Shirdi Sai Rural Institute's

ARTS, SCIENCE AND COMMERCE COLLEGE, RAHATA

"NAAC REACCREDITED "B++" GRADE COLLEGE"
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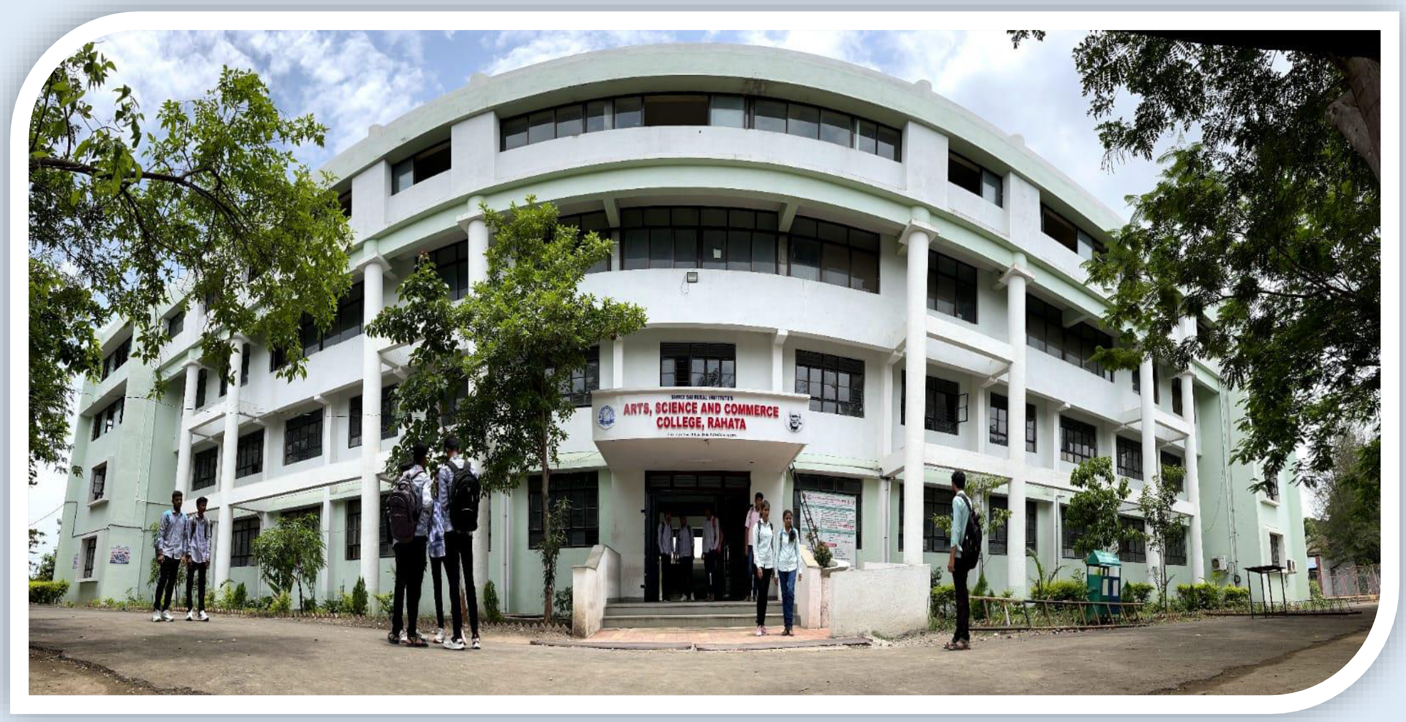

SELF STUDY REPORT-CYCLE 3rd

2018-2023

Criterion: III

Research, Innovations and Extension

Key Indicator: 3.3

Research Publication and Awards

Metric: 3.3.1 (Q$_{n}$M)

Number of research papers published per teacher in the Journals as notified on UGC CARE list during the last five years

Submitted to

NATIONAL ASSESSMENT AND ACCREDITATION COUNCIL(NAAC)
BENGALURU

Shirdi Sai Rural Institutes,
Arts, Science and Commerce College, Rahata
Tal- Rahata, Dist-Ahmednagar, Pin - 423107 (MS)
(University of Pune Affiliated ID No. PU/AN/ASC/052/1997)
NAAC RE-ACCREDITED "B++" GRADE COLLEGE

Ref. : ASCCR / Date

DECLARATION

We the undersigned, hereby declare that all information, reports, true copies of the supporting documents, and numerical data submitted by our institution for the purpose of NAAC accreditation have been thoroughly verified by the Internal Quality Assurance Cell (IQAC). We affirm that these submissions are accurate and correct as per our records.

This declaration pertains specifically to the accreditation process for the third cycle of the institution, covering the period from 2018-19 to 2022-23.

Thank you.

Sincerely,

Dr. Vikram P. Bhalekar
IQAC Coordinator
Coordinator
Internal Quality Assurance Cell
Arts,Science and Commerce College, Rahata

Prof.(Dr.) Somnath S. Gholap
Principal
Principal
Arts,Science and Commerce College
Rahata,Tel-Rahata,Dist-Ahmednagar

Date-**30/07/2024**

Place- **Rahata**

Recipient of "Best Rural College Award" from Student Welfare Board, (2011- 12 & 2013-14)

Sr NO.	Title of paper	Name of the author/s	Department of the teacher	Name of journal	Calendar Year of publication	ISSN number	Link to the recognition in UGC enlistment of the Journal /Digital Object Identifier (doi) number		
	Academic Year 2021-2022						**Link to website of the Journal**	**Link to article / paper / abstract of the article**	**Is it listed in UGC Care list**
1	PEG-200 as an asisted synthesis of Nitriles from aldehyde and Hydroxylamine under neutral condition	Dr.S S Gholap	Chemistry	Asian Journal of Organic and Medicinal Chemistry	2022	2456-8937	LINK	Printed	YES
2	An Efficient new procedure for the one pot conversion of aldehyde into corresponding amide using PEG-200 as a green solvent	Dr.S S Gholap	Chemistry	Stochastic Modeling & Applications	2022	0972-3641	LINK	Printed	YES
3	Liquidity Analysis of Co-oportative Sugar Factories in Maharashtra.	Dr. S.K. Pulate	Commerce	Journal on Bengal, Past and Present,	2021	0005 – 8807.	NA	Printed	YES
4	Hindi Cinema aur mera Bharat Desh me Mithkiy prayog	Dr. D. N. Dange	Hindi	Anahad lok	2021	2349-137X	LINK	LINK	YES
5	Pumice-based sulfonic acid: a sustainable and recyclable acidic catalyst for one-pot synthesis of pyrazole anchored 1,4-dihydropyridine derivatives at room temperature	Dr. G.D.Shirole	Chemistry	Research on Chemical intermediates	2022	0922-6168	LINK	LINK	YES
6	Novel Pumice@SO3H catalyzed efficient	Dr. G.D.Shirole	Chemistry	Sustainable Chemistry and	2021	2352-5541	LINK	LINK	YES

	synthesis of 2,4,5-triarylimidazoles and acridine-1,8-diones under microwave assisted solvent- free path,			Pharmacy					
7	IONIC LIQUID MEDIATED ONE POT SYNTHESIS OF 2,4,5-TRIARYLIMIDAZOLES FROM 1,3-DIARYL PYARAZOLE CARBALDEHYDES UNDER SOLVENT-FREE CONDITION	Dr. G.D.Shirole	Chemistry	Heterocyclic Letters	2021	2230-9632	LINK	LINK	YES
8	Citrus lemon juice mediated a cost effective one pot efficient synthesis of 1, 4 dihydropyridines	Dr. G.D.Shirole	Chemistry	Heterocyclic Letters	2021	2230-9632	LINK	LINK	YES
9	PUMICE@SO3H catalysed ultrasound mediated synthesis of polyhydraquinoline derivatives	Dr. G.D.Shirole	Chemistry	Heterocyclic Letters	2022	2230-9632	LINK	LINK	YES
10	TEA POWDER WASTE : AS A GREEN CATALYST FOR THE SYNTHESIS OF 1-AMIDOALKYL 2-NAPHTHOLS	Dr. G.D.Shirole	Chemistry	Heterocyclic Letters	2022	2230-9632	LINK	LINK	YES
11	Optimization of Fuzzy Logic Controller Using Genetic Algorithm : A simulation study on greenhouse climate control system	Dr. S.R. Potdar	Physics	Journal of Information and Computational Science	2021	1548-7741	LINK	LINK	YES
12	Novel Corona Virus Pandemic Impact on indian economy E-	Dr. V.P. Bhalekar	Physics	Journal of xidian University	2021	1001-2400	LINK	LINK	YES

	Commerce, Education and Employment								
13	Novel Corona Virus(COVID-19) Pandemic : The Overall Scenario and Its Effect on ECO	Dr. V.P. Bhalekar	Physics	Journal of xidian University	2021	1001-2400	LINK	LINK	YES
14	Novel Pumice@SO3H catalyzed efficient synthesis of 2,4,5-triarylimidazoles and acridine-1,8-diones under microwave assisted solvent- free path,	Mr. A.S. Tambe	Chemistry	Sustainable Chemistry and Pharmacy	2021	2352-5541	LINK	LINK	YES
15	PUMICE@SO3H catalysed ultrasound mediated synthesis of polyhydraquinoline derivatives	Mr. A.S. Tambe	Chemistry	Heterocyclic Letters	2022	2230-9632	LINK	LINK	YES
16	Pumice-based sulfonic acid: a sustainable and recyclable acidic catalyst for one-pot synthesis of pyrazole anchored 1,4-dihydropyridine derivatives at room temperature	Mr. A.S. Tambe	Chemistry	Research on Chemical intermediates	2022	0922-6168	LINK	LINK	YES
17	Green methodology in nanotechnology of metal Nanostructures and its ApplicationsAs a Catalyst : A Review	Mr. A. R. Pagare	Chemistry	Asian Journal of Organic and Medicinal Chemistry	2022	2456-8937	LINK	Printed	YES
18	PUMICE@SO3H catalysed ultrasound mediated synthesis of polyhydraquinoline derivatives	Mr. A. R.Pagare	Chemistry	Heterocyclic Letters	2022	2230-9632	LINK	LINK	YES

19	Pumice-based sulfonic acid: a sustainable and recyclable acidic catalyst for one-pot synthesis of pyrazole anchored 1,4-dihydropyridine derivatives at room temperature	Mr. R. V. Dhawale	Chemistry	Research on Chemical intermediates	2022	0922-6168	LINK	LINK	YES
20	PUMICE@SO3H catalysed ultrasound mediated synthesis of polyhydraquinoline derivatives	Mr. R. N Narode	Chemistry	Heterocyclic Letters	2022	2230-9632	LINK	LINK	YES
21	PUMICE@SO3H catalysed ultrasound mediated synthesis of polyhydraquinoline derivatives	Miss. S. B. Ambadkar	Chemistry	Heterocyclic Letters	2022	2230-9632	LINK	LINK	YES
22	Effect of farm pond algae on productivity in *Cucumis sativus* L. Using aqueous and cow urine extract.	Dr A A Aher	Botany	Bulletin of Environment ,Pharmacology and life Sciences	2021	2277-1808	LINK	LINK	YES

IQAC, Co-ordinator
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PEG-200 as an Assisted Synthesis of Nitriles from Aldehyde and Hydroxylamine under Neutral Conditions

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ABSTRACT

It has been documented that different aldehydes can be converted into the corresponding nitriles in a single pot with the help of PEG-200, an environmentally friendly medium. When aliphatic or aromatic aldehydes were directly combined with hydroxylamine hydrochlorides in PEG-200 under benign circumstances, the resulting aliphatic or aromatic nitriles produced good to outstanding yields. The process described here involves isolating intermediate aldoxime without using any acid or base activators. The produced compounds were described based on their elemental analysis, mass, FT(IR), 1H, and 13C-NMR spectra. The bonding mechanism of the produced compounds may be determined with the help of tT(NMR studies. and

Keywords: Aldehydes, hydroxylamine, nitriles, polyethene glycol-200, green protocol.

1: INTRODUCTION

Nitrile compounds are well-known synthetic precursors that can make amines, amides, amidines, carboxylic acids, and nitrogen-containing heterocycles[1-2]. Nitrile derivatives have numerous applications in synthesising polymers, dyes, pigments, pharmaceuticals, and agrochemicals. Milrinone[3], a nitrile analogue, has antiepileptic activity; perampanel[1], a nitrile analogue, has anti-HIV activity; and rilpivirine[1], which increases heart contractility and decreases pulmonary vascular resistance. Cimetidine[4] is a nonsteroidal aromatase inhibitor, letrozole[5] is a nonsteroidal receptor antagonist, bicalutamide[6] is a nonsteroidal receptor antagonist, and cyamemazine[7] is a typical antipsychotic agent (**Figure-1**).

The synthesis of nitriles can be achieved with alkyl halides and toxic metal nitriles like sodium or potassium cynide, copper cynide (CuCN), and silver cynide (AgCN) by nucleophilic substitution reaction[9-10]. In order to circumvent the use of toxic metal cyanides, the alternative method of dehydration of amides using TsCl/pyridine, Ph_3P/CCl_4, $SOCl_2$, P_2O_5, COCl[10]. Another method for the synthesis of nitrile from amines has been reported by utilising reagents like copper reagents[11], nickel peroxide[12], NaOCl[13], silver reagents[14], OsO_4[15], TCCA/TEMPO[16], I_2NH[10,17] has been reported so far. Furthermore, the synthesis of nitriles has been reported using classical methods such as the Rosenmund-von Braun[18] and Sandmeyer[19] reactions. Nevertheless, both the methods suffer from the use of toxic, stoichiometric amounts of cyanide reagents to get the desired compounds. Another approach for the synthesis of nitrile directly from aldehyde without the isolation of intermediate aldoxime in the presence of different reagents[20]. The dehydrating agents used so far include aq.NH_3/I_2 in THF as solvent,[21] N-methylpyrrolidone[22], red mud/MWI[23], DMSO[24], $Al_2O_3/MeSO_2Cl$[25], graphite/$MeSO_2Cl$[26], TCCA/NH_3[27], and glycerol[28]. These reported methods have several drawbacks, such as drastic conditions, use of expensive catalysts, hazardous reagents, limited scope, and the release of hazardous waste. Therefore, there is still a need to develop a new, efficient, and direct method of nitrile production from aldehydes.

Polyethylene glycol (PEG) is a cheap, nontoxic, and non-volatile solvent that is frequently used as a green solvent in many organic reactions. PEG has good thermal stability and is miscible with a wide range of organic solvents[29].

In continuation of our ongoing research into the development of new synthetic methods for the synthesis of biologically active compounds[30], we present here an efficient catalyst-free protocol for the synthesis of nitriles from aldehydes and hydroxylamine hydrochloride using polyethylene glycol-200 as a green reaction medium (**Scheme-1**).

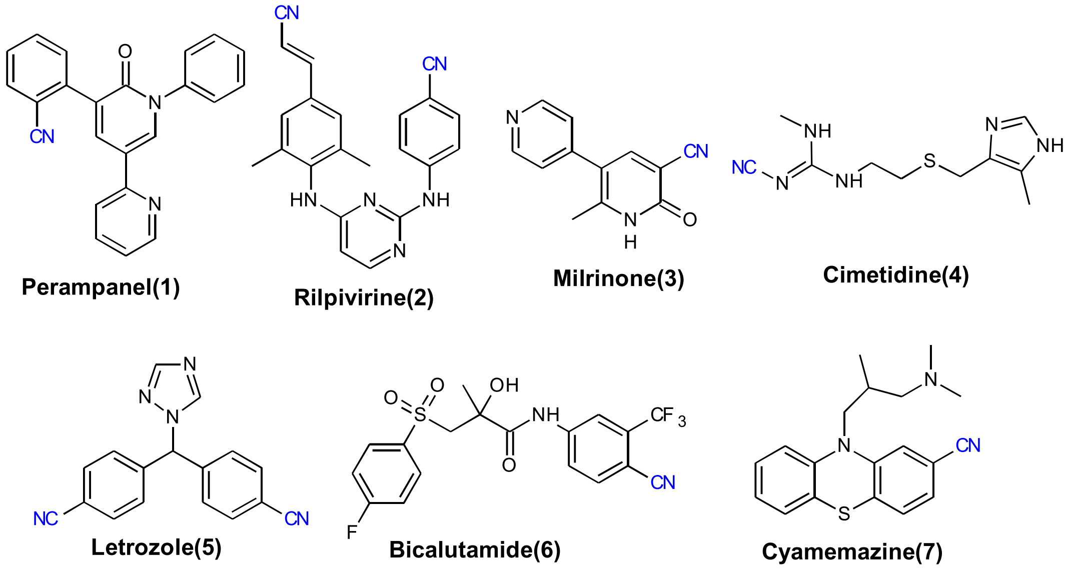
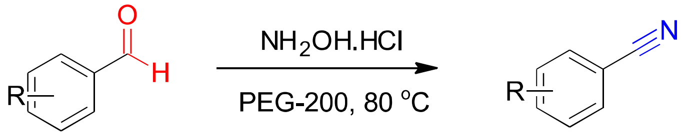


Figure-1: Some biological active nitrile compounds

2: EXPERIMENTAL

2.1: Reagents

Merck Chemical Co., Ltd. supplied 17 aromatic aldehydes (**1a-1r**) and hydroxylamine hydrochloride. Other reagents were purchased from the Loba chemie Company.



1(a-r) **2(a-r)**

Scheme-1: PEG-200 catalyzed synthesis of nitrile from aldehyde.

2.2: Synthesis of Nitriles:

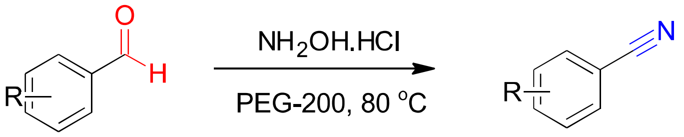
In a single-neck round-bottom flask, aldehydes (**1a** to **1r**) (1.00 mmol) and hydroxylamine hydrochloride (1.05 mmol) were added to polyethylene glycol-200 (4 ml). The reaction mixture was stirred for the time specified in **Table-2** at 80 °C. The reaction mixture was cooled to room temperature and diluted with water after TLC (5% ethyl acetate in hexane) confirmed the completion of the reaction (3 ml). To obtain the crude residue, product (**2a** to **2r**) was extracted in ethyl acetate (3 ml), solvent dried with magnesium sulfate, and solvent evaporated under reduced pressure. The crude residue material was purified using silica gel column chromatography with an ethyl acetate/hexane eluent. The melting point, FT(IR), ^{1}H NMR, ^{13}C NMR, and mass spectra were used to characterized the compounds and compared them to the literatures.

3: RESULTS AND DISCUSSION:

The proposed compound benzaldehyde was selected for the reaction's optimization. In the temperature-dependent reaction of aldehyde **1a** (1 mmol) and hydroxylamine hydrochloride (1.05 mmol) in 4 mL of PEG-200. In a 1:1 molar ratio, substituted aldehydes and hydroxylamine hydrochloride react in a PEG-200 medium. The synthetic nitriles are non-hygroscopic and stable at room temperature. The substituted nitriles are somewhat soluble in hexane, DMF, and DMSO but completely soluble in typical polar organic solvents such as ethanol, methanol, and chloroform. A few physico-chemical investigations, elemental analyses, and spectrum measurements were used to describe the synthesised substituted nitriles. On the basis of their elemental analysis, physico-chemical analysis, and spectrum data, the geometry of the recently synthesised compounds has been clarified. The elemental analysis of the produced substituted nitriles verified their stoichiometry. By calculating the carbon, hydrogen, and nitrogen contents of the produced compounds, it was discovered that the substituted aldehydes and hydroxylamine hydrochloride ratio was 1:1.

The findings showed that when the reaction was carried out at room temperature, no benzonitrile (**2a**) was produced after 24 hours of stirring (as shown by TLC). Since the reaction was proceeding smoothly and benzonitrile **2a** was formed with a 92% yield after 4 hours, the reaction was further investigated by raising the temperature to 80°C (**Table-1**, **entry-3**). Encouraged by the aforementioned results, it was decided to investigate the relationship between nitrile yield and reaction temperature by running the same process at 100 and 120°C for 4 hours. However, after 4 hours, no discernible improvement in yield was seen (**Table-1**, **entry 7** and **8**). Additionally, the aforementioned reaction was carried out at 80°C without the presence of PEG-200, and after 24 hours, no product production was seen (**Table-1, entry 4**). As a result, the reaction at 80°C for 4 hours was selected as the best reaction condition for further research. 35 It's also crucial to remember that it was challenging to advance the reaction when it was carried out with other alcoholic solvents, such as methanol, ethanol, and isopropanol (**Table-1, entry-6**). By contrasting the yield of **2a** with the reported methods, the superiority of the method given here was confirmed (**Table-2**).

In order to gain momentum in the coming reaction optimization, the reaction was carried out using a variety of aldehydes with varied functional groups. It was discovered that the current process works with aliphatic, aromatic, and heteroaromatic aldehydes. The yields of the matching nitriles ranged from good to outstanding (**Table-3**). Spectroscopic data was used to confirm the product's production and to compare it to those described in the literature[28,30-34].



1(a-r) **2(a-r)**

Table-1: Optimization of reaction conditions for the synthesis of nitrile.

Entry	Temperature (^{0}C)	Time(h)	Yield 2a^b(%)
1	RT	24	-
2	50	24	42
3	80	4	92
4	80	24	-^{c}
5	80	24	68^d
6	80	24	-^{e}
7	100	4	92
8	120	4	92

[a] Reactions are performed using the benzaldehyde 1a (1.00 mmol), hydroxylamine hydrochloride (1.05 mmol) in polyethylene glycol-200 (4 ml).

[b] Product isolated yields shows.

[c] Reaction performed without polyethenelycol-200.

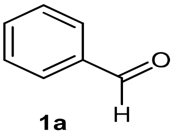
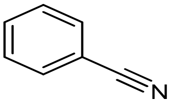
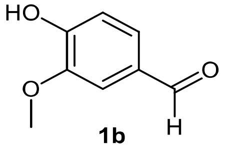
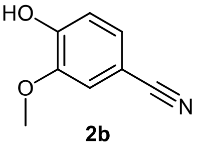
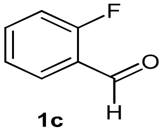
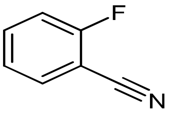
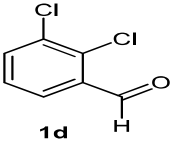
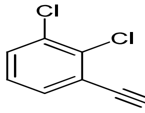
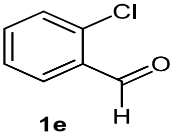
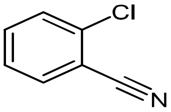
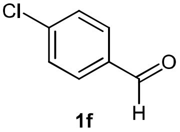
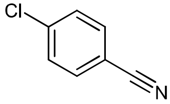
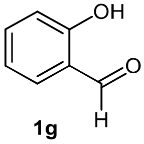
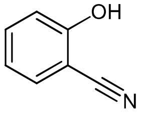
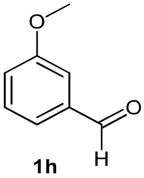
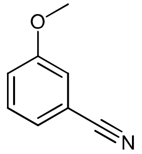
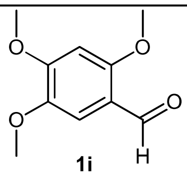
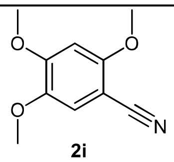
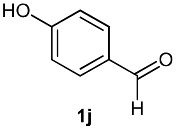
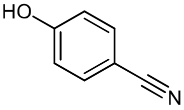
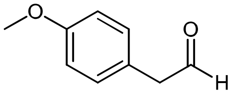
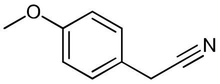
[d] Reaction performed polyethene glycol-400.

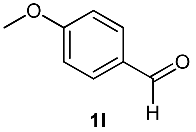
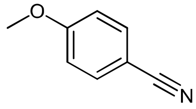
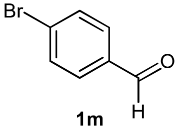
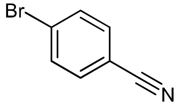
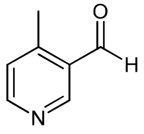
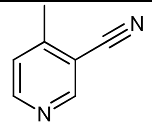
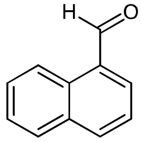
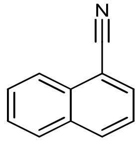
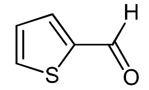
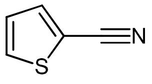
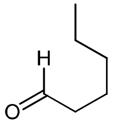
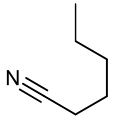
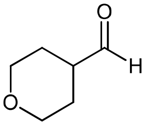
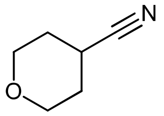
[e] Reaction performed in methanol, ethanol and isopropyl alcohol.

Table-2: Comparison of the yield of 2a with other methods reported in the literature.

Entry	Catalytic System	Yield (%)	Lit.
1.	Aq.NH_3/I_2, THF	82	21
2.	N-methyl-pyrrolidone	86	22
3.	Red mud catalyst/MW	89	23
4.	DMSO/100°C	76	24
5.	Dry Al_2O_3;$MeSO_2Cl$/100°C	90	25
6.	Graphite/$MeSO_2Cl$/100°C	90	26
7.	TCCA/Aq.NH_3/60°C	85	27
8.	Glycerol/90°C	90	28
9.	Present method	92	--

Table-3: Synthesis of nitriles using Polyethylene glycol-200 as solvent.

Entry	**Aldehyde (1)**	**Product (2)**	**Time (h)**	**Yield (%)**	**M.P(^{0}C) or B.P (^{0}C)/Torr**		**Ref**
					Found	**Reported**	
1	 1a	 2a	4	92	187-191	188-190	31
2	 1b	 2b	4.5	87	85-87	86.5	34
3	 1c	 2c	4.0	92	91/21	90/21	31
4	 1d	 2d	4.5	88	58-63	60-64	34
5	 1e	 2e	3	92	43-46	42	28
6	 1f	 2f	3	90	91-93	90-93	31
7	 1g	 2g	5	82	95-97	97	33
8	 1h	 2h	4.5	89	234	233	34
9	 1i	 2i	6	90	67-69	67-68	34
10	 1j	 2j	4.5	77	111-114	112	33
11	 1k	 2k	4.5	92	284-286	286	34

12	 1l	 2l	4	91	60-62	61	32
13	 1m	 2m	3	92	110-113	110-112	31
14	 1n	 2n	4.5	92	238-242	238	34
15	 1o	 2o	5.5	93	35-37	35	33
16	 1p	 2p	4.5	90	190-192	192	32
17	 1q	 2q	7	76	70-71/10	69-70/10	32
18	 1r	 2r	4.5	88	86-87	87	34

[a]Reactions are performed using the benzaldehyde **1(a-r)** (1.00 mmol), hydroxylamine hydrochloride (1.05 mmol) in polyethylene glycol-200 (4 ml) [b] Product isolated yields show.

Spectral Characterization:

The prepared compounds were initially identified based on their mass spectra and elemental studies. In the mass spectra of compounds 2a to 2r, the parent ion peak (m/z) was found at 103, 149, 121, 172, 137, 137, 119, 133, 193.19, 119, 137, 133, 181, 118.14, 153.18, 109, 97.16, and 111.14, respectively.

FT(IR) Spectra:

The characteristics of the functional group connected to the atom can be determined from the FT(IR) spectra. **Table-4** summarises the observed IR wavenumbers and their corresponding assignments. The band's absence caused by the carbonyl group's (C=O), which is present in the area 1685–1695 cm^{-1} in aromatic aldehydes, shows that the **2a–2r** compounds were successfully produced. Strong bands attributed to the aromatic C-H group were visible between 3031 and 3334 cm^{-1} in the FT(IR) spectra of the **2a-2r** compounds. Compared to its value in -CH3 compounds (2860–2935 cm-1), the mode (stretch) for the aromatic-OCH3 group of the compounds 2b, 2h, and 2i is the smaller magnitude at 2852–2862 cm^{-1}. The bands in the area of 3067–3066 cm^{-1} in the FT(IR) spectra of the compounds **2b, 2g, 2j, 2k**, and **2l** are attributed to aromatic ring O–H stretching vibrations. A band of excellent intensity has been seen in the range of 2224-2243cm^{-1} for the aromatic molecule with a group linked to the ring, and attributed to C-N stretching vibrations. The prominent band at 1307 cm^{-1} in the FT(IR) spectra of compound **2c** is attributed to aromatic C-F stretching vibration. The FT(IR) spectra of the compounds **2a** to **2r** revealed a band attributed to the phenolic C=C groups in the 1409–1498 and 1511–1611 cm^{-1}. In the infrared spectra of the **2d, 2e**, and **2f** compounds, bands at 785, 788, and 807 cm^{-1}, respectively, are attributed to aromatic C-Cl deformation modes.

Table-4: FT (IR) spectra of prepared nitriles derivatives

Comp No	Ar C-H	-CN	Ar C=C	-OCH_3	Mono/di/tri sub benz	Ar-OH	C-X
2a	3334	2229	1482/1575	-	638	-	-
2b	3031	2227	1478/1555	3017	797	3229	-
2c	3400	2236	1409/1596	-	708	-	1307
2d	3094	2231	1472/1592	-	765	-	785
2e	3102	2237	1470/1591	-	766	-	788
2f	3307	2238	1468/1575	-	628	-	807
2g	3078	2243	1460/1590	-	771	3071	-
2h	3077	2227	1454/1555	3009	872	-	-
2i	3066	2227	1464/1607	3633/3546/3469	820	-	-
2j	3079	2234	1451/1509	-	837	3273	-
2k	3054	2224	1466/1577	3103	834	-	-
2l	3112	2229	1471/1591	3067	758	-	-
2m	3067	2232	1474/1577	-	750	-	647
2n	3072	2225	1498/1511	3424	755	-	-
2o	3069	2227	1468/1611	-	-	-	-
2p	3066	2225	1471/1591	-	-	-	-
2q	-	2221	-	-	-	-	-
2r	-	2225	-	-	-	-	-

^{1}H NMR Spectra:

The aromatic protons of the phenyl group in the compounds **2a** to **2r**'s ^{1}H-NMR spectra exhibit a multiplet at 6.89–7.95 ppm. The absence of the singlet signal caused by the =CH- proton at 10.00–10.59 ppm in the **2a–2r** compounds suggests that the benzonitriles' nitrile group formed first.

Table-5: ^{1}H NMR spectra of prepared nitriles derivatives

Comp No	Ar Protons	- OCH_3	-OH	-CH_2-/-CH_3
2a	6.90-7.41	-	-	-
2b	6.96-7.23	3.93	6.38	-
2c	7.19-7.69	-	-	-
2d	7.38-7.64	-	-	-
2e	7.40-7.66	-	-	-
2f	7.26-7.62	-	-	-
2g	7.45-7.95	-	7.10	-
2h	6.96-7.23	3.93	-	-
2i	6.89-6.97	3.86	-	-
2j	6.93-7.65	-	-	-
2k	7.11-7.56	3.88	-	2.56
2l	7.58-7.95	3.87	-	-
2m	7.92-8.37	-	-	-
2n	7.28-8.60	-	-	2.32
2o	7.48-7.84	-	-	-
2p	7.22-7.68	-	-	-
2q	-	-	-	2.32
2r	-	-	-	3.23

^{13}C NMR Spectra:

Table-6 shows the ^{13}C-NMR spectra for the **2a–2r** compounds. In **2a-2r** compounds, the carbon of the nitrile group and the carbon of the methoxy group were attributed to the signals in regions 110.63–118.79 and 57.61–58.63 ppm, respectively, in compounds **2a** and **2r**. The C2, C3, C4, and C5 carbon atoms of the phenyl ring, respectively, were attributed to the resonances at regions 129.33-133.78, 129.67-134.78, 130.68-148-32, and 121.63-159.65 ppm. The carbon atom of the -CH_3 group was given credit for the resonance at 144.5 ppm.

Table-6: ^{13}C NMR spectra of prepared nitriles derivatives (in ppm)

Comp No	**Ar C-CN**	**Ar C2**	**Ar C3**	**Ar C4**	**-OCH$_3$**	**C-F**	**Ar C5**	**-CH$_3$**
2a	117.89	132.50	138.68	139.91	-	-	-	-
2b	117.17	129.33	134.92	143.68	57.61	-	-	-
2c	118.67	132.47	138.62	149.67	-	163.5	-	-
2d	117.28	133.68	138.68	130.68	-	-	131.68	-
2e	117.11	132.69	138.22	139.71	-	-	131.55	-
2f	110.76	133.35	129.67	139.53	-	-	-	-
2g	118.23	129.63	137.28	138.63	-	-	159.63	-
2h	116.98	128.53	136.99	148.32	58.63	-	121.63	-
2i	110.63	133.78	137.48	139.98	57.68	-	-	-
2j	119.47	134.16	138.78	136.40	-	-	-	-
2k	118.79	133.99	-	-	-	-		-
2l	113.92	133.95	134.71			-	-	-
2m	118.12	132.61	137.56	134.08				-
2n	118.22	-	-	-	-	-	-	21.33
2o	117.17	-	133.17	-	-	-	-	-
2p	117.69	133.68	134.78	134.78	-	-	-	-
2q	116.97	-	-	-	-	-	-	-
2r	118.09	-	-	-	-	-	-	-

4: CONCLUSION

In conclusion, we have demonstrated a practical, catalyst-free, cost-effective and environment-friendly protocol for directly synthesising structurally diversified nitriles from aldehydes mediated by PEG-200. Based on physicochemical and spectral studies expected structures of prepared compounds are represented in **Table-3**.

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REFERENCES

1. Fatiadi A. J, Patai S. and Rappoport Z.; Preparation and synthetic application of cyano compounds; 2nd Ed, New York, NY: Wiley-VCH; **1983**.
2. Murdoch D. and Keam S.; Drugs; **2005**; 65 (16): 2379-2404.
3. Larock R. C.; Comprehensive Organic Transformation; VCH Publishers: Weinheim, **1989**, 976.
4. Benjamin J., Roy M. and Gulick S; Infectious Diseases (4th Edition), **2017**.
5. Gerard L. Gilbert M., Nicole D. and Jean S.; J. Med. Chem.; **1986**, 29(12), 2433–2438.
6. Fleming F., Yao L., Ravikumar P., Funk L., and Shook B.; Journal of Medicinal Chemistry; **2010**, 53(22).
7. Padwal S., Ugale S. and Gholap S.; Iranian J. Org. Chem.; **2017**, 9(1), 1967-1973.
8. Bassetto M., Ferla S., Pertusati F., Kandil S., Westwell A., Brancale A., McGuigan C.; European Journal of Medicinal Chemistry; **2016**, 118, 230-243.
9. R. Sekharbolla and I. V. Kasiviswanath; J. Label Compd. Radiopharm; **2014**, 57, 82–85.
10. Patil S., et al.; PEG - a versatile conjugating ligand for drugs and drug delivery systems; J Controlled Release; J Controlled Release Soc.; **2014**, 192, 67-81.
11. Yamaguchi J. and Takeda T.; Chem. Lett.; **1992**, 1933.
12. Nakagawa K. and Tsuji T.; Chem. Pharm. Bull; **1963**, 11, 296.
13. Yamazaki S.; Synth. Commun.; **1997**, 27, 3559.
14. Clarke T. G., Hampson N. A., Lee, J. B., Morley J. R. and Scanlon B.; Tetrahedron Lett.; **1968**, 9, 5685.
15. Gao S., Herzig D. and Wang B.; Synthesis; **2001**, 544.
16. Kuang C., Dai H., Lu L. and Huo M.; Synthesis, **2003**, 2629.
17. Iida S. and Togo H; Syn let; **2006**, 2633.

18. Rosenmund KW and Struck E.; Chem Ber; **1919**, 52, 1749.
19. Sandmeyer T.; Ber Dtsch Chem Ges; **1884**, 17, 1633.
20. a) Sharghi H. and Saravari M.; Tetrahedron; **2002**, 58, 10323. b) Ballini R., Fiorini D. and Palmieri A.; Syn let; **1841**.
21. Patel N., Li J. and Johnson D.; Innovative Drug Synthesis; **Chapter-14**.
22. Chakraborti K., Kaur G. and Roy S.; Indian Journal of Chemistry; **2001**, 48B, 1000-1006.
23. Kumar S. H. M., Reddy B. V., Reddy P. T. and Yadav J. S.; Synthesis; **1999**, 586.
24. Khezri S. H.; ARKIVOC; **2007** (XV), 162-170.
25. Chill S. T. and Mebane R. C.; Synthetic Communications; **2009**, 39, 3601-3606.
26. Sharghi H. and Sarvari M. H.; Synthesis; **2003**, 2, 243-246.
27. Veisi H.; Synthesis; **2010**, 15, 2631-2635.
28. Ingale A., Patil S. and Shinde S.; Tetrahedron Letters; **2017**; 58, 4845-4848.
29. Patil U. B. et al.; Synthesis; **2013**, 45, 3295-3299.
30. a) Kahandal S. S., Kale S. R., Gawande M. B., Zboril R., Varma R. S. and Jayaram R.V.; RSC Adv; **2014**, 4, 6267-6274 b) Sun D. and Zhai H.; Catal. Commun.; **2007**, 8, 1027-1030. c) Chen J., Spear S. K., Huddleston J. G. and Roger R. D.; Green Chem.; **2005**, 7, 64-82. d) Namboodiri V. V. and Varma R. S.; Green Chem.; **2001**, 3, 146-148.
31. a) Gholap S. S. and Ugale S. R.; Chemistry Select.; **2017**, 2(24), 7445. b) Ugale S. R. and Gholap S.S.; Chem. Pap.; **2017**, 17(12), 2435. c) Gholap S.S. and Gunjal N.; Arabian J. Chem. **2017**, 10, S2750. d) Gholap S. S. and Sadaphal Y.R.; Sens. Actuators B Chem.; **2017**, 25, 173. e) Gholap S.S.; Eur. J. Med. Chem.; **2016**, 110, 13. f) Gholap S.S. and Gunjal N.; Iranian J. Catal.; **2016**, 8, 147. g) Gholap S.S., Dhakane V.D., Deshmukh U.P., Chavan H.V. and Bandgar B.P.; C. R. Chim. **2014**, 17, 431.
32. Sharghi H. and Sarvari M.H.; Tetrahedron; **2002**, 58, 10323.
33. Ali S. L., Nikalje M. D., Dewkar G. K., Paraskar A. S., Nikalje M. D. and Sudalai; A. J. Chem. Res., Synop.; **2000**, 30.
34. Kumar S. et.al.; Synthetic Communications, **1997**, 27(8), 1327-1333.
35. CRC, Handbook of tables for organic compound identification, 3rd and 54th ed.

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AN EFFICIENT NEW PROCEDURE FOR THE ONE-POT CONVERSION OF ALDEHYDES INTO CORRESPONDING AMIDES USING PEG-200 AS A GREEN SOLVENT

NAVNATH D. GUNJAL, SUNIL S. BHAGAT AND SOMNATH S. GHOLAP

ABSTRACT

The current work describes an effective, unique, and one-pot method for converting different aldehydes into their corresponding amides, employing polyethene glycol 200 as a green solvent and secondary amine and formic acid as catalysts. This method is brand-new and effective for turning different aldehydes into matching amides with good to exceptional yields. This methodology provides a scalable, extremely easy-to-use, and ecologically friendly process. The structure of the synthesised compounds was confirmed using elemental analytical data, FT-IR, NMR (^{1}H and ^{13}C), and mass spectral techniques. The data shows the composition of the 1:1 aldehyde: N, N-methylmethanamine hydrochloride.

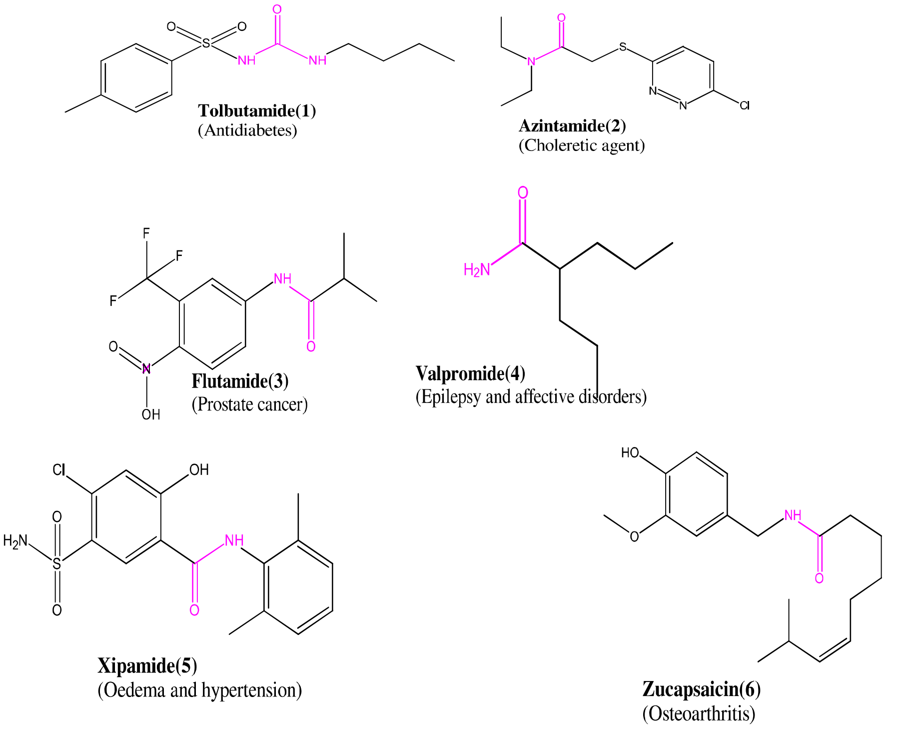
Keywords: Aldehydes, Amides, Formic acid and Polyethylene glycol-200

1. INTRODUCTION

Amide is a functional group consisting of a nitrogen atom attached to a carbonyl group or a carbonyl group with an amide functional group. Carboxamides, sulfonamides, polyamides, and phosphoramides are included in it as conjugate bases of ammonia[1]. Amides are synthetic precursors for nitriles, amines, carboxylic acids, amidines, and compounds with heterocycles containing nitrogen[2]. In addition to being used to create polymers, dyes, pigments, medicines, and agricultural products, amides are also found in biologically active molecules[3]. Dimethylformamide, the most used amide solvent, is particularly beneficial for chemical synthesis in both the chemical and pharmaceutical industries. Numerous physiologically active functionalities are present in plant N-alkylamides[4]. The design of peptidase inhibitors[5], human cytosolic phospholipase[6], and histone deacetylases[7], as well as the inhibition of numerous kinds of proteases, including cysteine, serine, and HIV moiety[8], are all accomplished using alpha ketoamides. The most common method for creating amides currently in use involves coupling a carboxylic acid with an amine; however, this method frequently also requires high temperatures since the amine first deprotonates the carboxylic acid[9]. The most frequent component of amide reactions, which involve activating carboxylic acid to obtain a better electrophile like acid chlorides, anhydrides, or esters, required coupling reagents like benzotriazol-1-yl-oxytripyrrolidinophosphonium hexafluorophosphate (PyBOP), Hydroxybenzotriazole (HOBt), Bis(dimethylamino)methylene (HATU) and 3-(diethoxyphosphoryloxy)-1,2,3-benzotriazin-4(3H)-one (DEPBT)[10]. Amido bond synthesis with boron regulators has been done in the past sts such as Tris (2,2,2-trifluoroethyl) borate and 5-Methoxy-2-iodophenylboronic acid (MIBA). Additionally, the Bodroux reaction[12], the Chapman rearrangement[13], the synthesis of substituted amides from arylaminomagnesium halides and complex esters, the production of aromatic amides through arene with isocyanate catalysed by aluminium trichloride[14], The normal technique of amide creation from alkyl halides via a nitrile intermediate involves particularly poisonous metals such as cyanides like NaCN, KCN, CuCN, and AgCN via the nucleophilic route, increasing carbon chain length during the process. This causes the dehydration of amides by cyanides, TsCl/pyridine, Ph_3P/CCl_4, $SOCl_2$, P_2O_5, and $COCl_2$[15]. The conversion is carried out using a variety of metal-based reagents, such as copper geagents[16], nickel peroxide[17], sodium chloride18, silver reagents[19], OsO4[20], TCCA with TEMPO[21], and I_2NH_3[22]. The conventional methods of Rosenmund-von Braun[23] and Sandmeyer[24] for synthesising amides via aryl nitriles require hazardous stoichiometric amounts of cyanide reagent catalysts to produce pre-functionalized starting materials. The drawbacks of these techniques include the use of very hazardous chemicals that are not commercially accessible, their lack of reusability, improper reaction conditions on a commercial scale, inadequate yields, and their restricted application to industrial levels. New techniques are thus continually being developed for practical monetisation.

The amide biologically active substances include tolbutamide (**1**), used to manage type-2 diabetes; azintamide (**2**), a choleretic agent; flutamide (**3**), a nonsteroidal antiandrogen (NSAA) primarily used to treat prostate cancer; valpromide (**4**), a carboxamide derivative of valproic acid, used to treat epilepsy and some affective disorders; xipamide (**5**); and zucapsaicin (**6**).

Pharmaceutical applications for polyethene glycol-200, from packaging to drug delivery systems, range widely. Their functions in DDS include acting as drug transporters, stabilisers, bioavailability enhancers, and mechanical supports in the form of bone scaffolds. The United States Food and Drug Administration approved polyethene glycol 200 as a biodegradable polymer31 containing many naturally occurring synthetic polymers. It has proven crucial for biocompatibility in numerous pharmaceutical and medical applications. Most employed the conjugating mass medicines in the molecules such as oligonucleotides and RNA[32]. In this, poly polyethene, synthetic scaffolds for spinal nerves, are used to heal spinal cord injuries. The material made of polyethene glycol 200 has good benefits in terms of biocompatibility and degradation, as well as tunable physical and mechanical properties. Daile, various and effective efforts are made to create amide chemistry. There are also more techniques for creating amides from aryl or alkyl halides that use metal cyanides to convert aldehydes to amides via nitrile without isolating the intermediate aldoxime stage while being exposed to a variety of dehydrating agents. The amide synthesised has several acks, including the use of heterogeneous cobalt-based catalysts for amine and various metal catalysts for amide synthesized[35] of Bu4NI/TBHP at higher temperatures and longer time cycles[36], and the requirement of high temperatures when using zinc-catalyst and TBHP. CuI/TBHP/temperature, POPd/N(NMe_2)$_3$, heating conditions, $CuSO_4.5H_2O$/Aq. TBHP/$CaCO_3$; and CuI/TBHP. So, these reported methods have several drawbacks: expensive, conditions reagents, a limited scope, and no treatment method for environmentally hazardous effluent. So therefore, we still need to develop green chemistry and a direct synthesis method for amides from aldehydes.



Tolbutamide(1)
(Antidiabetes)

Azintamide(2)
(Choleretic agent)

Flutamide(3)
(Prostate cancer)

Valpromide(4)
(Epilepsy and affective disorders)

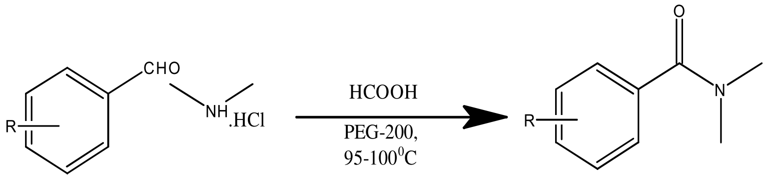
Xipamide(5)
(Oedema and hypertension)

Zucapsaicin(6)
(Osteoarthritis)

Figure-1: Some biologically active amide compounds

2. MATERIALS AND METHODS:

Aldehydes (**1a–1m**) (1.00 mmol), amine (1.05 mmol), and formic acid (1.5 mmol) in polyethene glycol 200 were added to a single neck round bottom flask (3 ml). For the duration listed in **Table-2**, the reaction mixture was heated to 100°C while stirred. Following TLC verification of the reaction's completion, the mixture was cooled to room temperature, and water was added to dilute it (3 ml). The product (**2a** to **2m**) was extracted in 3 ml of ethyl acetate, the solvent dried with magnesium sulphate, and the solvent evaporated under low pressure to yield the crude residue. The residual raw material was refined using high vacuum distillation to obtain the intended product.



1(a-m) **2(a-m)**

Scheme-1:General reaction scheme

3. RESULTS AND DISCUSSION

Environmentally safe solvents with minimal toxicity are employed in several pharmaceutical products51 in this approach to protocol creation. It has been applied to various surfaces in aqueous and non-aqueous conditions as a lubricating coating[52]. It has been used to preserve items like the sea in incidents involving warships and others[53]. Additionally, it serves as a stabiliser and shrinkage preventer when working with green wood. Although not yet in commercial manufacturing, this is also employed as a solid polymer electrolyte in a polymer host. Although numerous organisations worldwide are working to improve solid polymer electrolytes that contain this material to employ it in batteries, electrochromic display systems, and other goods in the future, In the creation of technical ceramics, it serves as a binder[53]. As a result, we demonstrate how to efficiently synthesise amides from aldehydes using a one-pot green procedure using polyethene glycol 200 as a green solvent (**Scheme-1**).

As a result, we have presented a workable, cost-effective green methodology for converting aldehydes to amides via the solvent polyethene glycol 200, with its range and restrictions. The model compound we initially selected for the required amide formations is benzaldehyde. We used polyethene glycol-200 (3 ml) as a solvent to react benzaldehyde 1a (1.00 mmol) with dimethylamine hydrochloride (1.05 mmol), formic acid (1.5 mmol), and it was optimised at a different temperature for the reaction conditions to produce dimethylbenzamide **2a** (**Table-1**). Product **2a** did not occur at room temperature because benzaldehyde did not react as it should have, as stated in **Table-1**. The reaction was further investigated by raising the temperature to 100°C; the reaction proceeded smoothly, and dimethyl benzamide **2a** was obtained with a 93% yield (**Table-1, Sr.No.3**). As a result, a high yield of amide was obtained in polyethene glycol-200 at 100°C (**Table-1, Sr.No.3**). There is more reaction time and temperature improvement but no product yield (**Table 1, Sr.No.7** and **Sr.No.8**), so 100°C was chosen as the reaction temperature. We got very little product when we ran the reaction without the polyethene glycol-200 (**Table-1**, **Sr.No.4**). It is also worth noting that when the reaction was carried out with other alcoholic solvents such as methanol, ethanol, and isopropanol, no or very little **2a** product was formed (**Table-1, Sr.No.6**). In a developed reaction condition, benzaldehyde **1a** (1.00 mmol), dimethylamine hydrochloride (1.05 mmol), and formic acid (1.5 mmol) were added to polyethene glycol-200 (3 ml) and stirred at 100^{o}C for 4 hours to yield 93% dimethylbenzamide **2a** (**Table-1, Sr. No. 3**).

Table-1: Reaction condition optimisation.

Sr. No	Temperature(^{0}C)	Time(h)	Yield 2a^{b}(%)
1	RT	24	-
2	50	24	42
3	100	4	93
4	100	24	27^{c}
5	100	24	90^{d}
6	100	24	-^{e}
7	120	4	89
8	140	4	75

[a]Reactions are performed using benzaldehyde 1a (1.00 mmol), Dimethylamine hydrochloride (1.05 mmol), and Formic acid (1.5 mmol) in polyethylene glycol-200 (3 ml).
[b] Product isolated yields shows.

[c] Reaction performed without polyethene glycol-200.

[d] Reaction performed polyethene glycol-400.

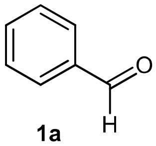
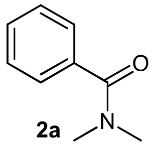
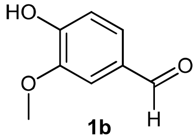
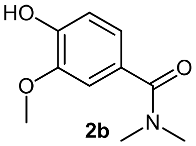
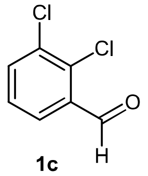
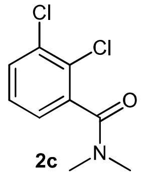
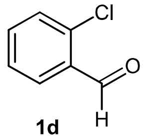
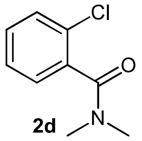
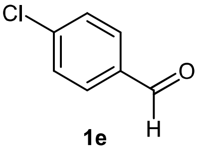
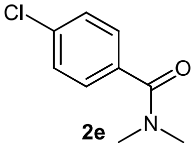
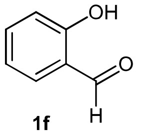
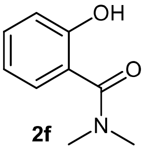
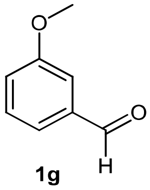
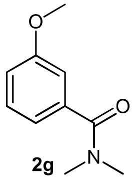
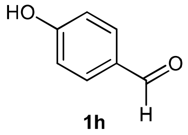
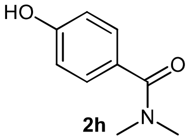
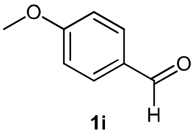
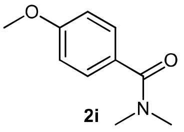
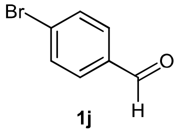
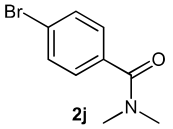
[e] Reaction performed in methanol, ethanol and isopropyl alcohol.

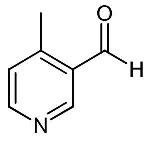
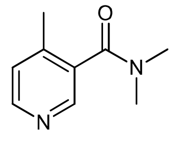
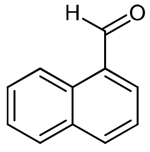
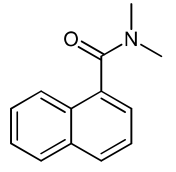
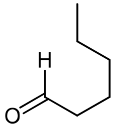
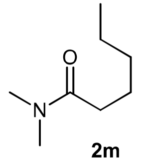
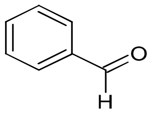
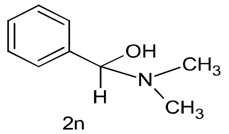
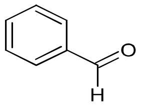
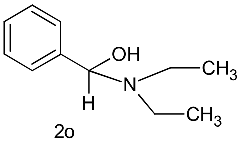
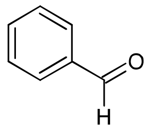
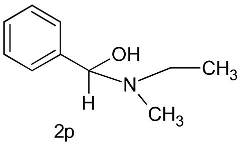
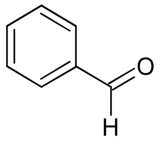
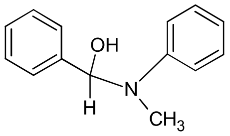
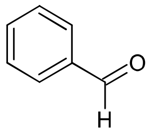
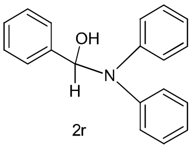
Table-2: Comparison of the yield of 2a with other methods reported in the literature.

Entry	Catalytic System	Yield(%)	Literature
1.	Co@C-N600/TBHP	91	34
2.	$CaCO_3$/CuI/$AgIO_3$	71	35
3.	Bu_4NI/TBHP	73	36
4.	Zinc-catalyst/TBHP	76	37
5.	POPd/$N(NMe_2)_3$	88	38
6.	CuI/TBHP	73	39

7.	$CuSO_4.5H_2O$/Aq. TBHP/$CaCO_3$	67	40
8.	Present method	93	--

Table-3: Synthesis of amides from aldehydes using Polyethylene glycol-200 as solvent.

Entry	**Aldehyde (1)**	**Product (2)**	**Time (h)**	**Yield (%)**	**M.P(^{0}C) or B.P (^{0}C)/Torr**		**Ref**
					Found	**Reported**	
1	 **1a**	 **2a**	4	93	130-132	132-133	41
2	 **1b**	 **2b**	4.5	89	312-314	310-314	42
4	 **1c**	 **2c**	3.5	80	348	345.2	43
5	 **1d**	 **2d**	3	90	107-110/1.5	109/110	44
6	 **1e**	 **2e**	3	89	135-136/1.5	128/130	44
7	 **1f**	 **2f**	5	80	294-295	293	45
8	 **1g**	 **2g**	4.5	90	312-313	314.4	46
10	 **1h**	 **2h**	4.5	75	349-350	342-348	46
12	 **1i**	 **2i**	4	90	200-202/20	196-197	47
13	 **1j**	 **2j**	3	92	310-312	320-325	48

14	 **1k**	 **2k**	4.5	90	300-306	315-325	49
15	 **1l**	 **2l**	5.5	93	360-362	364	47
16	 **1m**	 **2m**	7	70	120/20	123	50
17	 1n	 2n	5	87	100-102	101	48
18	 1o	 2o	5.5	81	103-105	104	51
19	 1p	 2p	6.5	73	102-104	103	52
20	 1q	 2q	7.2	78	107-109	107	53
21	 1r	 2r	7.0	82	115-121	117	54

[a]Reactions are performed using the aldehyde **1(a-r)** (1.00 mmol), Amine (1.05 mmol), and Formic acid (1.5 mmol) in polyethylene glycol-200 (3 ml). [b] Product isolated yields shows

They have optimised the polyethene glycol-200 one-pot transformation of aldehydes to corresponding amides to maintain high efficiency with structurally diverse aldehydes (**Table-2**). The amide formation reaction was completed in less than nine hours for all substrates tested by TLC. Melting points were recorded using an open capillary and were uncorrected. **Table-2** shows that amides were isolated in high yields—the reaction of an aldehyde with dimethylamine hydrochloride results in the formation of hydroxylamine salt **3**. The hydroxylamine salt **3** was then protonated with formic acid with polyethene glycol 200 (4), resulting in a 5-vial electrophilic addition. The expulsion of amides (**2**) from **5** regenerates polyethene glycol-200. A study on using polyethene glycol 200 was not carried out after the optimised reaction conditions. The reaction mass was quenched in water and extracted to solvent after the reaction was completed. The polyethene glycol 200 was miscible in water and difficult to separate.

To reduce pollution, there has been an increasing interest in the design of catalyst-free reactions, the absence of hazardous solvents, and low-cost, recyclable, and environmentally friendly solvents due to their reduced pollution. Catalysts and hazardous solvents are only sometimes eco-friendly or biodegradable, as observed in almost all chemical industries. As a result, our development method based on polyethene glycol-200 is superior and promotes an environmentally friendly method. Polyethene glycol has unique chemical and physical properties, including polarity, nonflammability, a high boiling point, and low toxicity, making it a viable green solvent in organic solvents. As a result, we developed a one-pot, efficient, catalyst-free synthesis of amides from aldehydes using polyethene glycol 200 as a green solvent.

3.1: SPECTRAL CHARACTERIZATION:

The prepared compounds were already identified using mass spectra and elemental studies. The parent ion peak (m/z) was found in the mass spectra of compounds **2a** to **2m** at 149.19, 195.22, 218.08, 183.63, 183.63, 165.19, 179.22, 228.09, 164.20, 199.25, and 143.23, respectively.

3.1.1: FT(IR) SPECTRA:

The properties of the functional group connected to the atom can be determined using the FT-IR spectra. **Table-4** summarises the observed IR wavenumbers and their corresponding assignments. Due to the aromatic C-H band of the prepared compounds, confirmatory broadband was observed at regions 32528-3595cm^{-1} for **2a–2m** compounds. The synthesised compounds' carbonyl (>C=O) group was detected at 1619-1625cm^{-1}. The aromatic hydroxyl band was discovered at 3165-3209cm^{-1} stretching bands. The observed **2a-2m** compounds' N-CH$_3$ band peaks in the 3319-3378 and 3368-3400cm^{-1}.

Table-4: FT (IR) spectra of N, N-dimethylbenzamide derivatives

Comp No	Ar C-H	N-CH$_3$	Ar C=C	C=O	Mono/di/tri sub benz	Ar-OH	C-X/-OCH$_3$
2a	3568	3368/3399	1487/1597	1620	701/749	-	-
2b	3558	3360/3395	1490/1592	1625	702/797	3209	3019
2c	3563	3366/3397	1471/1597	1621	708/775	-	691
2d	3595	3378/3400	1475/1591	1619	765	-	695
2e	3591	3355/3377	1477/1568	1625	705	-	628
2f	3587	3309/3368	1481/1575	1619	780	3194	-
2g	3588	3322/3399	1461/1600	1625	870	-	3010
2h	3581	3328/3392	1460/1591	1623	871	3165	-
2i	3528	3321/3390	1465/1579	1619	735	-	3017
2j	3533	3325/3395	1431/1591	1622	832	-	625
2k	3533	3319/3390	1430/1590	1625	834	-	3041
2l	3530	3321/3391	1476/1596	1620	695	-	-
2m	-	3325/3390	-	-	-	-	3076
2n	3533	3322/3389	1477/1594	-	699	-	-
2o	3531	3225/3390	1476/1594	-	735	-	-
2p	3532	3224/3388	1475/1590	-	738	-	-
2q	3533	3226/3391	1478/1591	-	732	-	-
2r	3530	3225/3390	1477/1592	-	733	-	-

3.1.2: ^{1}H NMR Spectra:

The compounds **2a–2m** DMSO-d$_6$ solution recorded ^{1}H NMR spectra. The number of protons and their chemical transformations were discovered to support the structure of the produced molecules. In the ^{1}H-NMR spectra of the compounds **2a** to **2m**, the aromatic protons of the phenyl group show a multiplet at 7.03–7.98 ppm. The produced **2b, 2g**, and **2i** molecules have methoxy protons visible at 2.64–3.89 ppm. The suggested **2b, 2f**, and **2h** compounds' aromatic hydroxyl protons were found in the 11.02 to 11.56 ppm range. **Table-5** lists some significant **2a–2m** ^{1}H NMR spectral bands and their assigned frequencies.

Table-5: ^{1}H NMR spectra of N, N-dimethyl benzamide derivatives

Comp No	Ar protons	N(CH$_3$)$_2$	-OH	-CH$_2$-/-CH$_3$/ -OCH$_3$
2a	7.39-7.40	3.03	-	-
2b	7.45-7.98	3.05	11.56	3.89

2c	7.03-7.95	3.15	-	-
2d	7.12-7.85	3.08	-	-
2e	7.03-7.77	3.16	-	-
2f	7.11-7.58	3.08	11.02	-
2g	7.20-7.51	3.13	-	3.86
2h	7.15-7.89	3.93	11.45	-
2i	7.08-7.36	3.07	-	3.86
2j	7.81-7.86	3.09	-	-
2k	7.32-7.96	3.09	-	2.64
2l	7.21-7.95	3.13	-	-
2m	-	3.07	-	3.18
2n	7.22-7.96	3.09	-	-
2o	7.21-7.90	-	-	-
2p	7.20-7.88	3.11	-	-
2q	7.25-7.99	-	-	-
2r	7.21-7.92	-	-	-

3.1.3: ^{13}C NMR Spectra:

The number of carbons and their chemical shifts were found to support the geometries of the produced compounds. At 170.68–172.11 ppm, the carbonyl carbon (>C=O) signals of the **2a–2m** were detected. In the areas of 132.55-133.96, 140.18-144.86, 138.19-138.98, 139.03-139.98, and 131.02-131.98 ppm, respectively, were the aromatic rings (C1 to C5) of the **2a-2m**, while the aromatic methoxy carbon atoms of the **2b** and **2g** compounds were discovered at 57.11 and 58.64 ppm.

Table-6: ^{13}C NMR spectra of N, N-dimethyl benzamide derivatives

Comp No	>C=O	Ar C1	Ar C2	Ar C3	Ar C4	Ar C5	$N(CH_3)_2$	$-OCH_3$
2a	171.91	132.67	144.22	138.68	139.91	131.68	38.24	-
2b	171.28	132.55	144.33	138.91	139.68	131.61	38.24	58.64
2c	170.68	133.56	140.18	138.62	139.62	131.78	38.75	-
2d	171.22	133.56	141.28	138.55	139.29	131.29	38.77	-
2e	172.11	133.99	143.52	138.19	139.03	131.78	39.22	-
2f	171.99	133.68	144.11	138.67	139.53	131.68	38.21	-
2g	171.68	133.71	144.78	138.28	139.63	131.19	38.77	57.11
2h	171.92	133.86	143.75	138.99	139.32	131.02	38.13	-
2i	172.01	133.69	144.86	138.44	139.98	131.92	38.68	-
2j	171.29	133.87	144.22	138.69	139.10	131.98	38.93	-
2k	171.66	133.96	143.99	138.21	139.12	131.47	38.99	-
2l	171.69	133.75	143.95	138.76	139.26	131.42	38.63	-
2m	171.16	-	-	-	-	-	38.47	-

4. CONCLUSION

Eventually, the authors demonstrated a practical and cost-effective one-pot protocol for converting aldehydes to amides using polyethene glycol 200 as a green solvent. These method advantages include a broad range of functional groups, the ability to easily apply to large-scale processes with excellent yield, cost efficiency, selectivity, environmental security, and a simple process for preparing the desired product. **Table-3** shows the predicted structures of the produced compounds based on physicochemical and spectral analyses.

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5. REFERENCES

1. Christian A. G. N. and Falque V.; Amide bond formation and peptide coupling; Tetrahedron; **2005,** 61(46), 10827-10852.

2. Fatiadi A. J., Patai S., Rappoport Z, David M. and Keam S.; Drugs; **2005,** 65(16), 2379-2404.
3. Stasi L. P., Artusi R., Bovino C., Buzzi B., Canciani L., Caselli G., Colace F., Garofalo P., Giambuzzi S., Larger P., Letari O. and Toro P.; Bioorg. Med. Chem. Lett.; **2013,** 23, 2653-2658.
4. Boonen J., Bronselaer A., Nielandt J., Veryser L., De Tré Guy; De Spiegeleer; Chemistry, occurrence and functionality of plant N-Alkylamides; Journal of Ethnopharmacology; **2012,** 142(3), 563-590.
5. Ocain T. D. and Rich D. H.; alpha-Keto amide inhibitors of aminopeptidases; J. Med. Chem.; **1992,** 35, 451.
6. Six D. A., Barbayianni E., Loukas V., Constantinou- Kototou V., Hadjipavlou-Litina D., Stephens D., Wong A. C., Magrioti V., Moutevelis-Minakakis P., Baker F. S., Dennis E. and Kokotos G.; synthesis of α-keto amides from aryl methyl ketones with dialkyl formamide; J. Med. Chem.; **2007,** 50, 4222.
7. Jenuwein T. and Allis C. D.; Translating the histone code Science; 2001, 293, 1074.
8. Wasserman H. H. and Petersen A. K.; Synthesis of the Cyclic Peptide Protease Inhibitor Eurystatin A Using Acyl Cyano Phosphorane Methodology; J. Org. Chem.; 1997, 62, 8972.
9. Montalbetti C. and Falque V.; Amide bond formation and peptide coupling; Tetrahedron; **2005,** 61(46), 10827-1085.
10. *Valeur E. and Bradley M. Amide bond formation: beyond the myth of coupling Reagents; Chem. Soc. Rev.;* ***2009,*** *38(2), 606-631.*
11. Sabatini M. T., Boulton L. T. and Sheppard T. D.; Simple catalysts for the sustainable synthesis of complex amides; Science Advances; **2009**, 3(9).
12. Bodroux F.; Amide formation with amino-magnesium compounds; Bull. Soc. Chim France; 1905, 33, 831.
13. Chapman A. W.; J. Chem. Soc., Trans.; **1925,** 127(0), 1992–1998
14. Leuckart R.; Berichte der deutschen chemischen Gesellschaft.; **1885,** 18, 873-877.
15. Yamaguchi J. and Takeda T.; Chem. Lett.; **1992**, 1933.
16. Nakagawa K. and Tsuji T.; Convenient Nickel-catalyzed Oxidation of Primary Amines to Nitriles with Tetrabutylammonium Peroxydisulfate; Chem. Pharm. Bull.; 1963, 11, 296.
17. Yamazaki S.; A Simple and Convenient Method for the Synthesis of Nitriles by Oxidation of Primary Amines with NaOCl in Ethanol; Synth. Commun.; **1997,** 27, 3559.
18. Clarke T. G., Hampson N. A., Lee J. B., Morley J. R. and Scanlon B.; Argentic oxide oxidations of organic compounds; Tetrahedron Lett.; **1968,** 9, 5685.
19. Gao S., Herzig D. and Wang B.; Synthesis; **2001,** 544.
20. Chen F., Kuang Y., Dai H., Lu L. and Huo M.; A Selective and Mild Oxidation of Primary Amines to Nitriles with Trichloroisocyanuric Acid; Synthesis; **2003,** 2629.
21. Iida. S. and Togo H.; Direct and Facile Oxidative Conversion of Primary, Secondary, and Tertiary Amines to Their Corresponding Nitrile; Syn let; **2006,** 2633.
22. Rosenmund K. W. and Struck E.; Aromatic nitriles can be synthesised from the corresponding aryl halides using copper(I) cyanide; Chem Ber.; **1919,** 52, 1749.
23. Sandmeyer T.; Ber Dtsch Chem Ges.; **1884,** 17,1633.
24. Sharghi H. and Saravari M.; Red mud catalysed one-pot synthesis of nitriles from aldehydes and hydroxylamine hydrochloride under microwave irradiation; Tetrahedron; **2002,** 58,10323.
25. Walker S. R.; Trends and Changes in Drug Research and Development; Springer Science & Business Media.; **2012,** p. 109.
26. Stormann H. and Arzneim F.; ARZNAD; **1964,** 14, 266.
27. Taylor and Francis; January **2000**. pp. 466.
28. Kimmel G., Kochhar D. and Baumann; In Vitro Methods in developmental Jasek, W, ed. (2007). Austria-Codex (in German). 1 (2007/2008 ed.), Vienna Österreichischer Apothekerverlag. pp. 600-603.

29. Sałat K., Jakubowska A. and Kulig K.; Expert Opinion on Investigational; Drugs; **2014,** 23(10), 1433-1440.
30. Patil S. et al.; PEG - a versatile conjugating ligand for drugs and drug delivery systems. J Controlled Release; J Controlled Release Soc.; 2014, 192, 67-81.
31. Katrin K., Richard H., Dagmar F. and Ulrich S.; Poly(ethylene glycol) in Drug Delivery: Pros and Cons as Potential Alternatives; Angew. Chem. Int.; Ed. 49, **2010,** 6288-6308.
32. Xian-bin K., Qiu-yan T., Xu-yi C., Yue T., Shi-Zhong S. and Zhong-lei S; Polyethylene glycol as a promising synthetic material for repair of spinal cord injury; Neural regeneration research, **2017,** 12(6).
33. Cuihua B., Xianfang Y. and Yingwei L.; Easy Access to Amides through Aldehydic C–H Bond Functionalization Catalyzed by Heterogeneous Co-Based Catalysts; ACS Catal.; **2015,** 5, 884-891.
34. Yoo W.J. and Li C.J. J.; Highly Efficient Oxidative Amidation of Aldehydes with Amine Hydrochloride Salts; Am. Chem. Soc.; **2006,** 128, 13064-13065.
35. Liu Z., Zhang J., Chen S., Shi E., Xu Y. and Wan X.; Direct synthesis of amides catalysed by Bu4NI with TBHP as an oxidant; Angew. Chem.; Int. Ed.; **2012,** 51, 3231-3235.
36. Zhang M. and Wu X.-F.; Tetrahedron Lett.; 2013, 54, 1059-1062.
37. Kekeli E. and Christian W.; New Colorimetric and Fluorimetric Chemosensors Based on Bithienyl-Imidazo-Anthraquinone Chromophores; Org. Lett.; 2007, 9(17), 3201-3204.
38. Dao-Qing D., Shuang-Hong H., Hui Z. and Zu-Li W.; Chinese Chemical Letters; **2017,** 1353-1357.
39. Dai W., Liu Y., Tong T., Li X. and Luo F.; Rh(III)-catalysed oxidative amidation of aldehydes: An efficient route to N-pyrazinamide and imides; Chin. J. Catal; **2014,** 35, 1012-1016.
40. Schroder N., Wencel-Delord J. and Glorius; High-Yielding, Versatile, and Practical [Rh(III)Cp*]-Catalyzed Ortho Bromination and Iodination of Arenes; J. Am. Chem. Soc.; **2012,** 134, 8298-8301.
41. Lieberman S. V.; Journal of the American Chemical Society; **1955,** 77(5), 1114–1116.
42. Subhedar D., Gupta S. and Bhanage B.; Direct Synthesis of Amides from Oxidative Coupling of Benzyl Alcohols and N-substituted Formamides Using a Co–Al Based Heterogeneous Catalyst, Catalysis Letters; **2018,** 148(10), 3102-3111.
43. Carl L. Y.; Thermophysical Properties of Chemicals and Hydrocarbons; **2014.**
44. Knochel P. and Yamada S.; Synthesis; **2010**, (14), 2490-2494.
45. Zhang F., Li L., Zhang J. and Gong H.; Scientific Reports; **2019,** 9(1), 1-6.
46. Ong D., Yen Z., Yoshii A., Revillo I., Takita R. and Chiba S.; Angewandte Chemie, International Edition; **2019,** 58(15), 4992-4997.
47. Sattler H. J. and Schunack W.; Chemische Berichte; **1975,** 108(3), 730-734.
48. Chaudhari M., Bisht G., Kumari P. and Gnanaprakasam B; Organic & Biomolecular Chemistry; **2016,** 14(39), 9215-9220.
49. Sheftel V.; CRC; **2000,** 1114–1116.
50. Nalam P. Clasohm J., Mashaghi A. Spencer N.; Tribology Letters; **2009,** 37(3), 541-552.
51. Lars-ÅkeKvarning B; **1998,** 133-141.
52. Schneider S.; Engineered Materials Handbook: Ceramics and Glasses; **1991,** 4, ASM International, 49.

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Bengal, Past and Present

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LIQUIDITY ANALYSIS OF CO-OPERATIVE SUGAR FACTORIES IN MAHARASHTRA

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Abstract

Liquidity analysis is measures the ability of the firm to meet its short term obligations and it indicates its short term financial strength. The current ratio is one of the most popular measures of financial strength. This ratio provides an indication of the liquidity of the business by comparing the amount of current assets to current liabilities. Liquid ratio measures how well company can pay its debts without selling inventory. It is just like a current ratio except its takes inventories out of the analysis. A liquid ratio above 1.00 generally indicates the company can meet its obligations

Keywords: Liquidity, Current Ratio, Liquid Ratio, financial, current assets, current liabilities, liquid assets, liquid liabilities, sugar, sugar factories.

Introduction

Liquidity analysis is measures the ability of the firm to meet its short term obligations and it indicates its short term financial strength. In order to stay in business a firm should be able to pay its obligations as they become due even when profits are low and cash flows are tight. To do this a firm has to maintain some reserve that can be used to cover cash flow deficits in the short run. These reserves can either be in cash or they can be a line of credit.

The availability of credit centers in part on whether a firm has the ability to come up with some cash within a year. This ability to come up with cash quickly is known as liquidity. A business is said to be liquid if it has the ability to raise the cash that is needed to pay all financial obligation.

Objective of the Study

1. To study liquidity analysis of selected co-operative sugar factories
2. To study financial strength of co-operative sugar factories by using the current ratio
3. To test the ability of co-operative sugar factories to meet its current obligations with the help of liquid ratio.

Research Methodology

The present study is depends upon secondary data. The secondary data were collected from the Govt. authorities, reference books, Periodicals, reports, newspapers & Internet. The annual report from 2009-10 to 2015-16 of selected Co-operative sugar factories has been used to collect the information.

Current Ratio

The current ratio is one of the most popular measures of financial strength. This ratio provides an indication of the liquidity of the business by comparing the amount of current assets to current liabilities. This measure of liquidity reflects how current assets are available per rupee off current liability.

In general every business prefers to have at least one rupee of current assets for every rupee of current liabilities. At minimum one wants to this ratio to be equal to one. A value of 1.25 or greater is desirable for this ratio. However the normal current ratio fluctuates from industry to industry. A current ratio significantly higher than the industry average could indicate the existence of redundant assets. Lower current ratio than the industry average could indicate the lack of liquidity.

A current ratio of 2:1 or higher is looked upon well. This ratio indicates that the firm is able to meet all debts and if the business gets in trouble they can liquidate the assets of the business and get their money

हिंदी सिनेमा और मेरा भारत देश : एक सांस्कृतिक अध्ययन

डॉ. दादासाहेब नारायण डांगे
सहयोगी प्राध्यापक, हिंदी विभाग,
कला, विज्ञान एवं वाणिज्य महाविद्यालय, राहाता

भूमिका :

देश एक व्यापक संकल्पना है। विश्व म विभिन्न देश है, जिन्ह हम राष्ट्र, वतन, मुल्क आदि कई नामों से परिभाषित करते हैं। परंतु असल म देश यह संकल्पना है क्या, यह समझना अत्यंत महत्त्वपूर्ण है। अपने देश के प्रति हर व्यक्ति के मन म प्रेम की भावना निहित होती है। परंतु केवल मन म प्रेम की भावना होने से कुछ नहीं हो सकता। उसके लिये देश को व्यापक रूप से समझने की जरूरत है। उसका सांस्कृतिक अध्ययन करने की आवश्यकता है। मेरे खयाल से हिंदी सिनेमा के माध्यम से हम देश नामक संकल्पना को अत्यंत सूक्ष्मता के साथ समझ सकते हैं। भारतीय सिनेमा ने हम ऐसी अनेक फिल्म दी है, जो देश को परिभाषित करने म सार्थक सिद्ध हुई है। उनम से कुछ प्रमुख फिल्मों के द्वारा हम देश का सांस्कृतिक अध्ययन करने का इस शोध आलेख म प्रयास कर रह हैं। जिससे हिंदी शोधार्थियों को निश्चित लाभ मिल सकता है।

संकेत शब्द :

हिंदी सिनेमा, मराठी फिल्म, भारत, सांस्कृतिक अध्ययन, मनोज कुमार

देश, वतन, राष्ट्र आदि कई नाम हैं, जिन्ह, हम बचपन से सुनते आए हैं; परंतु पहली बार हम सही मायने म अपने देश की पहचान तब होती है, जब हम स्कूल म प्रतिज्ञा लेते हैं कि, भारत मेरा देश है। उसके बाद इतिहास के पन्नों से तथा भौगोलिक अभ्यास से अपने देश की संस्कृति, उसका सांस्कृतिक वैभव, उसका वैविध्य धीरे-धीरे हमारे सम्मुख आने लगता है। तब हम समझ म आता है कि, ऐसा है अपना भारत देश, जो सांस्कृतिक दृष्टि से विश्व म सबसे महान देश है। देश की संकल्पना को जानते समय वहां के लोग, उनकी प्रवृत्तियां, परंपराएं, वेशभूषा, भाषा तथा भौगोलिक विविधता को जानना आवश्यक है। देश का अर्थ केवल किसी एक भूखंड पर अथवा भू-भाग पर रहनेवाले लोग नहीं हैं। लोगों के साथ-साथ उस भू-भाग पर स्थित पेड़-पौध, नदियां, पर्वत, ऐतिहासिक स्थल, पशु-पक्षी, उनके संबंध म सुनाई जानेवाली अच्छी- बुरी कथाएं, मिथक तथा अन्य विशेषताओं का समावेश होता है। प्रत्येक व्यक्ति अपने-अपने तरीके से देश को परिभाषित करने का प्रयास करता है। देश नामक संकल्पना को अपने लेखों, कविताओं तथा अन्य साहित्य प्रकारों के माध्यम से स्पष्ट करने का प्रयास करता है। परंतु आज इस लेख के माध्यम से सभी के सामने हिंदी तथा मराठी फिल्मों ने देश की संकल्पना को गीतों के माध्यम से किस प्रकार स्पष्ट किया है, उसका जिक्र कर रहा हूं। हिंदी फिल्मों म चित्रित कुछ गीतों

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Pumice-based sulfonic acid: a sustainable and recyclable acidic catalyst for one-pot synthesis of pyrazole anchored 1,4-dihydropyridine derivatives at room temperature

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Abstract

In the present investigation, we have developed an efficient and eco-friendly protocol for the synthesis of pyrazole anchored 1,4-dihydropyridine analogs using pumice-based sulfonic acid (pumice@SO_3H) as a recyclable solid acid catalyst under simple stirring at room temperature. The present protocol proceeded smoothly with 1,3-diaryl pyrazole-4-carbaldehydes, ethyl acetoacetate, and NH_4OAc in ethanol as a solvent with excellent yield. The pumice-based sulfonic acid catalyst is easily prepared from naturally occurring pumice by simple agitation with chlorosulfonic acid. The key features of this catalyst are its heterogeneous nature, high porosity, non-corrosive and non-toxic nature, recyclability, stable and highly efficient at room temperature. The application of this catalyst makes the protocol more environmentally benign.

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Novel Pumice@SO_3H catalyzed efficient synthesis of 2,4,5-triarylimidazoles and acridine-1,8-diones under microwave assisted solvent-free path

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ABSTRACT

In the present investigation, new heterogeneous catalyst pumice supported sulfonic acid (pumice@SO_3H) was prepared from natural pumice by simple agitation with chlorosulphonic acid. The catalytic performance of a pumice@SO_3H was investigated for the synthesis of 2,4,5-triaryl imidazoles and acridine-1,8-diones under microwave (MW) assisted solvent-free condition. The pumice@SO_3H was stable and exhibits a good Brønsted acidic character. The beneficial characteristic features observed with this protocol are the recyclability of catalyst, the solvent free approach, the applicability to a wide variety of substrates, good to excellent yields, and easy to use. The catalyst pumice@SO_3H with MW has been increased the green chemistry value of this method.

1. Introduction

Pumice is a naturally occurring volcanic material which has attracted attention due to various outstanding features associated with it such as high abundance, cheaply available, high porosity, large surface area, light weight and non-toxic nature. The presence of a high percentage of silica and a good number of hydroxyl groups makes it suitable as a backbone to develop new heterogeneous solid acid catalysts. The pumice supported materials have been employed as heterogeneous catalysts in numerous organic transformations (Yuana et al., 2012; Venezia et al., 2001; Alver et al., 2016; Deganello et al., 2000). Due to the presence of huge numbers of hydroxyl groups, Pumice has been converted into several active catalysts such as acidic (Maleki et al., 2020), nano-composites (Valadi et al., 2020), and metal supported catalyst (Liotta et al., 2001; Duca et al., 1995). This volcanic pumice material has also been used as adsorbents (Bekaroglu et al., 2010) and as photo catalysts in the water treatment (Rao et al., 2003).

The microwave assisted reactions is a well established green, and the minimum time consuming path used for the synthesis of a number of *N*-heterocycles by MCRs. The microwave protocol provides a clean, efficient, quicker, simple and powerful dielectric heating for the construction of complex heterocyclic compounds (Ahankar et al., 2016; Shirole et al., 2017, 2018; Mullassery et al., 2018; Bhatt et al., 2018; Magyar and Hell, 2019; Ulus et al., 2016; Zhu et al., 2017; Alirezvani et al., 2019). The multicomponent reactions (MCRs) have fascinated exceptional protocol for one pot synthesis of diverse heterocyclic compounds. The interesting characteristic features of MCRs are their high atom economy, synthetic efficiency, single operation, and simplicity (Aute et al., 2020; Bienayme et al., 2000; Harikrishna et al., 2020; Naeimi and Didar, 2017; Kiyani and Ghorbani, 2015; Alinezhad et al., 2020; Thwin et al., 2019). The synthesis of 2,4,5-triarylimidazole (Maleki et al., 2015), and acridine-1,8-diones (Yu et al., 2017) are provides the significant illustrations of multicomponent reactions. The imidazole and 1,4-dihydropyridine scaffolds are the important class of heterocyclic compounds, exhibit promising biological and pharmaceutical activities (Gong et al., 2016; Weinstein et al., 2007; Trommenschlager et al., 2017; Takle et al., 2006; Gunduz et al., 2014; Periyasami et al., 2019; Bhosle et al., 2020; Naouri et al., 2020; Joubert and Kapp, 2020; Jamalian et al., 2011) and also found as a core in various natural products (Fig. 1). Some imidazole derivatives are also used in the preparation of ionic liquids which have played a dual role in synthetic organic chemistry as a catalyst as well as solvents (Alinezhad et al., 2017; Nejatianfar et al., 2018; Ngugyen et al., 2019; Shirole and Shelke, 2016).

The imidazole and pyridine based ligands shows a strong coordination capability and resourceful coordination sites (Guo et al., 2013). They display the properties such as luminescence and gas adsorption (Chen et al., 2014; Li et al., 2018), luminescence and magnetic properties (Li et al., 2020), thermal and solid-state fluorescence, anion sensors

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IONIC LIQUID MEDIATED ONE POT SYNTHESIS OF 2,4,5-TRIARYLIMIDAZOLES FROM 1,3-DIARYL PYARAZOLE CARBALDEHYDES UNDER SOLVENT-FREE CONDITION

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Abstract:

A facile protocol has been established for the one-pot synthesis of 2,4,5-trisubstituted imidazoles derivatives via three-component condensation of 1,3-diaryl pyrazole aldehydes, benzil and ammonium acetate in the presence of catalytic amount of a ionic liquid $[HNMP][HSO_4]$ as an catalyst under solvent-free condition. The significant features of this protocol include high-atom economy, smooth work-up procedure, inexpensive catalyst, easy for handling, shorter reaction time, high yield, multi-component approach and solvent-free reaction.

Keywords:

1,3-diaryl pyrazole aldehyde, imidazole, benzil, multi-component strategy, ionic liquid, solvent free etc**.**

Introduction:

In the last decades, Ionic liquids (ILs) has attracted the interest of the scientific community, due to their versatile properties and their applications in organic synthesis, catalysis, biocatalysis. The ILs are an excellent alternative to substitute volatile organic solvents in more eco-friendly technologies, due to their various outstanding properties such as low vapor pressure, thermal and chemical stability, catalytic activity, non-flammability and non-corrosive nature[i, ii].

The multicomponent reaction has a great importance due to various properties such as high atom economy, one step operation, short reaction time, used for synthesis of various heterocycles. The synthesis of 2,4,5-triaryl imidazole derivatives is an important illustration of multicomponent reaction[iii]. They are synthesized via three component condensation of aldehyde, benzil and ammonium acetate in the presence of various catalysts such as nanomaterials, metal catalyst, zeolites, metal supported catalyst, and acidic as well as basic catalyst. Also, various ionic liquids (ILs) are used as an efficient catalyst for the synthesis of 2,4,5-triaryl imidazole derivatives[iv-viii].

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PUMICE@SO_3H CATALYZED ULTRASOUND MEDIATED SYNTHESIS OF POLYHYDROQUINOLINE DERIVATIVES.

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Abstract:

A sustainable and convenient protocol is developed for the synthesis of polyhydroquinoline derivatives under ultrasound irradiation at 45°C in the presence of pumice anchored sulfonic acid (Pumice@SO_3H) as a recoverable catalyst. These polyhydroquinolines were synthesized from aldehydes, dimedone, ethylacetoacetate and ammonium acetate by Hantzsch reaction. The attractive features of the present protocol are green approach, good yield, recovery of catalyst, easy work-up procedure and simple purification of product whereas the catalyst offers simple preparation, high catalytic activity, inexpensive, easy to use, recyclability and stability.

Keywords:
Pumice@SO_3H, polyhydroquinolines, ultrasound irradiation, dimedone, etc.

Introduction:

Pumice stone obtained due to volcanic eruptions has many advantages such as abundance, availability, large surface area, low cost, non-homogeneous nature, and excellent stability. Also due to the remarkable properties such as high porosity and high adsorption capacities have gained much interest in the field of catalysis. In recent years, the volcanic pumice converted into variety of supported active catalytic materials such as pumice@SO_3H[i, ii], Pd–Ag catalysts supported on pumice[iii], Pumice-modified cellulose fiber[iv], Volcanic based hybrid nanocomposite[v], Pumice supported Pd catalyst[vi], Immobilization of TiO_2 on pumice stone[vii], iron-coated pumice[viii, ix], pumice-supported Pd–Cu catalysts[x], etc.

Multi-component reactions (MCRs) are a constructive approach to synthesize heterocyclic compounds with diverse structures. In MCRs, more than two components reacts together in single step to produce a targeted heterocyclic system without isolation of any intermediate. Due to this, requires short time, reduce energy requirement, reduce quantity of precursors, and are useful to increase atom economy. The Hantzsch reaction is one of the most important examples of multicomponent reaction which is used for synthesis of polyhydroquinoline derivatives[xi, xii]. The polyhydroquinoline derivatives is of great attention due to their various activities such as anti-cancer, anti-diabetic, anti-hypertensive, anti-inflammatory, anti-microbial, anti-

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CITRUS LEMON JUICE MEDIATED A COST EFFECTIVE ONE POT EFFICIENT SYNTHESIS OF 1, 4 DIHYDROPYRIDINES

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Abstract: Citrus lemon juice is found to be an efficient natural organo catalyst for the one pot three component synthesis of 1, 4 dihydropyridines using aromatic aldehydes, ethyl acetoacetate and ammonium acetate at 80°C under solvent-free condition. The crucial features of this protocol are use of non-toxic and readily available natural catalyst, good to excellent yield, green synthesis, solvent-free condition and shorter reaction time with no by-products.

Keywords: 1, 4 dihydropyridines, citrus lemon juice, green synthesis, natural catalyst, solvent-free condition.

Introduction

Nowadays, the pollution related issues have become a major concern. In this context the green approach for the synthesis of organic molecules of biological significance has gained importance. In multicomponent reaction (MCR) three or more reactants combine to form a product[i]. The product molecule is obtained in one step and one pot. The multicomponent reactions have advantages such as atom economy, selectivity, efficiency and no by-products[ii]. The organic Bronsted acids and amines were used as homogeneous catalyst in multicomponent reactions. The Lewis acid supported on solid materials is also used in multicomponent reactions[iii].

The naturally occurring catalyst becomes important due to features such as green, cheap, easily availability and safe. The fruit juice is employed in to execute the multicomponent organic reactions due to its catalytic properties[iv, v]. One of them is lemon juice which contains citric acid (5-7%), ascorbic acid (0.5%) and other organic acids having pH in acidic region[iv]. The lemon juice is useful in the treatment of arthritis and rheumatism, heart disease, cancer prevention, high blood pressure, prevents kidney stone, asthma and etc[iv]. The citrus lemon juice has properties such as antioxidant and antimicrobial, pharmacological, anti-inflammatory, anti-cancer, antiallergy, cardiovascular protection, neuroprotective and hepato protective[vi-ix]. Recently, the juice of citrus lemon is also used as a catalyst in different organic reaction[x-xiii].

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TEA POWDER WASTE: AS A GREEN CATALYST FOR THE SYNTHESIS OF 1-AMIDOALKYL 2-NAPHTHOLS

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Abstract: Tea powder waste is used an efficient natural green catalyst for the one pot three component synthesis of amidoalkyl naphthol using aromatic aldehyde, 2-naphthol and acetamide at reflux condition. The catalyst could be recovered and reused at least five times without appreciable decreasing the catalytic activity. The nontoxic solvent, excellent yield, short reaction time, green synthesis and natural eco-friendly catalyst are the advantages of present protocol.

Keywords: Amidoalkyl naphthol, green synthesis, natural catalyst.

Introduction

In organic synthesis multi-component reaction are used due to its selectivity and high atom economy. In Ritter type reaction the formation of C-N gives N-alkyl amide compounds are of biologically active ingredients[i]. This type of reaction is associated with condensation of aryl aldehydes, beta naphthol and acetamide in presence of different catalysts like silica sulphuric acid[ii], $Ce(SO_4)_2$[iii], $HClO_4$-SiO_2[iv], $FeCl_3$-SiO_2[v], montmorillonite K10[vi], Ag nanoparticles[vii], bismuth (III) nitrate pentahydrate[viii], nano sulphated zirconia[ix], nano-graphene oxide[x], magnetic nano-Fe_3O_4@SiO_2@Hexamethylene tetramine supported ionic liquid[xi], tetrachlorosilane[xii], $K_5CoW_{12}O_{40}\cdot 3H_2O$[xiii] and cation-exchanged resins[xiv]. The reported methods have some limitations such as use of toxic reagents, tedious work up, hazardous solvent, high reaction temperature and formation of by-products. Therefore, it become a challenge to develop new cost-effective method for synthesis of 1-amidoalkyl-2-naphthols.

According to Research Department of India the consumption of tea powder in India was approximately 1.1 billion kilograms during the financial year 2021. So, the large amount of waste tea powder was introduced in the environment. The tea powder consists of carboxylate, aromatic, phenolic, hydroxyl groups, oxyl groups, carbon and calcium[xv]. The tea waste was used as adsorbent for the removal of dyes and heavy metals[xv]. The attempt was

OPTIMIZATION OF FUZZY LOGIC CONTROLLER USING GENETIC ALGORITHM:

A SIMULATION STUDY ON GREENHOUSE CLIMATE CONTROL SYSTEM

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Abstract

Fuzzy Logic Controllers are used in variety of Control Applications due its superior performance. The control action can be made more and more efficient if the Fuzzy systems are tuned properly. This tuning can be done with help of Genetic Algorithm(GA). In this paper we have presented simulation of Fuzzy Logic Controller (FLC) implemented in Simulink model of Greenhouse. This FLC is tuned by using GA and its performance is studied. The control of greenhouse temperature is studied with FLC and GA tuned FLC. The Simulink Models are Simulated under various climate conditions and results are studied. The GA-FLC shown better performance.

Keywords: *Fuzzy Logic Controller, Genetic Algorithm, Tuning of FLC, Greenhouse Climate Control.*

1. Introduction

In 1965 Lotfi A. Zadeh put forth the idea of Fuzzy Set Theory to describe precise information of system dynamics. It is based on human capability of reasoning and interpretation [1]. In fuzzy sets the imprecise information is presented by using linguistic terms instead in crisp or mathematical form. A temperature parameter can be expressed as 15ºC, 30ºC or 45ºC according to observations. In Fuzzy Logic it is expressed as *'cold',*

Novel Corona Virus Pandemic-Impact on Indian Economy, E-commerce, Education and Employment

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Novel Corona Virus Pandemic-Impact on Indian Economy, E-commerce, Education and Employment

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Abstract- The novel Corona virus (n-CoV-2) pandemic entered India from Wuhan, China. It invaded rest of the world including India in the month of March. The lockdown (25 March-03 May 2020) was set in motion by Indian and respective state governments, because of which the virus transmitted with a slow rate as compared to other countries. On the one hand, environment has been temporarily healing from these 40 days lockdown, on the other, there is a massive downfall/wreck/breakdown in the stock market. The Indian Government has taken numerous initiatives for the "Aam-Janta", to ease the impact of this Pandemic. The pandemic has disturbed every sphere of life in the country ranging from agriculture, economy, business sector, education and so forth as a result of the lockdown. Therefore, the current article attempts to explore the effect of novel corona virus, its transmission in India, discusses its impact and also seeks to suggest various ways to overcome this unprecedented situation on various aspects from economy to employment and ecommerce to education.

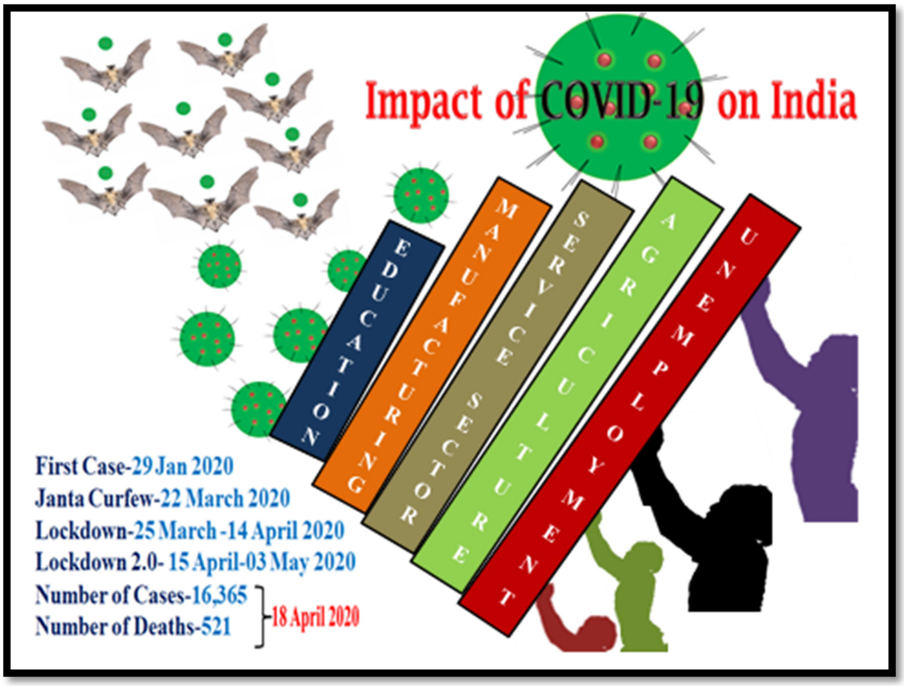

Fig.1 Graphical abstract- Impact of COVID-19 on India

Introduction- India, the second largest population in the world, is aware of the tremors that hit almost every corner of the world. The World Health Organization (WHO) declared the COVID-19 as a Pandemic[1] on 11 March, 2020. The first case of SARS-CoV-2 was found in India[2] (Kerala State) on 29 Jan 2020, the students travelling back from Wuhan, had symptoms of the virus and then later on till 01st March, 2020 there were only 03 cases. Until

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Novel Corona Virus (COVID-19) Pandemic: The Overall Scenario and its Effect on ECO

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Abstract- The world is suffering from a small species of diameter 65-125 nm and length of about 26-32kbs. A virus which was initially named as SARS-CoV-2 belongs to beta coronavirus group. Later on it is named as novel corona virus (2019-nCov) or COVID-19. The world health organization declared it as a Pandemic on 11 March, 2020. This is biggest manmade disaster, which could be stopped in the initial stage but now it has taken 21% lives of the total closed cases, this toll certainly advances to more than 30% worldwide. The death tolls of COVID-19 are very large as compared to combination of previous SARS and MARS, Ebola and all other viruses. At the current scenario China is recovering but it locked down the rest of the world. The virus which is originated from China now spreads in more than 200 countries and two international conveyances. In the current article the world's perspective, origin, symptoms, medication, transmission and its effect on worlds ECO (-nomy, -logy, -tourism, -politics, -terrorism) is discussed.

Introduction-The world faced numerous pandemics and it costs many human lives through the years. The viruses spread from animals to human, but the counterpart of the transmission will also be possible. This is the worst intense pandemic, after 1918-19 flu in which almost one third of the world's population was infected and 50 million causalities were reported. From 2003 epidemics like Severe Acute Respiratory Syndrome (SARS), 2012-Middle East Respiratory Syndrome (MERS) and others like NL63, HCoV-NH, HKU1, H1N1, Ebola etc.[1] were attacking the human life cycle. SARS-CoV emerged in China, where wild animal traders and individual animals slaughters were tested positive[2]. The novel corona virus, 2019-nCoV (SARS-CoV-2) originated in Wuhan-China[3] (Probably transmission through sea food Market) causes above 80 k deaths and 1600 k confirmed human infection[4] but still its origin is shadowy. The fatality rate of SARS-CoV[5] was 9·6%; and that of MERS-CoV[6] is 35%. It

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Novel Pumice@SO_3H catalyzed efficient synthesis of 2,4,5-triarylimidazoles and acridine-1,8-diones under microwave assisted solvent-free path

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Imidazole
Acridinedione
Benzil
Dimedone
Microwave
Etc

ABSTRACT

In the present investigation, new heterogeneous catalyst pumice supported sulfonic acid (pumice@SO_3H) was prepared from natural pumice by simple agitation with chlorosulphonic acid. The catalytic performance of a pumice@SO_3H was investigated for the synthesis of 2,4,5-triaryl imidazoles and acridine-1,8-diones under microwave (MW) assisted solvent-free condition. The pumice@SO_3H was stable and exhibits a good Brønsted acidic character. The beneficial characteristic features observed with this protocol are the recyclability of catalyst, the solvent free approach, the applicability to a wide variety of substrates, good to excellent yields, and easy to use. The catalyst pumice@SO_3H with MW has been increased the green chemistry value of this method.

1. Introduction

Pumice is a naturally occurring volcanic material which has attracted attention due to various outstanding features associated with it such as high abundance, cheaply available, high porosity, large surface area, light weight and non-toxic nature. The presence of a high percentage of silica and a good number of hydroxyl groups makes it suitable as a backbone to develop new heterogeneous solid acid catalysts. The pumice supported materials have been employed as heterogeneous catalysts in numerous organic transformations (Yuana et al., 2012; Venezia et al., 2001; Alver et al., 2016; Deganello et al., 2000). Due to the presence of huge numbers of hydroxyl groups, Pumice has been converted into several active catalysts such as acidic (Maleki et al., 2020), nano-composites (Valadi et al., 2020), and metal supported catalyst (Liotta et al., 2001; Duca et al., 1995). This volcanic pumice material has also been used as adsorbents (Bekaroglu et al., 2010) and as photo catalysts in the water treatment (Rao et al., 2003).

The microwave assisted reactions is a well established green, and the minimum time consuming path used for the synthesis of a number of *N*-heterocycles by MCRs. The microwave protocol provides a clean, efficient, quicker, simple and powerful dielectric heating for the construction of complex heterocyclic compounds (Ahankar et al., 2016; Shirole et al., 2017, 2018; Mullassery et al., 2018; Bhatt et al., 2018; Magyar and Hell, 2019; Ulus et al., 2016; Zhu et al., 2017; Alirezvani et al., 2019). The multicomponent reactions (MCRs) have fascinated exceptional protocol for one pot synthesis of diverse heterocyclic compounds. The interesting characteristic features of MCRs are their high atom economy, synthetic efficiency, single operation, and simplicity (Aute et al., 2020; Bienayme et al., 2000; Harikrishna et al., 2020; Naeimi and Didar, 2017; Kiyani and Ghorbani, 2015; Alinezhad et al., 2020; Thwin et al., 2019). The synthesis of 2,4,5-triarylimidazole (Maleki et al., 2015), and acridine-1,8-diones (Yu et al., 2017) are provides the significant illustrations of multicomponent reactions. The imidazole and 1,4-dihydropyridine scaffolds are the important class of heterocyclic compounds, exhibit promising biological and pharmaceutical activities (Gong et al., 2016; Weinstein et al., 2007; Trommenschlager et al., 2017; Takle et al., 2006; Gunduz et al., 2014; Periyasami et al., 2019; Bhosle et al., 2020; Naouri et al., 2020; Joubert and Kapp, 2020; Jamalian et al., 2011) and also found as a core in various natural products (Fig. 1). Some imidazole derivatives are also used in the preparation of ionic liquids which have played a dual role in synthetic organic chemistry as a catalyst as well as solvents (Alinezhad et al., 2017; Nejatianfar et al., 2018; Ngugyen et al., 2019; Shirole and Shelke, 2016).

The imidazole and pyridine based ligands shows a strong coordination capability and resourceful coordination sites (Guo et al., 2013). They display the properties such as luminescence and gas adsorption (Chen et al., 2014; Li et al., 2018), luminescence and magnetic properties (Li et al., 2020), thermal and solid-state fluorescence, anion sensors

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Pumice-based sulfonic acid: a sustainable and recyclable acidic catalyst for one-pot synthesis of pyrazole anchored 1,4-dihydropyridine derivatives at room temperature

Adinath Tambe[1] · **Gayatri Sadaphal**[1] · **Ravindra Dhawale**[1] · **Gopinath Shirole**[1]

Received: 14 July 2021 / Accepted: 23 December 2021

Abstract

In the present investigation, we have developed an efficient and eco-friendly protocol for the synthesis of pyrazole anchored 1,4-dihydropyridine analogs using pumice-based sulfonic acid (pumice@SO_3H) as a recyclable solid acid catalyst under simple stirring at room temperature. The present protocol proceeded smoothly with 1,3-diaryl pyrazole-4-carbaldehydes, ethyl acetoacetate, and NH_4OAc in ethanol as a solvent with excellent yield. The pumice-based sulfonic acid catalyst is easily prepared from naturally occurring pumice by simple agitation with chlorosulfonic acid. The key features of this catalyst are its heterogeneous nature, high porosity, non-corrosive and non-toxic nature, recyclability, stable and highly efficient at room temperature. The application of this catalyst makes the protocol more environmentally benign.

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PUMICE@SO$_3$H CATALYZED ULTRASOUND MEDIATED SYNTHESIS OF POLYHYDROQUINOLINE DERIVATIVES.

Adinath Tambe[a], Vaishnavi Tambe[a], Rahul Narode[a], Sunita Ambadkar[a], Amol Pagare[a], Vijay Kadnor [b], Gopinath Shirole*[a]

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Abstract:

A sustainable and convenient protocol is developed for the synthesis of polyhydroquinoline derivatives under ultrasound irradiation at 45°C in the presence of pumice anchored sulfonic acid (Pumice@SO$_3$H) as a recoverable catalyst. These polyhydroquinolines were synthesized from aldehydes, dimedone, ethylacetoacetate and ammonium acetate by Hantzsch reaction. The attractive features of the present protocol are green approach, good yield, recovery of catalyst, easy work-up procedure and simple purification of product whereas the catalyst offers simple preparation, high catalytic activity, inexpensive, easy to use, recyclability and stability.

Keywords:

Pumice@SO$_3$H, polyhydroquinolines, ultrasound irradiation, dimedone, etc.

Introduction:

Pumice stone obtained due to volcanic eruptions has many advantages such as abundance, availability, large surface area, low cost, non-homogeneous nature, and excellent stability. Also due to the remarkable properties such as high porosity and high adsorption capacities have gained much interest in the field of catalysis. In recent years, the volcanic pumice converted into variety of supported active catalytic materials such as pumice@SO$_3$H[i, ii], Pd–Ag catalysts supported on pumice[iii], Pumice-modified cellulose fiber[iv], Volcanic based hybrid nanocomposite[v], Pumice supported Pd catalyst[vi], Immobilization of TiO$_2$ on pumice stone[vii], iron-coated pumice[viii, ix], pumice-supported Pd–Cu catalysts[x], etc.

Multi-component reactions (MCRs) are a constructive approach to synthesize heterocyclic compounds with diverse structures. In MCRs, more than two components reacts together in single step to produce a targeted heterocyclic system without isolation of any intermediate. Due to this, requires short time, reduce energy requirement, reduce quantity of precursors, and are useful to increase atom economy. The Hantzsch reaction is one of the most important examples of multicomponent reaction which is used for synthesis of polyhydroquinoline derivatives[xi, xii]. The polyhydroquinoline derivatives is of great attention due to their various activities such as anti-cancer, anti-diabetic, anti-hypertensive, anti-inflammatory, anti-microbial, anti-

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Green Mehodology in Nanotechnology: Novel Development of Metal Nanostructures and Its Applications as a catalyst: A Review

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ABSTRACT

Nanotechnology is the one of the fastest growing area in the field of science. The synthesis of metal nanoparticles(NPs) is most important area of the resarch in the field of nanotechnology, due to large applications of NPs in biomedical fields such as drug delivery, imaging, biological activity, diagonistics, therapeutics using NPs,also applications as a catalyst in the synthesis of molecules. Traditional methods such as chemical and physical methods have been used for synthesis of NPs. But traditional methods have disadvantages including use of toxic chemicals, high energy consumption, hazardous products etc. Therefore, there is an essential need to develop environment friendly mehods for synthesis of NPs. Presently green mehods includes use of plants and their metabolits also uses microbes. This methods is not only cost effective also reduces the use of hazardous chemicals and moves towards greener synthesis. In this review we covers many green mehods for synthesis of NPs, characterisation of NPs and catalytic applications of NPs in synthesis of molecules.

KEYWORDS: Green synthesis, Nanoparticles, Catalyst.

INTRODUCTION

In the recent years, nanotechnology has emerged as a cutting edge technology interdisciplinary with physics, biology, chemistry, medicine, and material science. The prefix nano is derived from Greek word 'nanos' meaning "dwarf" which refers to things of one billionth in size. It was in the mid of 20th century when the basic concept of nanotechnology was put forward. Richard Feynman, an American physicist is known as the "Father of nanotechnology" and he explained in American physical society meeting held in 1959, that how world's all books can fit in a pamphlet. At that time, his lecture brought a revolution in the field of science. He even explained different methods by which it was possible to transform the individual atoms or molecules from one form to another smaller form by using different sets of tools. Nanotechnology word was coined by Norio Taniguchi of Tokyo University of Science. Much awareness was aroused among the people about nanotechnology when the book written by Eric Drexler named "Engines of creation" was published. He explained nanotechnology in relation to the nanometric scale in this book. So, nanotechnology can be defined as the application of controlling the properties of the matter at the molecular level[1].

Synthesis of nanostructures is often a key step in preparation of many important targets including nanocatalysts, nanomedicines, nanosensors, nanodevices and nanosystems. There are various types of methods for the synthesis of a large number of nanostructures in the form of nanoparticles, nanorods and nanotubes, thin films and nanoporous materials. Some of the already existing classical procedures to synthesis of diverse types of nanomaterials are improved to acquire novel nanostructures and some new methods are developed [2].

Nanostructure synthesis involves two major approaches:

I. TOP DOWN APPROACH

II. BOTTOM UP APPROACH

Top down synthesis is cutting of bulk material to get nanosized particles, where as in bottom up synthesis atoms build up into new molecules which grow into clusters and then form particles of nano-scale[3].

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PUMICE@SO_3H CATALYZED ULTRASOUND MEDIATED SYNTHESIS OF POLYHYDROQUINOLINE DERIVATIVES.

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Abstract:

A sustainable and convenient protocol is developed for the synthesis of polyhydroquinoline derivatives under ultrasound irradiation at 45°C in the presence of pumice anchored sulfonic acid (Pumice@SO_3H) as a recoverable catalyst. These polyhydroquinolines were synthesized from aldehydes, dimedone, ethylacetoacetate and ammonium acetate by Hantzsch reaction. The attractive features of the present protocol are green approach, good yield, recovery of catalyst, easy work-up procedure and simple purification of product whereas the catalyst offers simple preparation, high catalytic activity, inexpensive, easy to use, recyclability and stability.

Keywords:

Pumice@SO_3H, polyhydroquinolines, ultrasound irradiation, dimedone, etc.

Introduction:

Pumice stone obtained due to volcanic eruptions has many advantages such as abundance, availability, large surface area, low cost, non-homogeneous nature, and excellent stability. Also due to the remarkable properties such as high porosity and high adsorption capacities have gained much interest in the field of catalysis. In recent years, the volcanic pumice converted into variety of supported active catalytic materials such as pumice@SO_3H[i, ii], Pd–Ag catalysts supported on pumice[iii], Pumice-modified cellulose fiber[iv], Volcanic based hybrid nanocomposite[v], Pumice supported Pd catalyst[vi], Immobilization of TiO_2 on pumice stone[vii], iron-coated pumice[viii, ix], pumice-supported Pd–Cu catalysts[x], etc.

Multi-component reactions (MCRs) are a constructive approach to synthesize heterocyclic compounds with diverse structures. In MCRs, more than two components reacts together in single step to produce a targeted heterocyclic system without isolation of any intermediate. Due to this, requires short time, reduce energy requirement, reduce quantity of precursors, and are useful to increase atom economy. The Hantzsch reaction is one of the most important examples of multicomponent reaction which is used for synthesis of polyhydroquinoline derivatives[xi, xii]. The polyhydroquinoline derivatives is of great attention due to their various activities such as anti-cancer, anti-diabetic, anti-hypertensive, anti-inflammatory, anti-microbial, anti-

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Effect of Farm Pond Algae on Productivity in *Cucumis Sativus* L. Using Aqueous and Cow Urine Extracts

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ABSTRACT

The emergence of biofertilizer as a potential environmentally friendly inputs for supplementing the plant growth has been incredible and found supporting agricultural sustainability. Hence, in present study an attempt was made to assess the efficacy of fresh water algae from the farm ponds on the yield parameters in Cucumis sativus L. The field trial was conducted with RBD design and seven treatments were used with control, algal aqueous and algal cow urine extract by using algae from two farm ponds. Different concentrations of algae were applied through foliar application as per the standard methods. The results revealed that farm pond algae has promotive role in the yield of Cucumis Sativus L. The farm pond algae in 15 % cow urine extract had shown prominent result in the form of increased fruit length, diameter, total fruits per plant and total yield over the control which is almost close to the yield using commercial nutrients.

Keywords: RBD design, Cucumis Sativus, Cow Urine Extracts

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INTRODUCTION

The introduction of green revolution technologies in the agriculture marked striking quantitative increase in food production which was the welcoming sign, and it was hailed as one of the most significant matters of pride for a country like India in its long struggle for a better life. In the 1960s and the 70s, it was impressive progress made by India in food production as it was a significant achievement for any third world country. However, the journey of Indian agriculture since the green revolution has always raised the doubts about the quality of food it is serving. Although use of fertilizers and pesticides is inevitable, its entry in the food chain has questioned the intention and people across the world have started asking for the alternative sources for nutrients and pesticides [11-18].

It is believed that, as long as the agriculture system continues to use large scale chemical fertilizers, sustainability cannot be achieved [14]. The consumers and farmers share a strong desire for agricultural sustainability, increasing anxiety about pollution, and damage to the environment. They also have a strong desire and willingness to engage with new farming technology that can produce more nutritious and pollutants free food [4-7].

The emergence of biofertilizer as a potential environmentally friendly inputs for supplementing the plant growth has been incredible and found supporting agricultural sustainability. They meet the plant nutrient requirement as well as minimize the use of chemical fertilizers. [20, 19]. Freshwater algae have a high percentage of nutrients incorporated into their major biochemical properties and metabolites such as carbohydrates and protein [24]. The variety of substances excreted by blue-green algal extract influences plant growth and development in a variety of ways [18]. Algal microorganisms are found benefiting the plants by the synthesizing growth enhancing hormones. With this background, the study was conducted to assess the efficacy of fresh water algae from the farm ponds on the yield parameters in *Cucumis sativus* L.

MATERIAL AND METHODS

The farm ponds for collection of algal samples were identified from village Wakadi (19.6697° N, 74.5730° E) in RahataTaluka and village Sawargaontal (19.4863° N, 74.1651° E) in Sangamner Taluka of Ahmednagar district, Maharashtra, India. The algal material was handpicked from the pond and washed with water and brought to the laboratory in polythene bags. The collected samples were labelled as Sample 1 – Algae from farm pond of village Wakadi and Sample 2 - Algae from farm pod of village Sawargaontal. The dried algal mixture was used for the preparation of algal aqueous extract. 100 gm material of algal mixture was taken and boiled in 1000 ml distilled water to make final volume up to 100 ml. This process was repeated for obtaining the required amount of algal extract to be used for experimental trials. Using this standard algal extract 15 % algal extracts were prepared separately for both samples [9]. Cow urine extract was prepared for both samples using cow urine instead of distilled water.

The field trial was conducted to study the effect of algal extracts on the growth of *Cucumis sativus* L. The field was selected as per the recommendations for the farming practices. The field experiment was carried out from February 2019 to May 2020.The land for the field trial was prepared by ploughing, and the debris was collected by hand. After ploughing the land was thrown into ridges and furrows of 100 cm. The ridges and furrows were prepared with the raidger as per the standard method recommended for the plant. The farmyard manure was applied to the field in the proportion as recommended. Seven treatment sets were designed andthe seeds were treated by soaking them overnight into various concentrations as mentioned in table 1.

Table 1 -Treatment Symbols and treatments.

Treatment Symbol	**Concentration**
T_1	Control with water
T_2	Control with Cow Urine
T_3	15 % algal aqueous extract of sample 1.
T_4	15 % algal cow urine extract of sample 1.
T_5	15 % algal aqueous extract of sample 2.
T_6	15 % algal cow urine extract of sample 2.
T_7	Commercial Nutrient

The plantation of *Cucumis sativus* L. seeds in the field plot was carried out as per the Randomized Block Design (RBD). The irrigation was done as per the requirement of the plants at approximately weekly intervals. After one month, the irrigation interval was maintained, depending on the water requirement of the soil and plant.

As soon as the leaves were developed, the foliar application of algal aqueous extract, algal cow urine extract, and nutritional supplement was started. The foliar application of algal extract and commercial nutritional supplement was repeated after every 10 days of the first application. The parameters M:F ratio, Fruit set, fruit retention, fruit length (cm), Fruit diameter (cm), fruits per plant, fruit yield (gms) were recorded.

RESULTS AND DISCUSSION

Female to male flower ratio (Table 2) was maximum in T_2 i.e. 1:2.36 however it was minimum at T_1 i.e. 1:1.80.

Table 2 Effect of algal extract on Male and Female flower ratio, Fruit set and retention in *Cucumis sativus* L.

Treatment / Parameter	M:F Ratio		Fruit Set		Fruit Retention	
	Mean	SD	Mean	SD	Mean	SD
T_1	1:1.80	0.15	20.14	1.77	11.14	1.77
T_2	1:2.36	0.22	21.00	2.45	13.00	2.45
T_3	1:1.86	0.15	34.57	2.07	25.57	2.07
T_4	1:2.00	0.18	36.57	2.57	28.57	2.57
T_5	1:1.86	0.14	35.43	3.21	26.43	3.21
T_6	1:1.94	0.21	36.43	2.07	28.43	2.07
T_7	1:1.99	0.22	38.43	2.94	30.43	2.94
Total	1:1.97	0.24	31.80	7.62	23.37	7.74
	$F_{(6, 48)} = 7.09$, $p<0.01$		$F_{(6, 48)} = 68.28$, $p< 0.01$		$F_{(6, 48)} = 70.58$, $p< 0.01$	

T_1 showed minimum fruit set and fruit retention with 20.14 and 11.14 per plant respectively. However, T_7 showed maximum fruit set and fruit retention with 38.43 and 30.43 respectively. Commercial nutrient had shown 90.81 % more fruit set over the control, however the algal cow urine extract of sample 1 (T_4)and algal cow urine extract of sample 2 (T_6) have also shown prominent fruit set i.e. 81.58 % and 80.88 % more than control. Commercial nutrient (T_7) had shown 173.16 % more fruit retention over the control, however the algal cow urine extract of sample 1 (T_4)and algal cow urine extract of sample 2 (T6) have also shown maximum fruit retention i.e. 156.46 % and 155.21 % more than control. The ANOVA examined the effect of treatment on M:F flower ratio of *Cucumis sativus* L. which shows that there was a statistically significant effect within the treatment with $F_{(6, 48)} = 7.09$, $p<0.01$. The ANOVA shows that there was a statistically significant effect within the treatment for fruit set with $F_{(6, 48)} = 68.28$, $p< 0.01$, for fruit retention with $F_{(6, 48)} = 70.58$, $p< 0.01$. The algal extract is beneficial in stimulating the fruit setting in the cucumber [7]. The seedlings treated with the algal extracts set more flowers than the control. [11]. The results are in line with those reported by Taha *et al* [22]. The mentioned the female flowers between 39.42 to 46.34 in cucumber followed by application of sea weed extract. The results are similar to Dinesh *et .al.,* [12] who mentioned the sex ratio between 1.40-2.32. Taha *et. al*,[21] also reported the fruit setting in between 77.18-82.76 % which is similar to present study. Ajay *et. al*., [4] reported the fruit set percentage between 71 -81.90 % and fruit retention percentage between 77.23-84.84 % in *Cucumis sativus* L.). The study outcome is in line with the results of studies conducted by Ansari and Chowdhary [6] in bottle gourd, Mir [17] in cucumber and Mehdi *et al.,* [17] in cucumber.

Table 3 -Effect of algal extract on fruit length, diameter, fruits per plant and total yield in *Cucumis sativus* L.

Treatment/ Parameter	Fruit Length (cm)		Fruit Diameter (cm)		Fruits per plant		Fruit Yield (gms)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
T_1	12.43	1.72	11.57	2.88	11.14	1.77	1894.29	301.38
T_2	13.43	1.81	12.14	2.73	13.00	2.45	2275.00	428.66
T_3	14.14	1.07	13.57	2.44	25.57	2.07	4730.71	382.99
T_4	14.86	1.35	15.43	1.81	28.57	2.57	5714.29	514.55
T_5	14.57	1.40	14.57	1.51	26.43	3.21	5021.43	609.36
T_6	15.29	1.50	15.14	1.68	28.43	2.07	5827.86	424.39
T_7	15.43	0.79	15.43	1.51	30.43	2.94	6177.00	595.97
Total	14.31	1.66	13.98	2.50	23.37	7.74	4520.08	1685.38
	$F_{(6, 48)} = 4.03$, $p<0.01$		$F_{(6, 48)} = 3.84$, $p<0.01$		$F_{(6, 48)} = 70.58$, $p<0.01$		$F_{(6, 48)} = 92.88$, $p<0.01$	

It is seen from the table 3 that minimum fruit length was reported in T_1 with 12.5 cm and maximum fruit length was reported at T_7 with 15.5 cm. The variation in the fruit diameter was from 11.6 cm at T_1 to 15.5 cm at T_7. At the same time the number of fruits per plants varied from 11.1 cm at T_1 to 30.4 cm at T_7. The minimum yield of the fruits was reported at T_1 with 1894.3 gms and maximum yield was reported at T_7 with 6177 gms followed by T_6 with a yield of 5827.9 gms and T_4 with a yield of 5714.3. When the data of all parameters was compared with the control treatment, it was observed that T7 had shown 24.14 % more length as compare to control, however T4 and T6 had also shown 19.55 % and 23.01 % more growth compared to control. Similarly, T7 had shown 33.36 % more fruit diameter compare to control, whereas T4 and T6 also had shown 33.36 % and 30.86 % more growth compare to control. T7 reported 173.16 % more fruits as compare to control and it was 156.46 % and 155.21 % more in T4 and T6. T7 reported 226.09 % more fruit yield compare to control and again T4 and T6 had shown prominent yield with 201.66 % and 207.65 % more than control.

The ANOVA examined the effect of treatment on the Fruit Length, Fruit Diameter, Fruits per plant and fruit yield in of *Cucumis sativus* L. It shows that there was a statistically significant effect within the treatment for Fruit Length, Fruit Diameter, Fruits per plant and fruit yield with $F_{(6, 48)} = 4.03$, $p<0.01$, $F_{(6, 48)} = 3.84$, $p<0.01$, $F_{(6, 48)} = 70.58$, $p<0.01$, $F_{(6, 48)} = 92.88$, $p<0.01$ respectively.

The increases in overall weight of the fruit as well as total yield in cucumber treated with algal extract can be linked to the increasing fruit numbers, leaf area and dry weight as a result of enhanced physiological activities, photosynthesis and plant nutrition. The yield in cucumber could have been attributed due to an increases in distillate flowers which in increases the fruit number which is reflected in the total yield [5]. High level of cytokinin improve the nutrient mobilization and the algal extract increase the movement of cytokinin from the roots to the fruits. [13]. The increased cytokinin availability results into increased supply to the maturing fruits. In addition to the growth hormones, increased yield in cucumber could be due to the additional elements in the algae like macro, micronutrients and organic matters like, amino acids that improve nutritional status, vegetative growth and yield quality [1-3]. Bajpai, [8] also indicated about presence of active organic compounds in algae which acts a growth regulators. Metting *et al*., [16] have responded that nutrient mobilization, root development, improvement in chlorophyll content and leaf area are the physiological responses of crops after algal application.

The results are in agreement with that of Crouch and Van-Staden [10] who reported increases in fruit number by 10% and fruit weight by 15% followed by application of seaweed extract. Saravanan *et al*., [21] mentioned a significant increase in number of fruits and fruit yield per plant after application of sea weed extract. Zodape *et al*., [25] applied 2.5 % sea weed extract and reported better improvement in the length, diameter and number of fruit. Abdel-Mawgoud *et al.,* [3], were of the same opinion that the fruit weight and diameter in cucumber were enhanced as a result of increased vegetative growth after application of algal extract. The results are also similar to Taha, *et al*., [22] where they reported the fruit length between 13.36 cm -16.76 cm, fruit diameter between 3.38 cm - 4.85 cm and fruit weight between 154.3 gms. - 282.6 gms. Taha *et.al*., [21] reported the fruit weight between 112.31 -126.55 gms in cucumber treated with sea weed extract. They reported number of fruit between 14.89-21.73, fruit length between 17.32-18.20 cm, fruit diameter between 2.37-2.50 cm and the yield per fruit between 7.35-10.96 kg. Radameset.al., 2018 compared the benefits of the total yield of cucumber from chemical fertilization and algae and stated that algae is greater as it is friendly to the environment.

CONCLUSION

It is concluded from the study that, farm pond algae has promotive role in the yield of *Cucumis Sativus* L. The less expensive farm pond algae in 15 % cow urine extract had shown prominent result in the form of fruit length, diameter, total fruits per plant and total yield which is almost close to the yield using commercial nutrients. Hence, using algae as a source of nutrient can protect the yield as well as help to achieve the sustainability in agriculture.

REFERENCES

1. Abd El-Migeed, A. A.; A. B. El-Sayed and H. S. A. Hassan. (2004), "Growth enhancement of olive transplants by broken cells of fresh green algae as soil application", J. Agric. Res. Vol. 29(3), pp. 723-737
2. Abd El-Moniem E. A. and A. S. E. Abd-Allah (2008), "Effect of green algae cells extract as foliar spray on vegetative growth, yield and berries quality of superior grapevines", Am. Euras. J. Agric. and Environ. Sci., Vol. 4 (4), pp.427-433.
3. Abdel-Mawgoud, A.M.R.; Tantaway, A.S.; Hafez, M.M.; Habib, H.A. Seaweed Extract Improves Growth, Yield and Quality of Different Watermelon Hybrids. Res. J. Agric. Biol. Sci. 2010, 6, 161–168.
4. Ajay S. Kadi, K.P. Asati, Swati Barche and Tulasigeri, R.G. 2018. Effect of Different Plant Growth Regulators on Growth, Yield and Quality Parameters in Cucumber (*Cucumis sativus* L.) under Polyhouse Condition. *Int.J.Curr.Microbiol.App.Sci.* 7(04): 3339-3352
5. Al- Saaberi M. R. S. (2005) Effect of Some Agricultural Treatments on Growth, Yield of Lettuce Lactucaativa L. MS.C Thesis Horticulture Sciences University of Mosul College of Agriculture and Forestry.
6. Ansari, A,M. and Chowdhary, B.M. 2018. Effects of boron and plant growth regulators on bottle gourd (Lagenariasiceraria (Molina) Standle.). Res. J. Pharmacognosy and Phytochem.., SP1: 202-206.
7. Arthur, GD; WA Stirk and J Van Staden (2003), "Effect of a seaweed concentrate on the growth and yield of three varieties of Capsicum annuum", S Afr J Bot, Vol. 69, pp. 207–211.
8. Bajpai, V.K. Antimicrobial bioactive compounds from marine algae: A. mini review. Indian J. Geo-Marine Sci. 2016, 45, 1076–1085.
9. Bhosale N. B, Untawale, A.G. and Dhargalkar, V.K. (1975). Effect of seaweed extract on the growth of *Phaseolus vulgaris*. *Indian J. Mar. Sci.,* 4: 209- 210.
10. Crouch, I. J. and J. Van-Staden (2005). Effect of Seaweed Concentrate on the Establishment and Yield of Greenhouse Tomato plant. Jour. Of Applied phycology, 4(4): 291-296.
11. Crouch, I.J. and Van Staden, J. (1991). Evidence for rooting factors in a seaweed concentrate prepared from Ecklonia maxima. J. of Plant Physiol., 137 (3): 319- 322.
12. Dinesh, A., P. Prasanth, D. Lakshminarayana, K. Nagaraju and Gouthami, P. 2019. Efficacy of Plant Growth Regulators on Growth and Flowering of Cucumber (*Cucumis sativus* L.) cv. Malini under Shade Net Conditions. *Int.J.Curr.Microbiol.App.Sci.* 8(09): 313-317.
13. Hahn, H; de R. Zacks and H. Kende (1974), "Cytokinin formation in pea seeds", Naturwissenschaften, Vol. 61, pp. 170–171.
14. MajumdarKakali (2015), "Bio-Fertilizer use in Indian Agriculture" Indian Journal Of Research. Volume : 4 | Issue : 6. Pp-377-381.
15. Mehdi, M., Ahmed, N., Jabeen, N., and Baseerat, A. 2012. Effect of different concentration of ethrel on growth, fruiting behavior and yield of cucumber (Cucumis sativus L.) under greenhouse conditions. Asian J. Horti., 7 (2): 579-581.
16. Metting, B.; Zimmerman, W.J.; Crouch, I.; van Staden, J. Agronomic uses of seaweed and microalgae. In Introduction to Applied Phycology; Akatsuka, I., Ed.; SPB: The Hague, The Netherland, 1990; pp. 589–627.
17. Mir, A.A. 2007. Effect of pruning and plant growth regulators on growth, flowering, fruiting and yield of cucumber. Thesis submitted to Sher-e-Bangla Agricultural University, Dhaka.

18. Ordog, V., 1999. Beneficial effects of microalgale and cyanobacteria in plant soil systems, with special regard to their auxin-and cytokinin-like activity. Proceedings of the International Workshop and Training Course on Microalgal Biology and Biotechnology, June 13-26, Mosonmagyarovar, Hungary, pp: 13-26
19. Radames Trejo Valencia, Ludy Sánchez Acosta, Manuel Fortis Hernández, Pablo Preciado Rangel, Miguel Ángel Gallegos Robles, Rocío del Carmen Antonio Cruz and CiriloVázquezVázquez. Effect of Seaweed Aqueous Extracts and Compost on Vegetative Growth, Yield, and Nutraceutical Quality of Cucumber (Cucumis sativus L.) Fruit. Agronomy 2018, 8, 264. Pp-1.-13.
20. RanaRachna , Ramesh and Pooja Kapoor (2013), "Biofertilizers and Their Role in Agriculture". Pop. Kheti, 1(1):56-61.
21. Saravanan, S.; S. Thamburaj; D. Veeraragavathatham and A. Subbiah (2003), "Effect of seaweed extracts and chlormequat on Growth and fruit yield of tomato (*Lycopersicon esculentum* Mill.)", Indian J. Agric. Res., Vol. 37(2), pp. 70-87.
22. Taha Z. Sarhan ,SmiraT.Ali, Sanaa M.S.Rasheed (2011). Effect of bread yeast application and seaweed extract on cucumber (Cucumis sativus L.) Plant growth, yield and fruit quality. Mesopotamia j. of Agric (ISSN 1815-316X) Vol. (39) No(2). 26 -34.
23. Taha Z. Sarhan and SalihFarhan Ismael. (2014). Effect of Low Temperature and Seaweed Extracts on Flowering and Yield of Two Cucumber Cultivars (*Cucumis sativus* L.). International Journal of Agricultural and Food Research ISSN 1929-0969 | Vol. 3 No. 1, pp. 41-54 (2014).
24. Wake, H., A. Akasata, H. Umetsu, Y. Ozeki, K. Shimomura and T. Matsunaga, 1992. Promotion of plantlet formation from osmotic embryos of carrot treated with a high molecular weight extract from a marine cyanobacterium. Plant Cell Rep., 11: 62-65.
25. Zodape, S. T.; S. Mukherjee; M.P. Reddy, and D.R. Chaudharya. (2009), "Effect of Kappaphycusalvarezii (Doty) Doty ex silva. Extract on grain quality, yield and some yield components of wheat (*Triticum aestivum* L.)", International J. Plant Prod. Vol. 3, pp. 97-101.

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