DMSO followed by dilutions to 250–25 µg/mL concentrations. Inoculated microorganism suspensions were incubated at 37 °C for 1-5 days for MIC determination.[31].

General Procedure for Esterification of Compounds 3(a-e)

A mixture of compound **1** (1.36 g, 10 mmol) and 9-ethyl-9*H*-carbazole-3-carboxylic acid **2** (2.3 g, 10 mmol) was dissolved in dry pyridine (10 mL). Cooled the flask in an ice bath and phosphorousoxychloride (1.53g, 10 mmol) was added dropwise with constant stirring while maintain the temperature between 0–10 °C. After complete addition of phosphorousoxychloride, the reaction mixture was kept overnight at room temperature, then poured over crushed ice and acidified using cold dilute HCl. The off white solid product obtained was filtered and washed with cold dill. $NaHCO_3$ solution followed by washing with cold water. Crude product was dried and recrystallized from ethanol to obtain the desired product in pure form **3(a-e)**, which gave a positive test for ester.

2-acetyl-4, 6-dichlorophenyl 9-ethyl-9*H*-carbazole-3-carboxylate (3a) Off white solid; Yield (73 %); R_f = 0.44 (6 % ethylacetate in *n*-hexane); m.p. 98–99 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1130 (C–Cl), 1199 (C–O), 1697 (C=O), 1731 (ester C=O); ^{1}H NMR ($CDCl_3$) δ/ppm: 1.48 (t, 3H, CH_3), 2.55 (s, 3H, $COCH_3$), 4.43 (q, 2H, N–CH_2), 7.33 (m, 1H, ArH), 7.51 (m, 3H, ArH), 7.66 (d, *J* = 2.5 Hz,1H, ArH), 7.74 (d, *J* = 2.5 Hz, 1H, ArH), 8.18 (d, *J* = 7.7 Hz, 1H, ArH), 8.35 (dd, *J* = 1.6 & *J* = 7.0 Hz, 1H, ArH), 9.01(d, *J* = 1.5 Hz, 1H, ArH); ^{13}C NMR ($CDCl_3$) δ/ppm: 13.84, 30.04, 37.95, 108.47, 109.10, 118.20, 120.32, 120.93, 122.96, 123.13, 124.23, 124.37, 126.78, 128.16, 128.39, 130.21, 131.90, 133.33, 134.67, 140.69, 143.42, 145.18, 164.59, 195.67; MS (*m*/*z*): 426 (M+H)$^+$. HRMS (ESI): calculated for $C_{23}H_{17}Cl_2NNaO_3$ (M+Na) 448.047769, found 448.0480.

2-acetyl-4-chlorophenyl 9-ethyl-9*H*-carbazole-3-carboxylate (3b) Off white solid; Yield (70 %); R_f = 0.49 (6 % ethylacetate in *n*-hexane); m.p. 112–113 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1131 (C–Cl), 1200 (C–O), 1687 (C=O), 1733 (ester C=O); ^{1}H NMR ($CDCl_3$) δ/ppm: 1.49 (t, 3H, CH_3), 2.56 (s, 3H, $COCH_3$), 4.45 (q, 2H, N-CH_2), 7.18–7.26 (m, 2H, ArH), 7.33–7.66 (m, 4H, ArH), 7.77–8.16 (m, 2H, ArH), 8.31–8.99 (m, 2H, ArH); ^{13}C NMR ($CDCl_3$) δ/ppm: 13.72, 30.28, 37.53, 108.16, 109.05, 118.16, 119.80, 120.03, 120.90, 122.63, 123.07, 124.49, 124.94, 126.59, 128.45, 128.90, 130.10, 131.96, 133.82, 134.27, 140.52, 143.15, 145.23, 174.46, 192.74; MS (*m*/*z*): 392 (M+H)$^+$. HRMS (ESI): calculated for $C_{23}H_{18}ClNNaO_3$ (M+Na) 414.086742, found 414.086845.

2-acetyl-4-bromophenyl 9-ethyl-9*H*-carbazole-3-carboxylate (3c) Off white solid; Yield (67 %); R_f = 0.42 (6% ethylacetate in n-hexane); m.p. 153–154 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1033 (C-Br), 1239 (C–O), 1697 (C=O), 1732 (ester C=O); ^{1}H NMR ($CDCl_3$) δ/ppm: 1.47 (t, 3H, CH_3), 2.62 (s, 3H, $COCH_3$), 4.42 (q, 2H, N-CH_2), 7.24-7.26 (m, 2H, ArH), 7.31-7.36 (m, 2H, ArH), 7.44-7.55 (m, 3H, ArH), 8.18–8.28 (m, 2H, ArH). 8.93 (s, 1H, ArH); ^{13}C NMR ($CDCl_3$) δ/ppm: 13.97, 33.09, 37.76, 106.98, 107.73, 108.84, 110.13, 119.35, 119.57, 120.25, 120.45, 120.47, 122.64, 123.08, 126.37, 127.48, 133.09, 138.90, 140.76, 143.37, 155.46, 158.07, 172.01, 191.85; MS (*m*/*z*): 436 (M+H)$^+$. HRMS(ESI): calculated for $C_{23}H_{18}BrNNaO_3$ (M+Na) 458.047012, found 458.047019.

2-acetyl-4-methylphenyl 9-ethyl-9*H*-carbazole-3-carboxylate (3d) Off white solid; Yield (70 %); R_f = 0.52 (6% ethylacetate in n-hexane); m.p. 138–139 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1033 (C–O), 1692 (C=O), 1731 (ester C=O); ^{1}H NMR ($CDCl_3$) δ/ppm: 1.49 (t, 3H, CH_3), 2.43 (s, 3H, Ar-CH_3), 2.55 (s, 3H, $COCH_3$), 4.44 (q, 2H, N–CH_2), 7.17–7.26 (m, 2H, ArH), 7.32–7.40 (m, 2H, ArH), 7.49–7.67 (m, 2H, ArH), 7.79–7.82 (m, 2H, ArH), 8.16 (m, 1H, ArH), 8.31 (m, 1H, ArH); ^{13}C NMR ($CDCl_3$) δ/ppm: 13.51, 20.98, 29.85, 37.98, 107.94, 108.62, 119.35, 119.80, 120.48, 123.06, 123.53, 123.97, 124.51, 126.07, 127.97, 130.31, 130.99, 133.53, 135.39, 140.54, 143.16, 147.33, 165.97, 198.35; MS (*m*/*z*): 372 (M+H)$^+$. HRMS(ESI): calculated for $C_{24}H_{21}NNaO_3$ (M+Na) 394.012145, found 394.012150.

2-acetylphenyl 9-ethyl-9*H*-carbazole-3-carboxylate (3e) Off white solid; Yield (69 %); R_f = 0.48 (6 % ethylacetate in n-hexane); m.p. 198–199 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1124 (C–O), 1626 (C=O), 1706 (ester C=O); ^{1}H NMR ($CDCl_3$) δ/ppm: 1.44 (t, 3H, CH_3), 2.53 (s, 3H, $COCH_3$), 4.45 (q, 2H, N-CH_2), 6.99–7.34 (m, 3H, ArH), 7.50–7.66 (m, 4H, ArH), 7.96–8.02 (m, 1H, ArH), 8.11–8.21 (m, 2H, ArH), 8.66-8.70 (m, 1H, Ar-H); ^{13}C NMR ($CDCl_3$) δ/ppm: 14.17, 21.64, 37.98, 109.79, 112.34, 115.63, 116.51, 119.98, 120.02, 121.44, 121.89, 122.13, 123.30, 125.16, 127.71, 127.93, 129.35, 134.49, 134.75, 139.84, 142.17, 156.42, MS (*m*/*z*): 358 (M+H)$^+$. HRMS(ESI): calculated for $C_{23}H_{19}NNaO_3$ (M+Na) 380.175794, found 380.175801.

General Procedure for the Synthesis of Compounds 4(a-e)

Aryl ester **3** (1.0 g, 3 mmol) was dissolved in dry pyridine (10 mL) and to this reaction mixture powdered potassium hydroxide (1.65 g, 3 mmol) was added with constant stirring. The reaction mixture was stirred at room temperature for 3 h. After completion of the reaction (monitored by TLC), the contents were poured over crushed ice and acidified with conc. HCl. The pale yellow colored solid product obtained was filtered and recrystallized from ethanol to get pure compounds **4(a-e)**, which gave a negative test for ester.

1-(3,5-dichloro-2-hydroxyphenyl)-3-hydroxy-3-(9-methyl-9*H*-carbazol-3-yl)prop-2-en-1-one (4a) Pale yellow colored solid; Yield (73 %); R_f = 0.51 (6 % ethylacetate in n-hexane); m.p. 168–170 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1155 (C–Cl), 1592 (C=O), 2976 (enol OH), 3065 (OH); ^{1}H NMR (DMSO-d_6) δ/ppm: 1.36 (t, 3H, CH_3), 4.50 (q, 2H, N–CH_2), 7.25 (m, 1H, =CH enol), 7.50–7.57 (m, 2H, ArH), 7.65–7.77 (m, 2H, ArH), 7.82-8.31 (m, 5H, ArH), 12.57 (s, 1H, OH), 16.89 (s, 1H, enolic H); ^{13}C NMR (DMSO-d_6) δ/ppm: 14.19, 37.71, 107.19, 108.84, 109.06, 110.04, 110.70, 115.41, 120.25, 120.48, 121.00, 121.65, 122.34, 122.53, 125.40, 126.36, 127.26, 129.13, 134.05, 139.86, 142.19, 145.45, 168.06; MS (*m*/*z*): 426 (M+H)$^+$. HRMS (ESI): calculated for $C_{23}H_{17}Cl_2NNaO_3$ (M+Na) 448.047769, found 448.047534.

1-(5-chloro-2-hydroxyphenyl)-3-(9-ethyl-*9H*-carbazol-3-yl)-3-hydroxyprop-2-en-1-one (4b) Pale yellow colored solid; Yield (68 %); R_f = 0.55 (6 % ethylacetate in n-hexane); m.p. 137–138 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1131(C–Cl), 1591 (C=O), 2979 (enol OH), 3065 (OH); ^{1}H NMR (DMSO-d_6) δ/ppm: 1.35 (t, 3H, CH_3), 4.52 (q, 2H, N–CH_2), 7.32 (m, 1H, =CH enol), 7.51–7.58 (m, 2H, ArH), 7.68–7.74 (m, 2H, ArH), 7.80 (m, 1H, ArH), 8.0 (m, 1H, ArH), 8.28-8.36 (m, 3H, ArH), 9.09 (m, 1H, ArH), 12.48 (s, 1H, OH), 16.27 (bs, 1H, enolic H); ^{13}C NMR (DMSO-d_6) δ/ppm: 14.16, 37.70, 109.26, 110.04, 110.55, 120.15, 120.49, 121.23, 121.57, 122.38, 122.73, 122.99, 123.34, 126.89, 127.51, 133.49, 138.59, 140.67, 142.54, 159.75, 168.47, 203.07; MS (*m*/*z*): 392 (M+H)$^+$. HRMS (ESI): calculated for $C_{23}H_{18}ClNNaO_3$ (M+Na) 414.086740, found 414.086855.

1-(5-bromo-2-hydroxyphenyl)-3-(9-ethyl-9*H*-carbazol-3-yl)-3-hydroxyprop-2-en-1-one (4c)

Pale yellow colored solid; Yield (63 %); R_f = 0.52 (6 % ethylacetate in n-hexane); m.p. 148–149 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1023 (C-Br), 1594 (C=O), 2975 (enol OH), 3327 (OH); ^{1}H NMR (DMSO-d_6) δ/ppm: 1.35 (t, 3H, CH_3), 4.52 (q, 2H, N-CH_2), 6.98 (m, 1H, =CH enol), 7.26-7.54 (m, 3H, ArH), 7.69-8.05 (m, 4H, ArH), 8.23-8.32 (m, 2H, ArH), 9.06 (m, 1H, ArH), 11.73 (s, 1H, OH), 12.61 (s, 1H, enolic H); ^{13}C NMR (DMSO-d_6) δ/ppm: 14.18, 37.76, 106.30, 109.05, 109.79, 110.92, 111.90, 119.36, 119.80, 120.99, 121.88, 123.08, 124.20, 124.95, 129.57, 133.30, 138.22, 140.53, 141.96, 147.77, 154.78, 164.32, 177.15; MS (*m*/*z*): 436 (M+H)$^+$. HRMS(ESI): calculated for $C_{23}H_{18}BrNNaO_3$ (M+Na) 458.046015, found 458.047019.

3-(9-ethyl-9*H*-carbazol-3-yl)-3-hydroxy-1-(2-hydroxy-5-methylphenyl)prop-2-en-1-one (4d)

Pale yellow colored solid; Yield (65 %); R_f = 0.49 (6 % ethylacetate in n-hexane); m.p. 116–117 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1594 (C=O), 3056 (enol OH), 3325 (OH); ^{1}H NMR (DMSO-d_6) δ/ppm: 1.35 (t, 3H, CH_3), 2.64 (s, 3H, Ar–CH_3), 4.50 (q, 2H, N–CH_2), 6.96 (m, 1H, =CH enol), 7.26–7.29 (m, 1H, ArH), 7.50–7.55 (m, 2H, ArH), 7.63–7.70 (m, 3H, ArH), 7.96–8.29 (m, 3H, ArH), 8.80 (m, 1H, ArH), 11.73 (s, 1H, OH), 12.61 (s, 1H, enolic H); ^{13}C NMR (DMSO-d_6) δ/ppm: 14.19, 28.66, 37.54, 108.39, 109.07, 109.59, 110.47, 110.70, 119.80, 120.76, 121.00, 122.86, 126.37, 127.48, 133.08, 137.77, 138.22, 139.64, 142.18, 147.10, 150.61, 159.40, 168.06, 203.08; MS (*m*/*z*): 372 (M+H)$^+$. HRMS(ESI): calculated for $C_{24}H_{21}NNaO_3$ (M+Na) 394.012145, found 394.012250.

3-(9-ethyl-9H-carbazol-3-yl)-3-hydroxy-1-(2-hydroxyphenyl)prop-2-en-1-one (4e)

Pale yellow colored solid; Yield (69 %); R_f = 0.56 (6 % ethylacetate in *n*-hexane); m.p. 134–135 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1677 (C=O), 3059 (enol OH), 3327 (OH); ^{1}H NMR (DMSO-d_6) δ/ppm: 1.35 (t, 3H, CH_3), 4.50 (q, 2H, N-CH_2), 6.88 (m, 1H, =CH enol), 7.27–7.55 (m, 2H, ArH), 7.65–7.70

(m, 2H, ArH), 7.80–7.89 (m, 2H, ArH), 8.06–8.32 (m, 2H, ArH), 8.77–8.85 (m, 2H, ArH), 8.97 (m, 1H, ArH), 11.26 (s, 1H, OH), 12.50 (s, 1H, enolic H); ^{13}C NMR (DMSO-d_6) δ/ppm: 14.19, 37.75, 109.28, 109.58, 110.47, 111.44, 120.47, 120.99, 121.66, 121.88, 122.11, 122.84, 123.30, 123.98, 124.95, 125.83, 126.59, 127.26, 127.71, 128.89, 131.96, 160.36, 168.95; MS (*m*/*z*): 358 $(M+H)^+$. HRMS(ESI): calculated for $C_{23}H_{19}NNaO_3$ (M+Na) 380.175694, found 380.175701.

General Procedure for the Synthesis of Compounds 5(a-e)

β-diketones **4** (0.35g, 1 mmol) was taken in ethanol (10 mL) and to this reaction mixture hydrazine hydrate (1.5g, 3 mmol) was added. The reaction mixture was heated under reflux for 3 h. After completion of the reaction (monitored by TLC) the contents were allowed to attain room temperature, then poured into crushed ice and acidified with glacial acetic acid. The brown colored solid product obtained was filtered and recrystallized from ethanol to get pure products **5(a-e)**.

2,4-dichloro-6-(5-(9-ethyl-9*H*-carbazol-3-yl)-1*H*-pyrazol-3-yl)phenol (5a)

Brown solid; Yield (72 %); R_f = 0.50 (7 % ethylacetate in *n*-hexane); m.p. 132–133 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1189 (C–Cl), 1455 (C=N), 3246 (NH), 3373 (OH); ^{1}H NMR (DMSO-d_6) δ/ppm: 1.35 (t, 3H, CH_3), 4.49 (q, 2H, N-CH_2), 7.26 (m, 1H, CH pyrazole), 7.50–7.54 (m, 3H, ArH), 7.66–7.70 (m, 3H, ArH), 7.94–8.29 (m, 3H, ArH), 8.80 (s, 1H, NH), 12.61 (s, 1H, OH); ^{13}C NMR (DMSO-d_6) δ/ppm: 13.86, 37.79, 98.96, 108.92, 109.20, 111.12, 117.86, 118.65, 118.94, 119.20, 119.55, 120.60, 122.58, 123.48, 126.03, 126.32, 126.52, 129.01, 131.82, 140.28, 140.50, 155.24; MS (*m*/*z*): 422 $(M+H)^+$. HRMS (ESI): calculated for $C_{23}H_{18}Cl_2N_3O$ $(M+H)^+$ 422.082144, found 422.082963.

4-chloro-2-(5-(9-ethyl-9*H*-carbazol-3-yl)-1*H*-pyrazol-3-yl) phenol (5b)

Brown solid; Yield (70 %); R_f = 0.52 (7 % ethylacetate in *n*-hexane); m.p. 178–179 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1026 (C–Cl), 1438 (C=N), 3050 (NH), 3385 (OH); ^{1}H NMR (DMSO-d_6) δ/ppm: 1.36 (t, 3H, CH_3), 4.54 (q, 2H, N–CH_2), 7.23–7.28 (m, 1H, CH pyrazole), 7.30–7.35 (m, 1H, ArH), 7.50–7.58 (m, 2H, ArH), 7.62–7.70 (m, 1H, ArH), 7.73–7.82 (m, 2H, ArH), 7.88–8.37 (m, 4H, ArH), 9.08 (s, 1H, NH), 12.46 (s, 1H, OH); ^{13}C NMR (DMSO-d_6) δ/ppm: 13.85, 37.92, 108.08, 108.97, 109.21, 113.63, 114.32, 119.93, 120.29, 120.67, 120.80, 120.92, 121.48, 122.64, 123.34, 124.70, 125.77, 126.18, 126.43, 127.00, 128.50, 140.64, 142.17, 181.64; MS (*m*/*z*): 388 $(M+H)^+$. HRMS (ESI): calculated for $C_{23}H_{19}ClN_3O$ $(M+H)^+$ 388.121116, found 388.121056.

4-bromo-2-(5-(9-ethyl-9*H*-carbazol-3-yl)-1*H*-pyrazol-3-yl) phenol (5c)

Brown solid; Yield (68 %); R_f = 0.48 (7 % ethylacetate in n-hexane); m.p. 143–144 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1055 (C–Br), 1451(C=N), 3052 (NH), 3327 (OH); ^{1}H NMR (DMSO-d_6) δ/ppm: 1.36 (t, 3H, CH_3), 4.51 (q, 2H, N–CH_2), 7.22 (m, 1H, CH pyrazole), 7.28–7.51 (m, 3H, ArH), 7.53–7.68 (m, 3H, ArH), 7.75–8.34 (m, 4H, ArH), 9.08 (s, 1H, NH), 12.34 (s, 1H, OH); ^{13}C NMR (DMSO-d_6) δ/ppm: 13.74, 37.53, 98.84, 108.83, 109.79, 111.90, 117.93, 118.15, 118.61, 119.10, 119.79, 120.25, 122.12, 123.31,123.77, 124.93, 125.83, 129.79, 131.42, 139.85, 140.19, 152.08; MS (*m*/*z*): 432 $(M+H)^+$. HRMS (ESI): calculated for $C_{23}H_{19}$ BrN_3O $(M+H)^+$ 432.141115, found 432.141156.

2-(5-(9-ethyl-9*H*-carbazol-3-yl)-1*H*-pyrazol-3-yl)-4-methylphenol (5d)

Brown solid; Yield (71 %); R_f = 0.56 (7 % ethylacetate in n-hexane); m.p. 123–124 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1439(C=N), 3054(NH), 3385 (OH); ^{1}H NMR (DMSO-d_6) δ/ppm: 1.49 (t, 3H, CH_3), 2.55 (s, 3H, Ar-CH_3), 4.44 (q, 2H, N–CH_2), 6.99 (m, 1H, CH pyrazole), 7.29–7.45 (m, 3H, ArH), 7.46–7.51 (m, 2H, ArH), 7.53–8.16 (m, 5H, ArH), 10.20 (s, 1H, NH), 10.91 (s, 1H, OH); ^{13}C NMR (DMSO-d_6) δ/ppm: 13.96, 28.84, 37.98, 83.18, 108.83, 109.28, 112.54, 117.04, 118.15, 118.60, 119.79, 121.21, 122.66, 123.30,125.16, 127.93, 128.45, 129.57, 134.75, 139.84, 142.85, 156.64, 168.06, 170.81; MS (*m*/*z*): 368 $(M+H)^+$. HRMS (ESI): calculated for $C_{24}H_{22}N_3O$ $(M+H)^+$ 368.101135, found 368.101179.

2-(5-(9-ethyl-9*H*-carbazol-3-yl)-1*H*-pyrazol-3-yl) phenol (5e)

Brown solid; Yield (69 %); R_f = 0.49 (7 % ethylacetate in n-hexane); m.p. 151–152 °C; IR (KBr) $\tilde{\nu}_{max}$/cm^{-1}: 1560 (C=N), 3363 (NH), 3676 (OH); ^{1}H NMR (DMSO-d_6) δ/ppm: 1.42 (t, 3H, CH_3), 4.48 (q, 2H, N–CH_2), 6.93 (m, 1H, CH pyrazole), 7.05 (m, 1H, ArH), 7.25–7.33 (m, 2H, ArH), 7.48–7.65 (m, 4H, ArH), 7.94-8.17 (m, 4H, Ar-H), 9.11(s, 1H, NH), 12.31 (s, 1H, OH); ^{13}C NMR (DMSO-d_6) δ/ppm: 13.96, 37.76, 98.62, 108.61, 109.80, 117.26, 118.60, 119.80, 120.99, 122.10, 123.08, 123.98, 125.61, 126.81, 127.92, 128.22, 129.10, 134.26, 139.41, 142.40, 151.50, 157.31; MS (*m*/*z*): 354 $(M+H)^+$. HRMS (ESI): calculated for $C_{23}H_{20}N_3O$ $(M+H)^+$ 354.112130, found 354.112190.

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Savitribai Phule Pune University
(formerly University of Pune)

Declaration of Result of the Doctor of Philosophy (Ph. D.)

Kadnor Vijay Annasaheb (कडनोर विजय अण्णासाहेब)
Mother's Name : Shakuntala (शकुंतला)

University has accepted thesis submitted by the above mentioned candidate for award of Ph.D., as per reports of referees and examiners of open defence of the thesis. Accordingly, it is hereby notified that, the above mentioned candidate is declared to have passed the examination of Ph. D. and has become eligible for the award of Ph. D. Degree.

RELEVANT DETAILS ARE AS UNDER:

1.	Faculty	:	Science & Technology
2.	Subject	:	Chemistry
3.	Title of the Thesis	:	"Synthesis of Some Bioactive Carbazole Derivatives and Their SAR Study."
4.	Place of Research	:	Department of Chemistry S. S. G. M. College, Kopargaon, Dist.: Ahmednagar- 423 601.
5.	Name and Address of the Guide	:	Dr. S. N. Shelke Department of Chemistry S. S. G. M. College, Kopargaon, Dist.: Ahmednagar- 423 601.
6.	Date of Registration	:	17th January, 2013
7.	Date of Re-Registration	:	17th January, 2018
8.	Date of Declaration of Result	:	13th November, 2019

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Ref. No.: ACSCS/HD/2018-19 **Date:** 25/06/2018

Memorandum of Understanding (MOU)
Co-operative Educational Agreement

Department of Marathi
Pravara Rural Education Society's
Arts, Commerce and Science College, Satral
Tal- Rahuri, Dist- Ahmednagar (PIN: 413711)
And
Akhil Bhartiya Shri Swami Samarth Gurupeeth, Trimbakeshwar
Dist- Nashik (Maharashtra), PIN: 422212
Reg. No.: F-7655/NSK

Are herewith undertaking Co-operative educational agreement as:

1. The agreement is valid from the academic Year **2018-2019 to 2022-2023**
2. 'Societal Development and Value-based Cultural Spiritual Center' will provide training regarding youth culture and social values. In today's fast paced era, children need to be inculcated with child culture, youth culture and social values right from childhood for their overall development. It has become the need of today to bring about the overall personality development of children by giving life to book knowledge with social oriented experiences, to prove students for progress by adding value culture, through the Marathi Department in collaboration with Akhil Bhartiya Shri Swami Samarth Gurupeeth, Trimbakeshwar.
3. 'Akhil Bhartiya Shri Swami Samarth Gurupeeth, Trimbakeshwar' will provide Certificates to participated students, teachers and interested local citizens.
4. There will be no economic burden on both the parties.
5. Agreement doesn't include any legal rights transfer from one party to another.

Objectives:

- To introduce values to children through medieval Marathi prose, verse literature.
- To inculcate social values in children in Bhakti and Seva Kendra and Camps in rural areas.
- Cultivation of moral and ideological values in every child through selective *Vachanamrut* of the five Bhakti sects.
- To develop understanding, appreciation, analysis and evaluation skills by developing an understanding of life through values.
- To study Marathi culture and Marathi identity.

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Ref. No.: ACSCS/HD/2023-24 **Date:** 26/06/2023

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Dist- Nashik (Maharashtra), PIN: 422212
Reg. No.: F-7655/NSK

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Loknete Dr. Balasaheb Vikhe Patil (Padma Bhushan Awardee)
Pravara Rural Education Society's
ARTS, COMMERCE AND SCIENCE COLLEGE,
SATRAL

Extension Activity

Title of the Extension Activity

"Value Education Classes for Social Development at a Spiritual Centre"

Organized by

DEPARTMENT OF MARATHI

In Collaboration with

Akhil Bhartiya Shri Swami Samarth Gurupeeth,
Trimbakeshwar, Dist- Nashik, Pin : 422212
Reg. No.: F-7655/NSK

Extension Activity

Conducted by

DEPARTMENT OF MARATHI

In Collaboration with

Akhil Bhartiya Shri Swami Samarth Gurupeeth, Trimbakeshwar
Dist- Nashik (Maharashtra), Pin: 422212, Reg. No.: F-7655/NSK

Title of the Extension Activity: "Value Education Classes for Social Development at a Spiritual Center"

Preamble of the activity:

In today's fast-paced era, it is necessary to inculcate moral values in children from an early age to ensure their overall development. This includes instilling childhood values, youth values, and social values. The educational background of students entering higher education is rooted in constructivism. There is a need to provide children with experiential, community-focused knowledge alongside theoretical knowledge to foster their holistic personality development. Integrating moral values with virtuous practices to prepare students for maturity has become essential. For the past six years, the Marathi Department of the college has successfully implemented the "Value Education Classes for Social Development at a Spiritual Centre" as a free social initiative in rural areas where devotion and service activities are conducted.

Objectives:

1. To introduce children to moral values through medieval Marathi prose and poetry literature.
2. To instil social values in children at devotion and service centres in rural areas.
3. To nurture ethical and intellectual values in each child through selected teachings from five devotional traditions.
4. To develop understanding, appreciation, analysis, and evaluation skills by fostering life-related values.
5. To study Marathi culture and identity.

The "Value Education Classes for Social Development at a Spiritual Center" are held every Sunday by the Marathi Department and its students at various spiritual service centers, including Shri Swami Samarth Seva and Spiritual Center Dhanore Panchkroshi, Loni, Kolhar Budruk, Kolhar Khurd, Rampur, Tulapur-Nimber, etc. Along with the curriculum, activities related to Indian culture such as recitation of hymns, mantras, shlokas, prayers, aarti, daily services, Indian culture, and Marathi identity, as well as linguistic, intellectual, and physical activities for the overall development of children are conducted.

H.O.D.
Department of Marathi
Arts,Commerce & Science College,Satral

Arts, Commerce & Science College ACSC SATRAL Tal. Rahuri, Dist. Ahmednagar

PRINCIPAL
Arts,Commerce and Science
College,Satral,Tal.Rahuri
Dist.Ahmednagar,413711

Extension Activity Report

Good conduct is not possible without values. To cultivate good character and behavior, it is the responsibility of every parent and teacher to instil values in children at the right age. Recognizing this, the Marathi Department at Satral College has been successfully running a free social development initiative, the "Value Education Classes for Social Development at a Spiritual Center," since 2018 in rural areas engaged in devotional and service activities. These classes introduce children to traditional values through medieval Marathi prose and poetry. Social values are instilled in children at rural devotional and service centers. Efforts are made to nurture ethical and intellectual values in children through selected teachings from five devotional traditions. By developing an understanding of life values through value education, children enhance their comprehension, appreciation, analytical, and evaluation skills. The teachings of Marathi culture and identity highlight the importance of ancient Indian culture.

The "Value Education Classes for Social Development at a Spiritual Center" are held every Sunday by the Marathi Department and its students at various spiritual service centers, including Shri Swami Samarth Seva and Spiritual Center Dhanore Panchkroshi, Loni, Kolhar Budruk, Kolhar Khurd, Rampur, Tulapur-Nimber, etc. These spiritual service centers host 210 children, teenagers, and young adults who participate in weekly value education courses. Alongside the curriculum, activities related to Indian culture, such as recitations of hymns, mantras, shlokas, prayers, aarti, daily services, as well as good thoughts, moral stories, festivals, and information on agriculture, environment, and health, are conducted. Linguistic, intellectual, and physical activities are included to foster the overall development of children.

Spiritual literature and spiritual service centers act as workshops that repair the mind, promoting thoughtful content that can easily bring about changes in societal mindsets and instill proper values in children, parents, and youth. Spirituality, as taught here, contributes to public education and social enlightenment, inculcating ethical and life values within family systems.

The value education classes conducted at spiritual centers reach out to children, parents, and youth, addressing human issues, transformation, enlightenment, and various aspects of nation-building through scientific criteria in simple, accessible language. These classes provide in-depth, substantiated, and relevant analysis on topics like religion, society, language, literature, art, culture, education, history, geography, science, justice, ethics, economics, medicine, and environment. Essentially, these value education classes are all-encompassing and interdisciplinary. Since transformation of thought is a key component of these classes, they challenge the intellect. The scope of childhood value classes extends beyond the spiritual center, touching all aspects of life, making it a movement. Therefore, the enlightenment from these classes addresses religious, individual, and modern value systems.

The primary goal of value education classes is societal transformation. New ideas consistent with human values are introduced. Efforts are made to reject ignorance, superstitions, and outdated unwanted traditions in favor of building a new society. Value education classes are held to bring about profound changes in social life. Given their focus on social and cultural elements, these classes comment on aspects related to people's lives. The inspiration of value education classes is to present logical, science-based thoughts that not only influence others but also compel them to act.

Outcomes:

1. Conducting value education classes at spiritual centers will enrich family systems and society.
2. Educational components of value education classes will enhance students' study habits and reading culture.
3. Value education classes can help eliminate irregular lifestyles, meaningless stress, bad company, unlimited expectations, and mobile addiction.

2

Event at a glance…

Prof. Dr. Navanath Shinde addressing on "Value Education Classes for Social Development at a Spiritual Centre"

Conducting Value Education Classes…

H.O.D.
Department of Marathi
Arts,Commerce & Science College,Satral

Arts, Commerce & Science College • ACSC SATRAL • Tal. Rahuri, Dist. Ahmednagar

PRINCIPAL
Arts,Commerce and Science
College,Satral,Tal.Rahuri
Dist.Ahmednagar,413711

3

Functional MoU Copies

***Shabdalaya Prakashan*, Shrirampur**
Post Box No. 90, Ward No. 7,
Shrirampur Dist.- Ahmednagar, PIN: 413709 , Maharashtra

Pravara Rural Education Society's
ARTS, COMMERCE & SCIENCE COLLEGE, SATRAL
Tal : Rahuri, Dist : Ahmednagar. Pin: 413 711
Savitribai Phule Pune University, Affiliated ID No. PU.A.N.ASC 057 1998
NAAC Accredited "B++" Grade with CGPA 2.87
☎- 02426- 275763 **Fax-02426 275763**
Web: - www.paravarasatralcollege.org. **Email ID :-** acscsatral@Rediffmail.com

Ref. No.: ACSCS/HD/2018-19 **Date:** 28/06/2018

Memorandum of Understanding (MOU)
Co-operative Educational Agreement

Department of Marathi
Pravara Rural Education Society's
Arts, Commerce and Science College, Satral
Tal- Rahuri, Dist- Ahmednagar (PIN: 413711)
And
Shabdalaya Prakashan, Shrirampur
Post Box No. 90, Ward No. 7, Shrirampur
Dist.- Ahmednagar, PIN: 413709 (M.S.), India

THIS AGREEMENT, is valid from the **Academic Year 2018-19 to 2022-23**, by and between Department of Marathi, Arts, Commerce and Science College, Satral, Tal: Rahuri, Dist: Ahmednagar (M.S.), India.

WITNESSETH THAT:

WHEREAS, Arts, Commerce and Science College, Satral, Tal- Rahuri, Dist.- Ahmednagar, PIN: 413711 (M.S.), India and **Shabdalaya Prakashan, Post Box No. 90, Ward No. 7, Shrirampur, Dist.- Ahmednagar, PIN: 413709 (M.S.), India** desire to promote the enrichment of their teaching-learning, Research and discovery and engagement missions; and

WHEREAS, Arts, Commerce and Science College, Satral, Tal- Rahuri, Dist.- Ahmednagar (M.S.), India and **Shabdalaya Prakashan, Shrirampur** desire to strengthen and expand the mutual contacts between the two organizations; and

WHEREAS Arts, Commerce and Science College, Satral, Tal- Rahuri, Dist.- Ahmednagar (M.S.), India and **Shabdalaya Prakashan, Shrirampur** desire to provide for a vibrant collaboration between the two organizations on the terms and conditions hereinafter set forth;

IN WITNESS THERE OF, Arts, Commerce and Science College, Satral, Tal- Rahuri, Dist.- Ahmednagar (M.S.), India and **Shabdalaya Prakashan, Shrirampur** have executed this Agreement as of the date first above written.

FOR,

Arts, Commerce and Science College,
Satral, Tal-Rahuri, Dist.-Ahmednagar
PIN: 413711 (M.S.), India

Dr. Sopan N. Shingote
PRINCIPAL
Art,Commerce & Science College
Satral,Tal.Rahuri,Dist.A'Nagar

AUTHORIZED SIGNATORY NAME:
(Dr. Sopan N. Shingote)

DESIGNATION: Principal
ACS College, Satral

Date: 28/06/2018

FOR,

Shabdalaya Prakashan,
Shrirampur, Dist.-Ahmednagar
PIN: 413709 (M.S.), India

(HON'BLE SUMATI LANDE)
शब्दालय प्रकाशन
गॉड गिफ्ट ७, आयडिया टॉवरच्या बाजूला
श्रीरामपूर ४१३ ७०९ जि. अहमदनगर

AUTHORIZED SIGNATORY NAME:
(Hon'ble Sumati Lande)

DESIGNATION: Senior Poet and Publisher
Shabdalaya Prakashan, Shrirampur

Date: 28/06/2018

NOW THEREFORE, it is mutually agreed as follows:

I. Scope of Agreement - The Agreement, shall include, but not be limited to, the following types of collaboration:

A. Seek mutual advice and support in planning and executing programs promoting excellence in respective areas of E-learning, e-content development and education.

B. Assist in Student, Teacher Training, and Student exchange Placement assistance.

C. Collaborative E-learning, e-content development, Learning and Teaching, and Engagement.

D. Encourage the faculty members and scholars of either institute to attend lectures, seminars, workshops and conferences in the respective areas of interest.

E. Share the library and literature facilities mutually by giving access to library and other resources of either institute to scholars/students/research personnel of other institute.

F. Other mutually agreed educational programs.

II. Definitions - As used herein the terms "host organization" and "home organization "shall have the following meanings

A. Host organization - the organization accepting the faculty member/scientist or student.

B. Home organization - the organization providing the faculty member/scientist or student.

Period of Agreement - This MOU shall remain in force for five years from the date of the last signature. Prior to the expiration date, this agreement may be reviewed for possible renewal for a further three-year period. Either party may terminate this MOU by providing 60 days advance written notice to the other party.

III. In this case, personnel already participating in the exchange shall serve out their terms under the conditions specified at the time of their appointment.

IV. Activities Under This Agreement – It is expected that activities taking place under this agreement will be initiated primarily in coordination with their respective administrative units concerned with such activities. All activities undertaken must conform to the policies and procedures in place at each institution.

V. Planning and Management of Activities- Both the institutions plan and the activities with mutual discussion and support.

VI. Funding of Activities- Activity Agreements should make financial costs and obligations explicit. Collaborating units are encouraged to work together to identify and secure any outside funding which may be needed. Projects requiring funding must be approved by both institutions.

VII. Limitation and Warranties:

- Each party shall ensure that the other is not put to any liability for any act of the respective party under this MoU.
- Each party represents that they have full power and authority to enter into this MOU in general.

VIII. Commercials:

The training, field visit shall be conducted at the host facility in a time bound manner as per availability and schedule at host facility.

IX. General:

- Both the parties may receive information proprietary to other party (the "Confidential Information") in the course of performance of their obligations under this MOU. Confidential Information not meant to include any information which (a) is publicly available; (b) is rightfully received by the parties from third parties without accompanying secrecy obligations; (c) is already in either party's possession and was lawfully received from sources other than the parties or (d) is independently developed by the parties. The two bodies understand and acknowledge that the Confidential Information is valuable and confidential an degrees that it will at all times be kept in trust, to be disclosed only to such persons as have a “need to know" the same for the effective implementation of this MOU and that it will only be used by the parties for the benefit of others.
- Both the parties understand and agrees that all written or other tangible data and documentation developed or procured by the other party in performing its obligations under this MOU, whether in printed or electronic form, belongs to other party and that other party will have all rights, title and interest therein.
- Both parties shall not use the name and brand of the other party in any advertisement or make any public announcement without the prior written approval of the other.
- Any and all disputes or differences arising out of or in connection with this MoU or its performance shall, so far as it is possible, be settled by negotiations between the Parties amicably through consultation & understanding.

Indemnification:

Both the parties shall indemnify and hold each other harmless from and against any claim, loss, liability, or expense, including, but not limited to, damages, patent and trademark infringement, costs and attorneys' fees, arising out of or in connection with any acts or omissions of their agents or employees.

I. **Non-discrimination – Arts, Commerce and Science College, Satral, Tal- Rahuri, Dist.- Ahmednagar (M.S.), India** and **Shabdalaya Prakashan, Post Box No. 90, Ward No. 7, Shrirampur** agree that no person shall on the grounds of race, colour, national origin, gender, sexual orientation, or creed be excluded from participation under the terms of this Agreement.

II. **Modification -** The terms of this Agreement may be changed or modified only by written amendment signed by authorized agents of the parties hereto.

FOR,
Arts, Commerce and Science College,
Satral, Tal-Rahuri, Dist.-Ahmednagar
PIN: 413711 (M.S.), India

Dr. Sopan N. Shingote
PRINCIPAL
Art,Commerce & Science College
Satral,Tal.Rahuri,Dist.A'Nagar

AUTHORIZED SIGNATORY NAME:
(Dr. Sopan N. Shingote)

DESIGNATION: Principal
ACS College, Satral

Date: 28/06/2018

FOR,
Shabdalaya Prakashan,
Shrirampur, Dist.-Ahmednagar
PIN: 413709 (M.S.), India

(HON'BLE SUMATI LANDE)
शब्दालय प्रकाशन
वॉर्ड नं ७, आयडिया टॉवरच्या बाजूला
श्रीरामपूर ४१३ ७०९ जि. अहमदनगर

AUTHORIZED SIGNATORY NAME:
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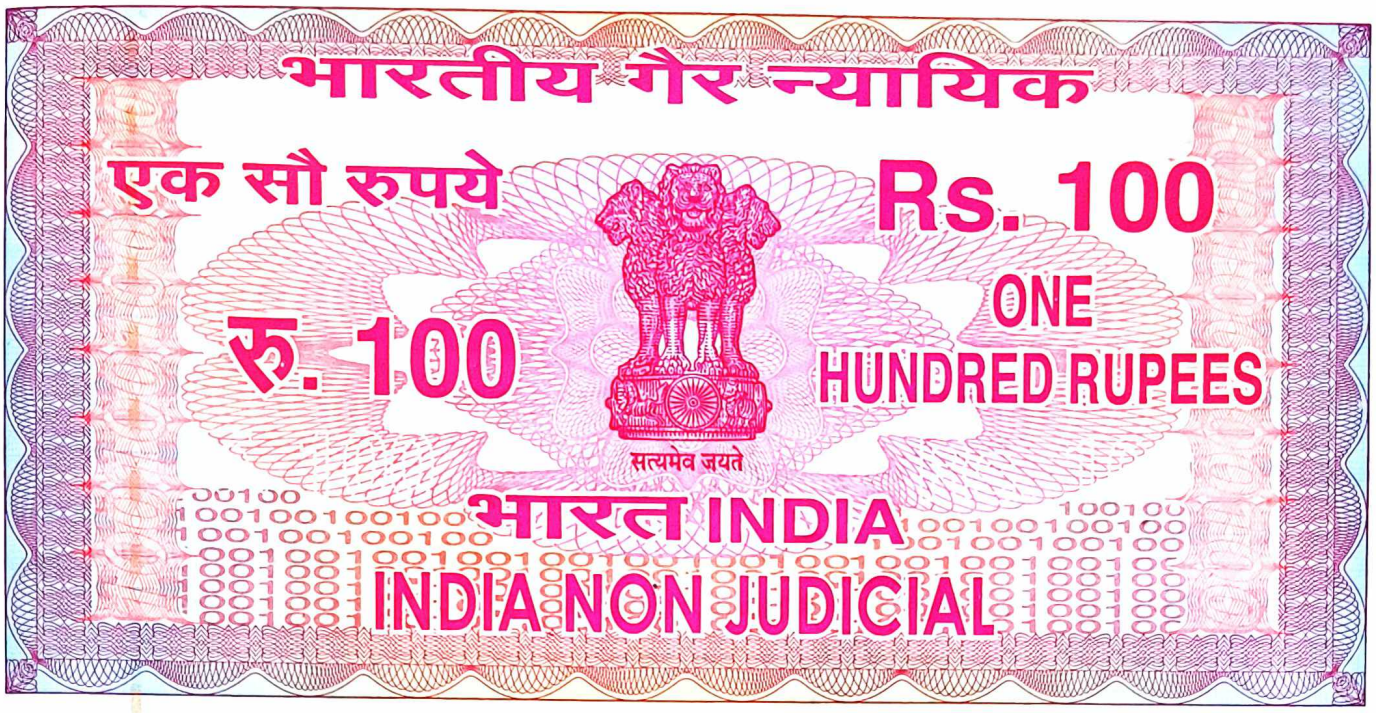
DESIGNATION: Senior Poet and Publisher
Shabdalaya Prakashan, Shrirampur

Date: 28/06/2018



महाराष्ट्र MAHARASHTRA ◑ 2022 ◑ 35AA 508556

उपकोषागार कार्यालय, राहाता
पु. दि.क

MEMORANDUM OF UNDERSTANDING

THIS AGREEMENT, entered into this 24th day of July 2023, by and between Department of Marathi, Arts, Commerce and Science College, Satral, Tal: Rahuri, Dist: Ahmednagar (M.S.), India.

WITNESSETH THAT:

WHEREAS, Arts, Commerce and Science College, Satral, Tal- Rahuri, Dist.- Ahmednagar, PIN: 413711 (M.S.), India and **Shabdalaya Prakashan, Post Box No. 90, Ward No. 7, Shrirampur** desire to promote the enrichment of their teaching-learning, Research and discovery and engagement missions; and

WHEREAS, Arts, Commerce and Science College, Satral, Tal- Rahuri, Dist.- Ahmednagar (M.S.), India and **Shabdalaya Prakashan, Shrirampur** desire to strengthen and expand the mutual contacts between the two organizations; and

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दस्ताचा प्रकार / अनुच्छेद क्रमांक
(Nature of Document /Article No.
दस्त नोंदणी करणार आहेत का ? — करारनामा
(Whether it is to be Registerd)
नोंदणी होणार असल्यास दुय्यम निबंधक कार्यालयाचे नाव —
(If Registrable Name of S.R.O.)
मिळकतीचे वर्णन
(Property Description in Brif) —
मोबदला रक्कम
(Consideration Amount) —
मुद्रांक विकत घेणाऱ्याचे नाव
(Stamp Purchaser's Name) प्राचार्य अँगर ड्रॅग सौ. साप
दुसऱ्या पक्षकाराचे नाव
(Name of Other Party)
हस्ते असल्यास त्यांचे नाव व पत्ता कला वाणिज्य व विज्ञान महाविद्यालय सातारा (मराठी विभाग)
(If thoough another person then Name & Add.)
मुद्रांक शुल्क रक्कम
(Stamp Duty Amount) ७०० /
मुद्रांक विक्री नोंद वही अनुक्रमांक / दिनांक
(Serial No. Date) ४९१२
मुद्रांक विकत घेणाऱ्याची सही
(Stamp Purchaser Sign / Date)

सौ.एस.आर.तागड
मुद्रांक विक्रेता
मु.वि.ला.नं.१४/९६ लोणी बु।।ता.राहाता

21 JUL 2023

(ज्या कारणासाठी ज्यांनी मुद्रांक खरेदी केला त्यांनी त्याच कारणासाठी मुद्रांक खरेदी केल्यापासुन ६ महिन्यात वापरणे बंधनकारक आहे)

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PIN: 413711 (M.S.), India

AUTHORIZED SIGNATORY NAME:
(PROF. DR. P. M. DONGARE)

Principal
Arts, Commerce and Science College, Satral
Tal- Rahuri, Dist- Ahmednagar- 413711

DESIGNATION: Principal
ACS College, Satral

Date: 24/07/2023

Arts, Commerce & Science College • Satral • Tal.Rahuri, Dist.A'Nagar

FOR
Shabdalaya Prakashan,
Shrirampur

AUTHORIZED SIGNATORY NAME:
(HON'BLE SUMATI LANDE)

शब्दालय प्रकाशन
गाँर्डन ७, आयडिया टॉवरच्या बाजूला
श्रीरामपूर ४१३ ७०९ जि अहमदनगर

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Date: 24/07/2023

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Art's,Commerce & Science College Tal.Rahuri, Dist.A'Nagar Satral

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Arts, Commerce and Science College,
Satral, Tal-Rahuri, Dist.-Ahmednagar
PIN: 413711 (M.S.), India

AUTHORIZED SIGNATORY NAME:
(PROF. DR. P. M. DONGARE)
Principal
Arts, Commerce and Science College,Satral
Tal- Rahuri, Dist- Ahmednagar- 413711

DESIGNATION: Principal
ACS College, Satral

Date: 24/07/2023

Arts,Commerce & Science College Tal.Rahuri, Dist.A'Nagar Satral

FOR
Shabdalaya Prakashan,
Shrirampur

AUTHORIZED SIGNATORY NAME:
(HON'BLE SUMATI LANDE)
शब्दालय प्रकाशन
गॉर्डन ७, आयडिया टॉवरच्या बाजूला
श्रीरामपूर ४१३ ७०९ जि अहमदनगर

DESIGNATION: Senior Poet and Publisher
Shabdalaya Prakashan, Shrirampur

Date: 24/07/2023

Translation Version of the Report - **Marathi Language Day**

2018-2019

Under the Savitribai Phule Pune University, Student Development Board, the Marathi Department of the college organized Marathi Language Day on Monday, 27th February 2019. The initiative included the event "Authors Meet," which emphasized the essence of literature through storytelling, novels, and poetry. Poetry reflects life experiences in a rhythmic blend and ceases where its narrative ends. Poetry isn't about recounting life stories or autobiographies. Currently, the market is flooded with poets and poetry. Friends, writing is not subservient to anyone. Poetry is not a platform for convenient truths, as expressed by Professor A. G. Suryavanshi.

The joint initiative by Savitribai Phule Pune University, Student Development Board, and the Loknete Padma Bhushan Dr. Balasaheb Vikhe Patil Pravara Rural Education Institute's Arts, Commerce, and Science College at Satral included celebrating Marathi Language Day with a student poets' meet, commemorating the birth anniversary of Kusumagraj. During this event, Dr. Sopanrao Shingote emphasized that Marathi, the official language of Maharashtra, was enriched by the eternal thoughts of Saint Dnyaneshwar, creating a spiritual democracy. He stressed the pride in our mother tongue and its literature. The event was attended by Vice-Principals Dr. Jayshree Singar and Dr. Deepak Gholap. Presidential remarks were presented by Ms. Sunita Namdev Ponde, and the proposal was approved by Ms. Pratiksha Vitthal Gagre. Coordinator Prof. Dr. Navnath Shinde gave the introductory speech. Student poets included Ms. Poonam Laxman Gagre, Ms. Aarti Gavade, Ms. Shubhangi Devidas Shirsat, Ms. Priyanka Sambare, and Dr. Anant Kedare. Dr. Gangaram Vaditke offered the vote of thanks, and the program was hosted by Prof. Latika Pandure.

Principal
Arts, Commerce and Science College,Satral
Tal- Rahuri, Dist- Ahmednagar- 413711

लोकनेते डॉ. बाळासाहेब विखे पाटील (पद्मभूषण उपाधीने सन्मानित)
प्रवरा ग्रामीण शिक्षण संस्थेचे,
कला, वाणिज्य व विज्ञान महाविद्यालय, सात्रळ
ता . राहुरी, जि. अहमदनगर. पिन: ४१३७११
फोन नं : (०२४२६)२७५७६३/६४

शब्दालय प्रकाशन, श्रीरामपूर
आणि
मराठी विभाग
यांच्या संयुक्त विद्यमाने

दि.२७/०२/२०१९ रोजी सकाळी ठीक ९०.०० वाजता आयोजित

मराठी भाषा गौरव दिवस

विभागीय उपक्रम अहवाल
(Department Activity Report)

समन्वयक
डॉ. नवनाथ अंगद शिंदे
सहयोगी प्राध्यापक व मराठी विभागप्रमुख,
कला, वाणिज्य व विज्ञान महाविद्यालय, सात्रळ

डॉ. गंगाराम कोंडीराम वडितके
सहाय्यक प्राध्यापक, मराठी विभाग

डॉ- गंगाराम वडीतके
मराठी विभाग प्रमुख
कला ,वाणिज्य व विज्ञान महाविद्यालय सात्रळ
ता- राहुरी, जि- अहमदनगर.
दि-२१/०२/२०१९.

प्रति -
मा. प्राचार्य ,
प्रवरा ग्रामीण शिक्षण संस्थेचे,
कला, वाणिज्य व विज्ञान महाविद्यालय सात्रळ.

विषय-मराठी भाषा गौरव दिवस घेण्यास परवानगी मिळणेबाबत-

महोदय ,

वरील विषयानुसार आपल्या महाविद्यालयामध्ये दिनांक २७ /२/ २०१९. रोजी सकाळी ठीक १०.०० वाजता मराठी भाषा गौरव दिन साजरा करावयाचा आहे. या कार्यक्रमासाठी प्रमुख पाहुणे प्राध्यापक ए. जी सूर्यवंशी यांना आमंत्रित करण्यात येणार आहे. तरी या कार्यक्रमासाठी आपण मान्यता द्यावी ही विनंती.

आपला विश्वासू.

विभाग प्रमुख
मराठी विभाग
कला,वाणिज्य व विज्ञान महाविद्यालय,सात्रळ
ता.राहुरी.जि.अहमदनगर-४१३७११

Yes
21.02.19

LOKNETE DR. BALASAHEB VIKHE PATIL (PADMA BHUSHAN AWARDEE)PRAVARA RURAL EDUCATION SOCIETY'S

Pravara Rural Education Society's,

ARTS, COMMERCE & SCIENCE COLLEGE SATRAL

Tal- Rahuri, Dist- A.nagar-413 711, Maharashtra (INDIA)

SavitribaiPhule Pune University, Affiliated ID No. PU.A.N.ASC 057 1998

Phone No.☎:02426- 275763(☎) : 02426- 275764

Web: http://pravaracollege.in/ASC_Satral/Email :acscsatral@rediffmail.com

NAAC Accredited "B++" Grade with CGPA 2.78

Ref.No./ACS/Satral/२०१८-१९/HP.17 दि- 23102120१९

प्रति :
प्राध्यापक .ए .जी .सूर्यवंशी .
राज्यशास्त्र विभाग ,
कला, वाणिज्य व विज्ञान महाविद्यालय सात्रळ,
ता- राहुरी, जि- अहमदनगर .

विषय -मराठी भाषा गौरव दिन समारंभासाठी प्रमुख पाहुणे म्हणून उपस्थित राहणे बाबत-

महोदय ,
आमच्या महाविद्यालयामध्ये मराठी भाषा गौरव दिन दिनांक २७/ ०२/ २०१९ रोजी सकाळी ठीक -११.०० वाजता घेण्यात येणार आहे. तरी आपण प्रमुख अतिथी म्हणून उपस्थित राहून आमच्या विद्यार्थ्यांना मार्गदर्शन करावे ही विनंती .

धन्यवाद -

प्राचार्य
कला वाणिज्य व विज्ञान महाविद्यालय
सात्रळ ता.राहुरी,जि.अहमदनगर

O/C
24.2.19.

LOKNETE DR. BALASAHEB VIKHE PATIL (PADMA BHUSHAN AWARDEE)PRAVARA RURAL EDUCATION SOCIETY'S

Pravara Rural Education Society's,

ARTS, COMMERCE & SCIENCE COLLEGE SATRAL

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Ref.No./ACS/Satral/२०१८-१९/

दि-23/02/2019.

सूचना
मराठी विभाग

महाविद्यालयातील कला, वाणिज्य व विज्ञान या शाखेतील सर्व विद्यार्थ्यांना सुचित करण्यात येते की ,बुधवार दिनांक २७/ ०२ /२०१९ रोजी ठीक सकाळी -११.०० वाजता **मराठी भाषा गौरव दिन** या कार्यक्रमाचे आयोजन करण्यात आलेले आहे .सर्व विद्यार्थ्यांनी सेमिनार हॉलमध्ये उपस्थित रहावे.

प्राचार्य
कला वाणिज्य व विज्ञान महाविद्यालय
सात्रळ ता.राहुरी,जि.अहमदनगर

LOKNETE DR. BALASAHEB VIKHE PATIL (PADMA BHUSHAN AWARDEE)PRAVARA RURAL EDUCATION SOCIETY'S

Pravara Rural Education Society's,

ARTS, COMMERCE & SCIENCE COLLEGE SATRAL

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SavitribaiPhule Pune University, Affiliated ID No. PU.A.N.ASC 057 1998

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NAAC Accredited "B++" Grade with CGPA 2.78

Ref.No./ACS/Satral/२०१८-१९/

दि- 23/02/2019

सूचना

मराठी विभाग

महाविद्यालयातील सर्व प्राध्यापक व प्राध्यापके तर कर्मचारी यांना कळविण्यात येते की मराठी भाषा गौरव दिन बुधवार दिनांक २७/ ०२ /२०१९ रोजी सकाळी ठीक -११.०० वाजता मराठी भाषा गौरव दिवस आयोजित करण्यात आलेला आहे. या कार्यक्रमासाठी प्रमुख पाहुणे प्राध्यापक ए. जी सूर्यवंशी उपस्थित राहणार आहेत. महाविद्यालयाचे प्रभारी प्राचार्य जयश्री सिनगर यांच्या अध्यक्षतेखाली कार्यक्रम संपन्न होणार आहे .तरी सर्वांनी सेमिनार हॉलमध्ये उपस्थित राहावे ही विनंती

प्राचार्य

प्राचार्य
कला वाणिज्य व विज्ञान महाविद्यालय
सात्रळ ता.राहुरी,जि.अहमदनगर

LOKNETE DR. BALASAHEB VIKHE PATIL (PADMA BHUSHAN AWARDEE)PRAVARA RURAL EDUCATION SOCIETY'S

Pravara Rural Education Society's,

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SavitribaiPhule Pune University, Affiliated ID No. PU.A.N.ASC 057 1998

Phone No.☎:02426- 275763(☎) : 02426- 275764

Web: http://pravaracollege.in/ASC_Satral/Email :acscsatral@rediffmail.com

NAAC Accredited "B++" Grade with CGPA 2.78

Ref.No./ACS/Satral/२०१८-१९/HD.31 दि- २७/०२/१९

प्रति -
प्राध्यापक. ए. जी. सूर्यवंशी.
कला ,वाणिज्य व विज्ञान महाविद्यालय सात्रळ.
ता- राहुरी ,जि- अहमदनगर.

विषय-आभार पत्र

महोदय ,
दिनांक २७/ ०२/ २०१९ रोजी आयोजित मराठी भाषा गौरव दिन समारंभ प्रसंगी आपण प्रमुख पाहुणे म्हणून उपस्थित राहिला व आमच्या विद्यार्थी, विद्यार्थिनी तसेच प्राध्यापक यांना बहुमोल मार्गदर्शन केल्याबद्दल आम्ही आपले आभारी आहोत.
धन्यवाद ॰

प्राचार्य
कला वाणिज्य व विज्ञान महाविद्यालय
सात्रळ ता.राहुरी,जि.अहमदनगर

0 / 2

27.2.19

प्रवरा ग्रामीण शिक्षण संस्थेचे

कला, वाणिज्य व विज्ञान महाविद्यालय सात्रळ तालुका राहुरी जिल्हा अहमदनगर

मराठी विभाग

आयोजित

मराठी भाषा गौरव दिन

कवी कुसुमाग्रज यांच्या जयंतीनिमित्त-

लेखक आपल्या भेटीला या उपक्रमांतर्गत विशेष व्याख्यान

बुधवार. दिनांक २७ फेब्रुवारी २०१९. सकाळी -११.०० वाजता

कार्यक्रम पत्रिका

ग्रंथ प्रदर्शनाचे उद्घाटन.	महाविद्यालय विकास समिती व सर्व पदाधिकारी यांच्या शुभहस्ते
प्रास्ताविक व अतिथींची ओळख	प्राध्यापक डॉक्टर नवनाथ शिंदे
पद्मश्री पद्मभूषण कवी कुसुमाग्रज प्रतिमा पूजन व दीप प्रज्वलन	विचार पिठावरील मान्यवरांच्या शुभ हस्ते
सत्कार सोहळा	माननीय प्राचार्य व मान्यवरांच्या शुभहस्ते
विद्यार्थी विद्यार्थिनी गुणगौरव	उल्लेखनीय यश संपादन केलेले विद्यार्थी
प्रमुख अतिथींचे मार्गदर्शन	प्राध्यापक ए. .जी. सूर्यवंशी .
अध्यक्षीय भाषण	उप प्राचार्य जयश्री सिनगर
आभार	प्रा .डॉ- वडीतके जी के.
सूत्रसंचालन	प्रा- लतिका पंडुरे.

विभाग प्रमुख
मराठी विभाग
कला,वाणिज्य व विज्ञान महाविद्यालय,सात्रळ
ता.राहुरी.जि.अहमदनगर-४१३७११

प्राचार्य
कला वाणिज्य व विज्ञान महाविद्यालय
सात्रळ ता.राहुरी,जि.अहमदनगर

प्रवरा ग्रामीण शिक्षण संस्थेचे,

कला, वाणिज्य व विज्ञान महाविद्यालय, सात्रळ

ता. राहुरी, जि. अहमदनगर

मराठी विभाग आयोजित

२७ फेब्रुवारी २०१९ मराठी भाषा गौरव दिन

लेखक आपल्या भेटीला या उपक्रमांतर्गत विशेष व्याख्यान

संक्षिप्त अहवाल

२०१८-२०१९

सावित्रीबाई फुले पुणे विद्यापीठ, विद्यार्थी विकास मंडळ अंतर्गत महाविद्यालयातील मराठी विभागाच्या वतीने सोमवार दिनांक २७ फेब्रुवारी २०१९ रोजी मराठी भाषा गौरव दिनाचे आयोजन केले .लेखक आपल्या भेटीला या उपक्रमांतर्गत तोंडातून सहजतेने येणारे उद्गार म्हणजे साहीत्य कथा कादंबरी काव्य. कवितेत जीवनानुभवांची संमिश्र लय येते. जिथे कवितेची गोष्ट सांगून होईल, तिथे कविता संपते. जीवनकहाणी किंवा आत्मचरित्र सांगणे म्हणजे कविता नव्हे. सध्या कवी आणि कवितांचा बाजार भरलेला आहे. मित्रहो लेखणी कोणाची गुलाम नसते. सोयीस्कर सत्य सांगण्याची जागा म्हणजे कविता नव्हे, असे परखड मत प्राध्यापक. ए. जी. सूर्यवंशीयांनी व्यक्त केले.

सावित्रीबाई फुले पुणे विद्यापीठ, विद्यार्थी विकास मंडळ आणि लोकनेते पद्मभूषण डॉ. बाळासाहेब विखे पाटील प्रवरा ग्रामीण शिक्षण संस्थेचे सात्रळ येथील कला, वाणिज्य व विज्ञान महाविद्यालय, मराठी विभाग यांच्या संयुक्त विद्यमाने आयोजित याप्रसंगी मराठी भाषा गौरव दिनानिमित्त विद्यार्थी कवी संमेलनाचे आयोजन करून कविवर्य कुसुमाग्रज यांची जयंती साजरी करण्यात आली. यावेळी, मराठी महाराष्ट्राची राजभाषा आहे संत ज्ञानेश्वरांच्या अजरामर विचारामुळे मराठी भाषेत अध्यात्मिक लोकशाही निर्माण झाली. मराठी ही आपली मातृभाषा असून जन्मदात्री आई एवढेच अभिमान प्रत्येकाला आपल्या मातृभाषेविषयी असायला हवा पाहिजे मराठी भाषेतील साहित्य मातृभाषेची थोरवी वाढवणारे आहे मराठी भाषेचा सर्वांगीण वापर झाला तर तिचा गौरव आपोआप होईल असे मत प्रभारी प्राचार्य डॉक्टर सोपानराव शिंगोटे यांनी व्यक्त केले

उपप्राचार्या डॉ. जयश्री सिनगर, उपप्रचार्य डॉ. दीपक घोलप उपस्थित होते. अध्यक्षीय सूचना कु. सुनीता नामदेव पोंदे यांनी मांडली. अनुमोदन कु. प्रतीक्षा विठ्ठल गागरे यांनी दिले. प्रास्ताविक समन्वयक प्रा. डॉ. नवनाथ शिंदे यांनी केले. विद्यार्थी कवी संमेलनामध्ये कु. पुनम लक्ष्मण गागरे, कु. आरती गावडे, कु. शुभांगी देविदास शिरसाठ, कु. प्रियंका सांबरे तसेच डॉ. अनंत केदारे. आभार डॉ. गंगाराम वडीतके यांनी मानले. सूत्रसंचालन प्रा लतिका पंडुरे.यांनी केले.

विभाग प्रमुख
मराठी विभाग
कला,वाणिज्य व विज्ञान महाविद्यालय,सात्रळ
ता.राहुरी.जि.अहमदनगर-४१३७१०

प्राचार्य
कला वाणिज्य व विज्ञान महाविद्यालय
सात्रळ ता.राहुरी,जि.अहमदनगर

२७ फेब्रुवारी २०१९ रोजी मराठी भाषा गौरव दिन प्रास्ताविक करताना.

प्रतिमा पूजन

विभाग प्रमुख
मराठी विभाग
कला,वाणिज्य व विज्ञान महाविद्यालय,सात्रळ
ता.राहुरी,जि.अहमदनगर-४१३७११

प्राचार्य
कला वाणिज्य व विज्ञान महाविद्यालय
सात्रळ ता.राहुरी,जि.अहमदनगर

काव्यवाचन करताना

विभाग प्रमुख
मराठी विभाग
कला,वाणिज्य व विज्ञान महाविद्यालय,सात्रळ
ता.राहुरी.जि.अहमदनगर-४१३७११

प्राचार्य
कला वाणिज्य व विज्ञान महाविद्यालय
सात्रळ ता.राहुरी,जि.अहमदनगर

प्राध्यापक. ए. जी. सूर्यवंशी मार्गदर्शन करताना.

विभाग प्रमुख
मराठी विभाग
कला,वाणिज्य व विज्ञान महाविद्यालय,सात्रळ
ता.राहुरी.जि.अहमदनगर-४१३७११

प्राचार्य
कला वाणिज्य व विज्ञान महाविद्यालय
सात्रळ ता.राहुरी,जि.अहमदनगर

प्रवरा ग्रामीण शिक्षण संस्थेचे

कला, वाणिज्य व विज्ञान महाविद्यालय सात्रळ तालुका राहुरी जिल्हा अहमदनगर

मराठी विभाग

आयोजित

मराठी भाषा गौरव दिन

कवी कुसुमाग्रज यांच्या जयंतीनिमित्त-

लेखक आपल्या भेटीला या उपक्रमांतर्गत विशेष व्याख्यान

बुधवार. दिनांक २७ फेब्रुवारी २०१९. सकाळी -११.०० वाजता

- उपस्थिती पत्रक -

अ. नं.	विदयार्थि नाव	वर्ग	सही
१	अनाप भाकुताहेब शाकासाहेब	S.Y.B.A	
२	बोर्डे उमाकांत नामदेव	S.Y.B.A	
३.	गागरे भारत नानासाहेब	S.Y.B.A	
४	रुपवते कोमल विजय	S.Y.B.A.	
५	वाघ अक्षय अशोक	S.Y.B.A.	
६	पवार कीरण गुलाबराव	S.Y.B.A.	
७	पाळंदे सचीन राजेंद्र	S.Y.BA.	
८	पर्वत संकेत नानासाहेब	SYBA	
९	सोजळे केतकर पाटिलबुवा	SYB.A	
१०.	शिंदे अक्षय सुरेश	S.YB.A.	
११	आंधळे दशरथ सचीन	T.Y.B.A.	
१२.	कु. घोलप प्रेरणा सुभाष	T.Y.B.A.	
१३	हारदे संतोष संपत	T.Y.B.A.	
१४	जाधव वृषाली भानुदास	T.Y.B.A	
१५	मंडलीक मनिषा रमेश	TY.B.A.	

१६.	गागरे दिपक बाळासाहेब	T.Y.B.A.	GDPB.
१७.	कुपे आदिनाथ बाळासाहेब	T.Y.B.A	KupAB
१८	वाकचौरे सुजीत किशोर	T.Y.B.A	SKwa.
१९	अनाप कृष्णा सोपान	FY B.com.	KrA.S.
२०.	शिंदे पवन नंदू	FY.B.com	SPN.
२१	गिरी प्रमोद संजय	FY.B.com.	GiPS
22	हारदे बळीराम शिवाजी	FY.B.com.	BaliRam
२३	खाटेकर कुमरेश दुर्गाजी	F.Y.B.com	KMD.
२४	पाटोळे प्रेरणा प्रविण	FY.B.com.	PatePP
२५	कु अनाप आरती कैलास	SYBSC.	AnapK
२६.	बलमे राजदास विठ्ठल	SYBSC	BMRV.
२७.	दाते निकीता आण्णासाहेब	SY.BSC.	DDate
२८	ढमक प्रज्वल दिपक	SY.BSC.	PDD.
२९	सोनवणे निकीता गंगाराम	T.Y.B.A	SNG.
३०	लोंढे ममता प्रदिप	T.Y.B.A	LmmP.
३१.	ब्राम्हणे शुभम रविंद्र	TY.B.A.	BrahSR.
३२.	ठोंबरे विश्राम दिपक	S.Y.B.A	Thombr.
३३	सुपेकर ऊर्मिला बाळासाहेब	S.Y.B.A.	SUPEKUB
३४	शिंदे आशिष मच्छिंद्र	SYBA	Ashi.

विभाग प्रमुख
मराठी विभाग
कला,वाणिज्य व विज्ञान महाविद्यालय,सात्रळ
ता.राहुरी,जि.अहमदनगर-४१३७११

प्राचार्य
कला वाणिज्य व विज्ञान महाविद्यालय
सात्रळ ता.राहुरी,जि.अहमदनगर

लोकनेते डॉ . बाळासाहेब विखे पाटील (पद्मभूषण उपाधीने सन्मानित)
प्रवरा ग्रामीण शिक्षण संस्थेचे

कला, वाणिज्य व विज्ञान महाविद्यालय, सात्रळ

ता. राहुरी, जि. अहमदनगर

शब्दालय प्रकाशन, श्रीरामपूर

आणि

मराठी विभाग

यांच्या संयुक्त विद्यमाने

दि.२७/०२/२०१९ रोजी सकाळी ठीक ९०.०० वाजता आयोजित

मराठी भाषा गौरव दिन

समारोप फीडबॅक

1	Name Of the organizing college/Department :	शब्दालय प्रकाशन, श्रीरामपूर आणि मराठी विभाग	
2	Name of the activity	मराठी भाषा गौरव दिन	
3	Participants name	Barde Aksha Namdan.	
4	Participants Mobile no	9763961869	
5	Faculty (Arts/Commerce/Science)	Arts	
A	Usefulness of this activity for students development:	Satisfactory ✓	Unsatisfactory
B	Was the period Sufficient for the activity	✓	
C	Organization of activity was up to mark	✓	
D	Speech of the Guest/Resource Person	✓	
E	Any other suggestions	✓	
	Signature of the Participant	BARDAN.	

विभाग प्रमुख
मराठी विभाग
कला,वाणिज्य व विज्ञान महाविद्यालय,सात्रळ
ता.राहुरी,जि.अहमदनगर-४१३७११

प्राचार्य
कला वाणिज्य व विज्ञान महाविद्यालय
सात्रळ ता.राहुरी,जि.अहमदनगर

Satral Dairy

fssai LIC No. 11517032000035

Head Office : Satral Dairy, Gat No. 184, At Satral, Post. Songaon, Tal. Rahuri, Dist. Ahmednagar 413 711 Mob. 9511991768
Unit No. 2 : Gut No. 69 A, Pangran,Tal. Navapur, Dist. Nandurbar 425418 E-mail : satraldairy@ymail.com

SATRAL DAIRY SATRAL 11517032000035

Date : 16.07.2018

To whom so it may be concern

The faculty of commerce Arts, Commerce and Science College Satral and Satral Dairy Satral, Tal.Rahuri, Dist.Ahmednagar have collaboration for

- To import basic business knowledge.
- To find out the hidden talent of the students.
- To enlighten the students regarding the new concepts introduced in the industrial sector.
- To create entrepreneurial awareness among students.
- To motivate student to make their mind set for taking up entrepreneurship as career.
- To enalble the students to get a better understanding of Advertising and brand marketing.

It is being signed in presence of Heads of both the institutes.

Principal
I/C PRINCIPAL
Art,Commerce & Science Collage
Arts, Commerce and Science College, Satral

Proprietor
Satral Dairy, Satral
SATRAL DAIRY
A/Po. Satral, Tal. Rahuri
Dist. Ahmednagar 413711

Date: - 07/01/2019

To,

The Principal,

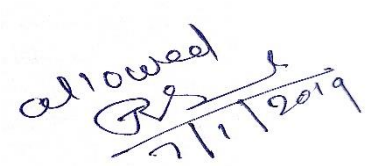
Arts, Commerce and Science College, Satral.

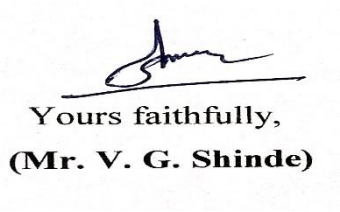
Subject: - Permission to organize Satral Dairy Visit for T. Y. B. Com students.

Respected Sir,

With reference to the above-mentioned subject, the final year's students of B. Com need to visit Satral Dairy, Satral. This visit to Satral Dairy aims to impart industrial operational knowledge and offer our students a valuable opportunity to gain practical experience. The proposed Satral Visit program is scheduled for 11th January, 2019.

Thanking you,





Yours faithfully,

(Mr. V. G. Shinde)

Date- 08/01/2019

To,
The Manager,
Satral Dairy, Satral.
Tal. Rahuri, Dist. Ahmednagar.

Subject: - To get permission for the Satral Dairy Visit to the students.

Respected Sir,

With reference to the above-mentioned subject, Savitribai Phule Pune University has introduced an 'Industrial Visit' program for third-year B. Com. students. The objective of the Dairy Visit is to furnish students with operational insights into the industry and acquaint them with various facets of business and commercial activities. A visit to Satral Dairy will offer students first-hand exposure to the operational dynamics of the staff. Therefore, I kindly request you to extend the opportunity of a Satral Dairy Visit to the students listed from our college (List enclosed).

Thanking you,

Principal
Principal
Arts,Commerce and Science College
At/Po.Satral,Tal.Rahuri,
Dist.Ahmednagar.413711

Date-10/01/2019

Student Notice

All the T. Y. B. Com students are hereby informed that the department is going to organize an **Industry Visit** on 11th January, 2019 at 10.30 am at Satral Dairy, Satral. Attendance for this visit is mandatory.

Note: -

- Students are required to have dress code and college ID cards.
- Students are also encouraged to bring notebooks and pens to take notes during the visit

Arts, Commerce & Science College ACSC SATRAL Tal. Rahuri, Dist. Ahmednagar

Principal

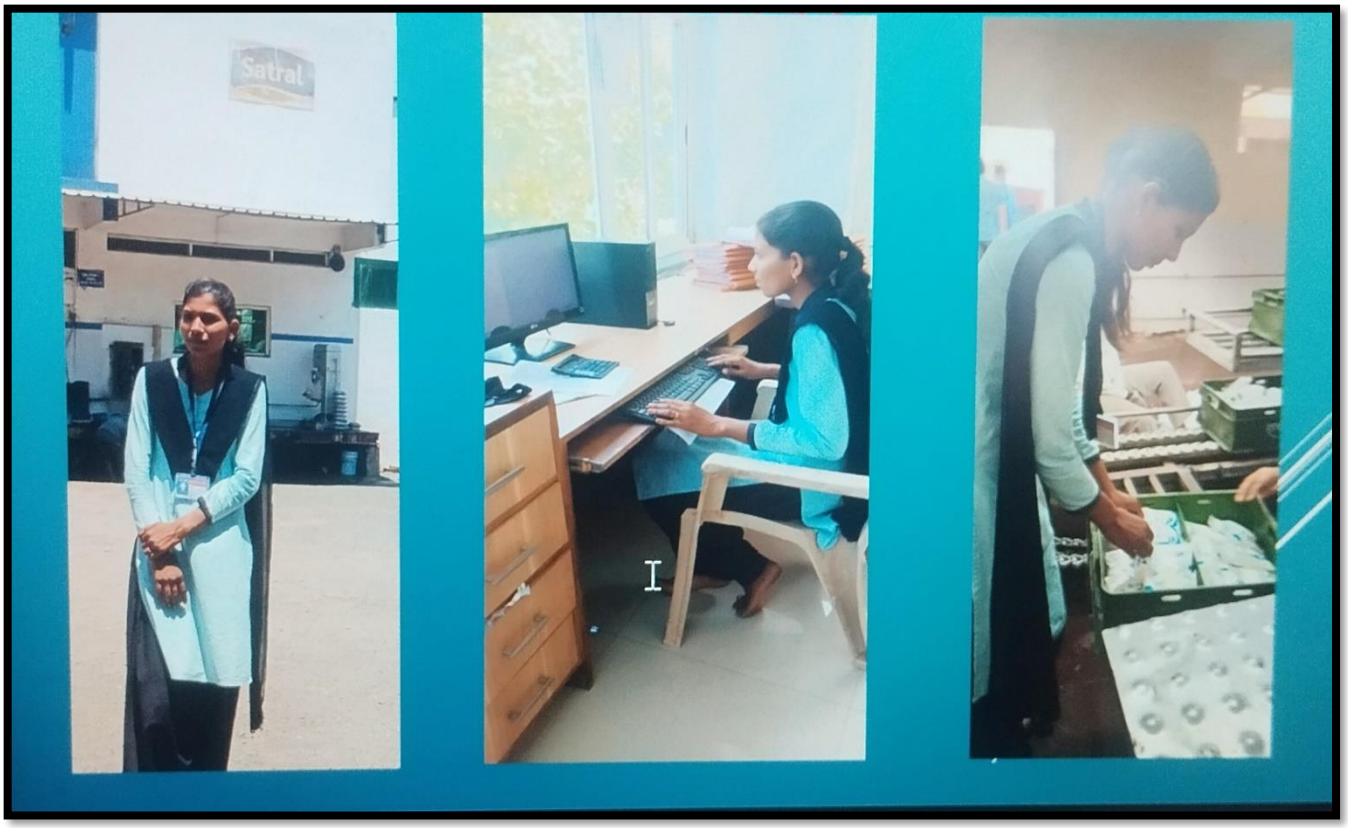
Principal
Arts,Commerce and Science College
At/Po.Satral,Tal.Rahuri,
Dist.Ahmednagar.413711

Report on Industrial Visit

Name of the Visit	Industrial Visit
Place to Visit	Satral Dairy, Satral. A/P- Satral, Tal. Rahuri, Dist- Ahmednagar
Date	11/01//2019
Objectives	• To get experiential learning. • To provide students with a first-hand exposure to the intricacies of dairy production.
Name of Coordinator	Mr. V. G. Shinde
No. of Participants	35

On 11th January, 2019, the last year's students of B. Com visited Satral Dairy, Satral. The Satral Dairy visit program provided an insightful experience into dairy farming and production processes. Participants witnessed the entire journey from milking to packaging, gaining a comprehensive understanding of quality control measures and sustainable practices. The interactive sessions with experts highlighted the significance of technological advancements in maximizing efficiency while minimizing environmental impact.

Additionally, the visit emphasized the importance of animal welfare and hygiene standards in ensuring premium dairy products. Overall, the program was enlightening, fostering appreciation for the complexities of dairy production and the dedication of those involved in delivering high-quality goods to consumers. Mr. D. N. Ghane (HoD), Mr. V. G. Shinde and Dr. U. A. Tajane were made this visit successful which will definitely benefit to the students in the future.



T. Y. B. Com students at visiting in Satral Dairy…

Mr. V. G. Shinde
(Coordinator)

HOD
H.O.D.
Department of Commerce
Arts,Commerce & Science College,Satral.

Principal
Principal
Arts,Commerce and Science College
At/Po.Satral,Tal.Rahuri,
Dist.Ahmednagar.413711

Loknete Dr. BalasahebVikhe Patil (Padma Bhushan Awardee)
Pravara Rural Education Society's

Arts, Commerce and Science College, Satral

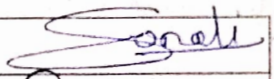
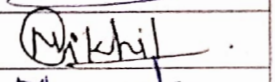
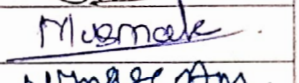
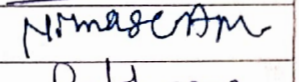
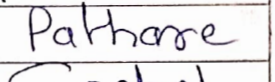
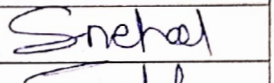
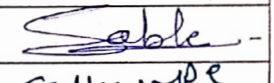
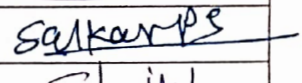
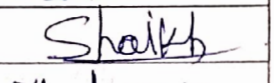
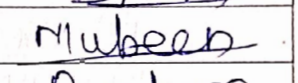
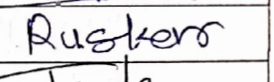
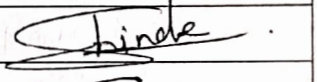
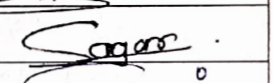
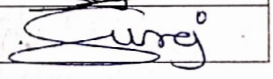
Department of Commerce

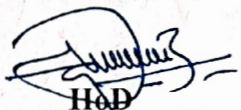
Dairy Visit Program – Satral Dairy, Satral

T.Y. B.Com Student List-2018-19

Sr. No.	Name of Student	Sign
1.	Dhage Ganesh Prakash	
2.	Dighe Mayuri Appasaheb	
3.	Dighe Nilesh Rajendra	
4.	Dokhe Aarti Ramesh	
5.	Dokhe Komal Maruti	
6.	Gagare Amol Kailas	
7.	Gagare Ashutosh Arun	
8.	Gagare Punam Bapusaheb	
9.	Gagare Vikas Savaleram	
10.	Gholap Sanket Sampat	
11.	Ghorpade Swapnil Uttam	
12.	GulaveSachin Shravan	
13.	Harde Aarti Appasaheb	
14.	Harde Shubhangi Dnyandeo	
15.	Harde Sulochana Vishnu	
16.	Kadu Akshay Ramesh	
17.	Kadu Sagar Ashok	
18.	Kambale Satish Digambar	
19.	Kamble Laxman Baban	
20.	Khaladkar Abhishek Dashrath	
21.	Khemnar Baban Kushaba	

Art's, Commerce & Science College Tal.Rahuri, Dist.A'Nagar Satral

22.	Khemnar Sonali Annasaheb	
23.	Kolapkar Nikhil Mukund	
24.	Musmade Nilesh Arun	
25.	Nimase Amol Macchindra	
26.	Pathare Dhananjay Haushiram	
27.	Patole Snehal Sunil	
28.	Sabale Swapnil Kailas	
29.	Salkar Pradip Sanjay	
30.	Shaikh Eptisam Nabab	
31.	Shaikh Mubeen Sultan	
32.	Shaikh Ruksar Javed	
33.	Shinde Rupali Bhausaheb	
34.	Shinde Sagar Sanjay	
35.	Shinde Suraj Vilas	



H.O.D.
Department of Commerce
Arts,Commerce & Science College,Satral.

Research Collaboration: Savitribai Phule Pune University, Pune

Research Scholar: Dr. N. S. Kanhe

सावित्रीबाई फुले पुणे विद्यापीठ
भौतिकशास्त्र विभाग,
गणेशखिंड पुणे -४११ ००७
दूरध्वनी क्र. ह्र (०२०) २५६९२६७८, २५६९९०७२,
२५६९१७०९ विस्तारित क्र. :२०६/२०२/२२२
फॅक्स : (०२०) २५६९१६८४

Savitribai Phule Pune University
DEPARTMENT OF PHYSICS
Ganeshkhind, Pune - 411007.
Tel.No. : (020) 25692678, 25699072, 25691709
Fax : (020) 25691684
E-mail : @physics.unipune.ac.in
Website : http://physics.unipune.ac.in

Confirmation of Admission / Registration

Ref : PHY/HoD/Ph.D/ 71

Date : 11/02/2015
16

To,

Mr.Kanhe Nilesh Sampat

Subject: Confirmation of admission to the Ph.D. in Physics

Dear, **Mr.Kanhe Nilesh Sampat**

I am happy to inform you that the Research and Recognition Committee in Physics Science has approved your research topic as it is / with the modification/s as follows:

"Studies on structure Property Correlation of Magnetic Nanoparticles Synthesized by Gas Phase Condensation"

Your admission is now confirmed as per Ph.D. Rule 7 (ix). The details of your admission are:

1.Subject	: Physics
2.Faculty	: Science
3.Guide	: Dr. V.L.Mathe
4.Co-Guide	: Dr.(Mrs.)S.V.Bhoraskar
5.Date of Registration	: 01/07/2014
6.Period of Registration	: From 01/07/2014 to 01/07/2019

Please note that your admission will be governed by the Savitribai Phule Pune University Rules for the Degree of Doctor of Philosophy (Ph. D) with effect **11th Jully,2009**
Please also note you will have to pay the fees prescribed as per the following schedule: The first installment will have to be paid within a month from the date on which your admission is confirmed. The successive installment will have to be paid within a month from the date of completion of each year. In case of failure to pay the prescribed fees as per the schedule mentioned, a late fee of Rs. 100/- for Indian students & Rs.500/- for foreign per month from the date of payment shall be charged.

Thanking you,

Yours faithfully,

Head, Place of Research

Copy forwarded with compliments:
1) The Dy. Registrar, Ph.D. Section, SPPU , Pune-7
2) The Guide : Dr. V.L.Mathe
3) The Co-Guide : Dr.(Mrs.)S.V.Bhoraskar

Ph. D. Award Certificate: Dr. N. S. Kanhe

Savitribai Phule Pune University

(formerly University of Pune)

Declaration of Result of the Doctor of Philosophy (Ph.D.)

Kanhe Nilesh Sampat (कान्हे निलेश संपत)

Mother's Name : Ujjwala (उज्वला)

University has accepted the thesis submitted by the above-mentioned candidate for the award of Ph.D., as per reports of referees and examiners of open defense of the thesis. Accordingly, it is hereby notified that, the above-mentioned candidate is declared to have passed the examination of Ph. D. and has become eligible for the award of Ph. D. Degree.

RELEVANT DETAILS ARE AS UNDER:

1	Faculty	:	Science & Technology
2	Subject	:	Physics
3	Title of the Thesis	:	"Studies on structure property correlation of magnetic nanoparticles synthesized by gas phase condensation "
4	Place of Research	:	Department of Physics Savitribai Phule Pune University Pune- 411 007.
5	Name and Address of the Guide	:	Prof. Mathe Vikas Laxman Department of Physics Savitribai Phule Pune University Pune- 411 007.
6	Name and Address of the Co-guide	:	Prof. Mrs. S.V. Bhoraskar Department of Physics Savitribai Phule Pune University Pune- 411 007.
7	Date of Registration	:	01st July 2014
8	Date of Re- Registration	:	01st July 2019
9	Date of Declaration of Result	:	16th November, 2021

SAVITRIBAI PHULE PUNE UNIVERSITY Admission Section PUNE-7

Ganeshkhind, Pune 411007
Ref. No. PGS/Ph .D. /
Date:

for Director
Board of Examinations & Evaluation

S.P.P.U.P—2000-04-2018(20)[1/Office]

Research Collaboration: Padmashri Vikhe Patil College of Arts, Science and Commerce Pravaranagar, Rahata, Dist.-Ahmednagar (MS)

Research Scholar: Dr. V. G. Shinde

Padmashri Dr. Vitthalrao Vikhe Patil
(1901-1980)

ISO 9001:2008 Certified

Pravara Rural Education Society's

Padmashri Vikhe Patil College of Arts, Science & Commerce, Pravaranagar,

A/P. LONI 413 713, Tal. Rahata, Dist. Ahmednagar.
E-mail : pvpcollege@gmail.com Web - www.pravarapvpcollege.org.in
Offi. (02422) 273425 Fax No. : (02422) 273426
Affiliated to University of Pune ID No. PU/AN/ASC/016(1971)
Re-Accredited by NAAC at 'A' Grade with CGPA 3.61 out of 4
Recipient of Best Rural College Award. 'College with Potential for Excellence' Status by UGC, New Delhi

Dr. S. R. Walunj, M.Com., M.Phil, Ph.D.
Principal

Ref: PVPC/ Commerce Research/ Date 04/02/2014

To
Mr. Shinde Vijaykumar Gulabrao,
ACS College, Satral,
Tal- Rahuri, Dist- Ahmednagar .

Subject : Confirmation of admission to the Ph.D. Programme in Commerce.

Dear Mr. Shinde Vijaykumar Gulabrao,

I am happy to inform you that the Research and Recognition Committee in **Marketing (Commerce)** has approved your research topic as it is as follows (Ref.:-PG/Com/5252 dated – 22 Nov. 2014) **"कृषि मालाच्या किमान आधारभूत किंमती व उत्पादन खर्चाच्या सहसंबंधाचा चिकित्सक अभ्यास".**

Your admission is now confirmed as per Ph.D. Rule II. 3 & 6. The details of your admission are.

Subject	:	Marketing
Faculty	:	Commerce
Guide	:	Dr. M. S. Patgaonkar, A. C. S. College, Rahata, Tal- Rahata, Dist- Ahmednagar.
Co-Guide	:	--
Date of Registration	:	28/07/2014
Period of Registration	:	5 Years

Please note that your admission will be governed by the Rules for the Degree of Doctor of Philosophy (Ph.D.) with effect from 28.07.2014.

Please also note that you will have to pay the fees prescribed as per the following schedule:

The first installment will have to be paid within a month from the date on which your admission is confirmed. The successive installment will have to be paid within a month from the date of completion of each year. In case of failure to pay the prescribed fees as per the schedule mentioned, a late fee of Rs. 100/- per month from the date of payment shall be charged.

I thank you.

Sincerely yours,
Principal

Copy to :
1. The Deputy Registrar, Ph.D. Section, Savitribai Phule Pune University, Pune , 411007.
2. Dr. M. S. Patgaonkar., Research Guide, A. C. S. College, Rahata, Tal- Rahata, Dist- Ahmednagar.
3. Research Center, P.V.P. College, Loni, Tal- Rahata, Dist- Ahmednagar.
4. Accounts, P.V.P. College, Loni, Tal- Rahata, Dist- Ahmednagar.

MGMT SYS
RvA C216

Ph. D. Award Certificate: Dr. V. G. Shinde

Savitribai Phule Pune University

(formerly University of Pune)

Declaration of Result of the Doctor of Philosophy (Ph.D.)

Shinde Vijaykumar Gulabrao (शिंदे विजयकुमार गुलाबराव)

Mother's Name : Hirabai (हिराबाई)

University has accepted thesis submitted by the above-mentioned candidate for award of Ph. D., as per reports of referees and examiners of open defence of the thesis. Accordingly, it is hereby notified that, the above-mentioned candidate is declared to have passed the examination of Ph. D. and has become eligible for the award of Ph.D. Degree.

RELEVANT DETAILS ARE AS UNDER :

1.	Faculty	:	Commerce & Management
2.	Subject	:	Marketing
3.	Title of the Thesis	:	" कृषि मालाच्या किमान आधारभूत किंमती व उत्पादन खर्चाच्या सहसबंधांचा चिकित्सक अभ्यास."
4.	Place of Research	:	Padmashri Vikhe Patil College of Arts, Science & Commerce, Pravaranagar, A/P. Loni – 413 713, Tal. Rahata, Dist. – Ahmednagar.
5.	Name and Address of the Guide	:	Dr. Patgaonkar Madhavi Sadashiv Shirdi Sai Rural Institute Arts, Science & Commerce College, At Pimplas Rahata, Tal. Rahata, Dist. – Ahmednagar.
6.	Date of Registration	:	28th July, 2014
7.	Date of Re-Registration	:	28th July, 2019
8.	Date of Declaration of Result	:	03rd January, 2022

SAVITRIBAI PHULE PUNE UNIVERSITY Admission Section PUNE-7

Ganeshkhind, Pune – 411 007.
Ref. No. PGS/Ph.D. / 44
Date : 17/01/2022

for Director
Board of Examinations and Evaluation

S.P.P.U.P—3,000-08-2021(295)[1/Office]

Research Collaboration: K.R.T. Arts, B. H. Commerce and A. M. Science, College Nashik

Research Scholar: Mrs. D. D. Agarakar

Maratha Vidya Prasarak Samaj's
K.R.T. Arts, B.H. Commerce & A.M. Science College, Nashik.
(KTHM College)

Dr. V. B. Gaikwad
M.Sc., M.Phil, Ph.D
Principal

Gangapur Road, Shivaji Nagar, Nashik - 422 002. (M.S.) India. Office : 0253-2571376, Fax : 2577341, (R) 2571502

- College with Potential for Excellence Status by UGC, New Delhi.
- Best College Award of Savitribai Phule Pune University.
- DBT Star College.
- Affiliated to SPP University [ID No. PU/NS//ASC/012(1969)]
- Junior College Index No. J-13.17.001
- DST-FIST Sponsored.
- UGC Sponsored B.Voc. Programme & Community College.

Ref.No. : 2018-19/1829

Date :

ADMISSION LETTER

To,
Dipti Dilip Agarkar
Dept. of Chemistry,
KRT Arts, BH Commerce and AM Science (KTHM) College, Nashik

Subject: Admission to M.Phil. (Chemistry) Course, Year 2015-2016

Dear Student,

I am happy to inform you that you are admitted to the M.Phil. (Chemistry) course, 2015-2016. I take this opportunity to congratulate you for the same.

Please note that you are admitted to the M.Phil. course w.e.f. 21/07/2015 subject to the fulfillment of eligibility of the course. Your place of research will be Department of Chemistry, K.T.H.M. College, Nashik-02.

1. You have to apply for eligibility certificate within a month from the date on which this letter is issued.
2. You are requested to produce all necessary documents such as Transfer / Migration certificate, Non- Creamy Later Certificate, Educational Gap certificate, Change in Name, etc.
3. You are requested to produce original statement of marks and degree certificate along with self attested Xerox copies.
4. You are requested to produce No Objection Certificate and year leave certificate from the Principal / Employer, if employed.

Please note that, if student fails to produce documents mentioned above within thirty days from the receipt the letter, his/her admission will be treated as cancelled.

Yours faithfully,

Principal,
K.T.H.M. College, Nashik

Copy to: Guide: - Dr. S.R.Kuchekar

M.Phil. Award Certificate: Mrs. D. D. Agarkar

Savitribai Phule Pune University
(formerly University of Pune)

Declaration of Result of the Master of Philosophy (M.Phil.)

Agarkar Dipti Dilip (आगरकर दिप्ती दिलीप)

Mother's Name : Puspha (पुष्पा)

The dissertation submitted by the above mentioned candidate for the award of the M.Phil. Degree has been accepted by the University as per reports of the referees. The Candidate has also passed in theory papers, viva-voce examination and Final Seminar prescribed for this degree. Accordingly it is hereby notified that the above mentioned candidate is declared to have passed the M.Phil. Examination and has become eligible for the award of the degree.

RELEVANT DETAILS ARE AS UNDER :

1.	Faculty	:	Science & Technology
2.	Subject	:	Chemistry
3.	Title of the Thesis	:	"Isolation of Protin Rich Flour from Processed Soy Grains and Calcium from Drumsticks."
4.	Place of Research	:	Department of Chemistry, K.R.T. Arts, B.H. Commerce and A.M. Science College, Shivaji Nagar, Gangapur Road, Nashik – 422 002.
5.	Name and Address of the Guide	:	Dr. S.R. Kuchekar Department of Chemistry, K.R.T. Arts, B.H. Commerce and A.M. Science College, Shivaji Nagar, Gangapur Road, Nashik – 422 002.
6.	Date of Registration	:	21st July, 2015
7.	Date of Declaration of Result	:	26th October, 2021
8.	Final Grade	:	"A"

SAVITRIBAI PHULE PUNE UNIVERSITY Admission Section PUNE-7

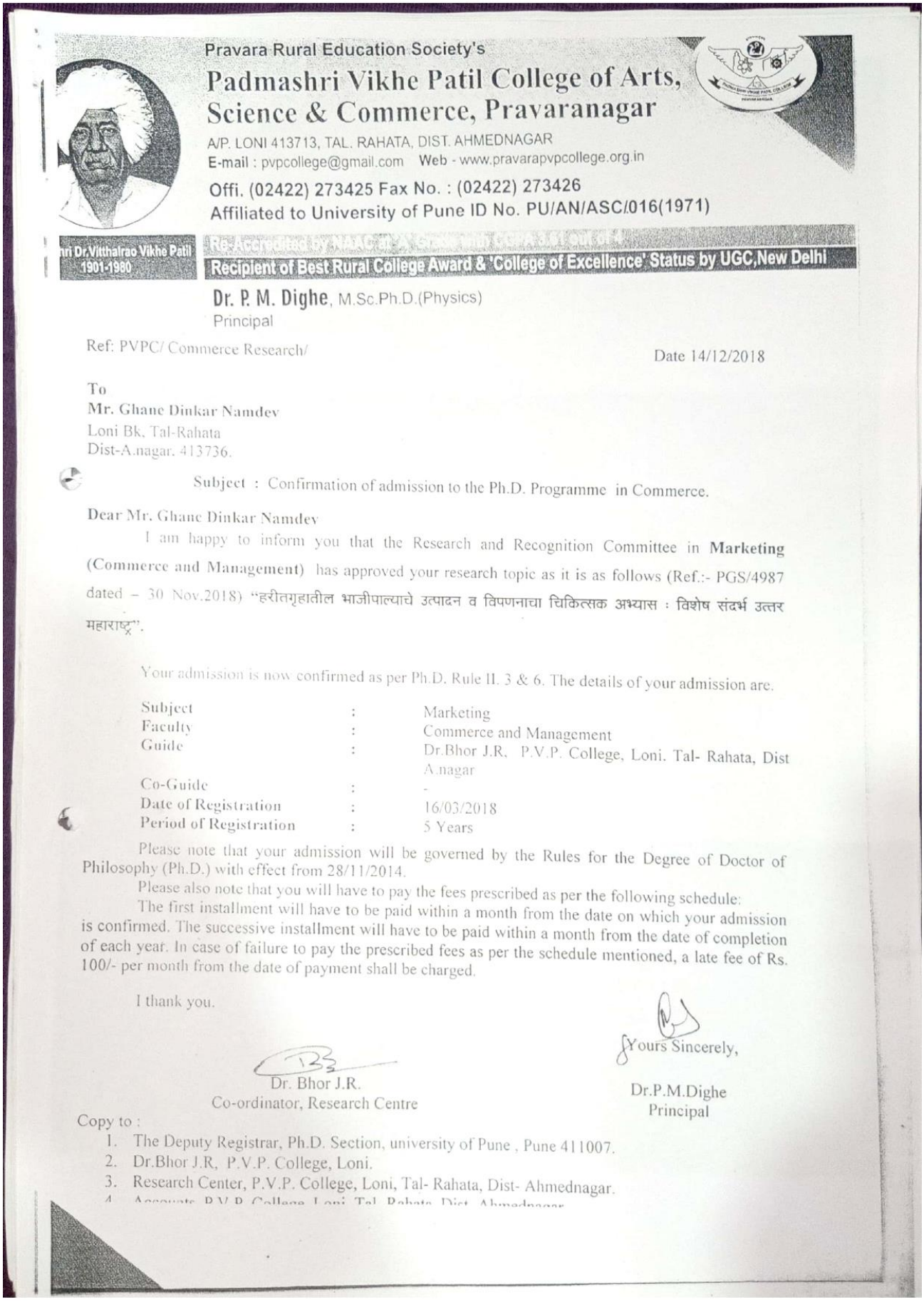
Ganeshkhind, Pune 411007.
Ref. No.: PGS/M.Phil./02
Date : 10th Jan. 2022

for Director
Board of Examinations and Evaluation

S.P.P.U.P—3,000-08-2021(295)[1/Office]

Research Collaboration: Padmashri Vikhe Patil College of Arts, Science and Commerce Pravaranagar, Rahata, Dist.-Ahmednagar (MS)

Research Scholar: Mr. D. N. Ghane



Pravara Rural Education Society's

Padmashri Vikhe Patil College of Arts, Science & Commerce, Pravaranagar

A/P. LONI 413713, TAL. RAHATA, DIST. AHMEDNAGAR
E-mail : pvpcollege@gmail.com Web - www.pravarapvpcollege.org.in
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Hon'ble Padmashri Dr.Vitthalrao Vikhe Patil 1901-1980

Re-Accredited by NAAC with A+ Grade (3rd Cycle) Recipient of Best Rural College Award & 'College of Excellence' Status by UGC,New Delhi

Dr. P. M. Dighe, M.Sc.Ph.D.(Physics)
Principal

Ref: PVPC/ Commerce Research/ Date 14/12/2018

To
Mr. Ghane Dinkar Namdev
Loni Bk. Tal-Rahata
Dist-A.nagar. 413736.

Subject : Confirmation of admission to the Ph.D. Programme in Commerce.

Dear Mr. Ghane Dinkar Namdev

I am happy to inform you that the Research and Recognition Committee in **Marketing (Commerce and Management)** has approved your research topic as it is as follows (Ref.:- PGS/4987 dated – 30 Nov.2018) "हरीतगृहातील भाजीपाल्याचे उत्पादन व विपणनाचा चिकित्सक अभ्यास : विशेष संदर्भ उत्तर महाराष्ट्र".

Your admission is now confirmed as per Ph.D. Rule II. 3 & 6. The details of your admission are.

Subject	:	Marketing
Faculty	:	Commerce and Management
Guide	:	Dr.Bhor J.R. P.V.P. College, Loni. Tal- Rahata, Dist A.nagar
Co-Guide	:	-
Date of Registration	:	16/03/2018
Period of Registration	:	5 Years

Please note that your admission will be governed by the Rules for the Degree of Doctor of Philosophy (Ph.D.) with effect from 28/11/2014.

Please also note that you will have to pay the fees prescribed as per the following schedule:

The first installment will have to be paid within a month from the date on which your admission is confirmed. The successive installment will have to be paid within a month from the date of completion of each year. In case of failure to pay the prescribed fees as per the schedule mentioned, a late fee of Rs. 100/- per month from the date of payment shall be charged.

I thank you.

Yours Sincerely,

Dr. Bhor J.R.
Co-ordinator, Research Centre

Dr.P.M.Dighe
Principal

Copy to :
1. The Deputy Registrar, Ph.D. Section, university of Pune , Pune 411007.
2. Dr.Bhor J.R, P.V.P. College, Loni.
3. Research Center, P.V.P. College, Loni, Tal- Rahata, Dist- Ahmednagar.
4. Accounts, P.V.P. College, Loni, Tal. Rahata, Dist. Ahmednagar.