Shirdi Sai Rural Institute's

ARTS, SCIENCE AND COMMERCE COLLEGE, RAHATA

"NAAC REACCREDITED "B++" GRADE COLLEGE"

A/P/Tal-Rahata,Dist.-Ahmednagar.(M.S.)423107

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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_nM)

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)

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Arts, Science and Commerce College, Rahata
Tal- Rahata, Dist-Ahmednagar, Pin - 423107 (MS)
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NAAC RE-ACCREDITED "B++" GRADE COLLEGE

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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,

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Arts,Science and Commerce College, Rahata

Arts,Science and Commerce College Rahata
Tel-Rahata
Dist-A'nagar

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

Date-**30/07/2024**

Place- **Rahata**

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 2020-2021						Link to website of the Journal	Link to article / paper / abstract of the article	Is it listed in UGC Care list
1	Natural surfactants assisted an efficient synthesis of tetrahydro-β-carbolines	Prof.Dr.S.S.Gholap	Chemistry	Results in Chemistry	2021	Online ISSN: 2211-7156	LINK	LINK	YES
2	State Bank of India corporate social responsibility	Prof. Dr. Rajaram Nathaji Wachaure	Commerce	Journal of emergency Technologies and innovative research	2020	ISSN-2349-5162	LINK	LINK	UGC Approved Journal No 63975
3	Inventory management in Indian industry (A study of Maruti Udyog Limited).	Prof. Dr. Rajaram Nathaji Wachaure	Commerce	International Journal of Advanced research ideas and innovations in technology	2020	ISSN: 2454-132X	LINK	Printed	UGC Approved
4	महाराष्ट्र राज्य मार्ग परिवहन मंडळाचा प्रवासी ग्राहक व्यवसाय: आर्थिक विश्लेषण	Dr. Pulate Suresh K.	Commerce	Ajanta	2021	ISSN 2277-5730	LINK	Printed	UGC Approved Journal No 40776
5	Sustainable Rural development in India.	Dr. Pulate Suresh K.	Commerce	Ajanta	2021	ISSN 2277-5730	LINK	Printed	UGC Approved Journal No 40776
6	Women Social	Dr. Jayshree R.	Economics	B Adhar	2021	ISSN-	LINK	Printed	YES

	Problems: Special Reference to India Agricultural Sector and women Enterepreneurs.	Dighe				2278-9308			
7	Problems of women Entrepreneurs in Agricultural Marketing during pendemic situation: A case study of Ahemednagar District in Maharashtra.	Dr. Jayshree R. Dighe	Economics	Scholarly Research Journal for Interdisciplinary Studies	2021	ISSN: 2278-8808	LINK	Printed	UGC Approved
8	दुसऱ्या बाजीराव पेशव्यांच्या काळातील इंग्रज वकिलांची राजकारणातील भूमिका प्रा मते अनिल बापूराव	Prof. A. B. Mate	History	Sustainable innovative development in economics environment agriculture health Society	2021	ISSN: 2230-9578	NA	Printed	UGC Approved
9	वहता तालुक्यातील दुसऱ्या बाजीराव पेशव्यांच्या काळातील अन्याबा राहातेकरांचा	Prof. A. B. Mate	History	Ajanta	2021	ISSN-2277-5730	LINK	Printed	UGC Approved Journal No 40776
10	मन्नू भंडारी के नाटक 'महाभोज' मे मूल्यहीनता मन्नू.	Dr. D. N. Dange	Hindi	Shodh Samiksha aur Mulyankan	2021	ISSN-0974-2832	LINK	LINK	UGC Approved
11	डॉक्टर शंकर शेष के नाटक 'रक्तबीज' मे मिथकीय प्रयोग	Dr. D. N. Dange	Hindi	Akshara Multidisciplinary Research Journal	2021	ISSN 2582-5429	LINK	Printed	UGC Approved
12	वर्तमान परिप्रेक्ष मे	Dr. D. N. Dange	Hindi	Shodh Samiksha	2021	ISSN-	LINK		UGC

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13	सोशल मीडिया का साहित्य के प्रचार-प्रसार मे महत्वपूर्ण भूमिका	Dr. Shaikh A. S.	Hindi	International Research Mirror	2020	ISSN: 2250-253X	LINK	Printed	UGC Approved
14	Cloud Computing	Dr. D. T. Satpute	Laibrary	Ajanta	2020	ISSN 2277-570	LINK	Printed	UGC Approved Journal No 40776
15	The Influence of Polysulfide Solvent on the Performance of Cadmium Sulfide Sensitized Zirconium Dioxide-Based Quantum Dots	Dr. V.P. Bhalekar	Physics	Engineered Science	2021	ISSN: 2576-9898 (Online)	LINK	LINK	YES
16	Green Stnthesis of Pyrazolone Derivatives using Ionic Liquid as an Efficient and Green Catalyst Via Facile Multi-Component Reaction path.	Dr. Gopinath Shirole	Chemistry	Heterocyclic Letters	2020	ISSN: (print) 2231-3087 / (online) 2230-9632	LINK	LINK	YES
17	Green Stnthesis of Pyrazolone Derivatives using Ionic Liquid as an Efficient and Green Catalyst Via Facile Multi-Component Reaction path.	Prof. Adinath Tambe	Chemistry	Heterocyclic Letters	2020	ISSN: (print) 2231-3087 / (online) 2230-9632	LINK	LINK	YES

18	Synthesis and Biological Assessment of Carbazole Linked Pyrazole Schiff bases and Diarylthiourea Derivatives	Dr. Gopinath Shirole	Chemistry	Croatica Ca Chemica	2021	1334417X, 00111643	LINK	LINK	YES
19	Ionic Liquid catalyzed one pot green synthesis of isoxazolone derivatives via multicomponent reaction.	Dr. Gopinath Shirole	Chemistry	Indian Journal of Chemistry	2020	ISSN: (online) 0975-0975	LINK	LINK	YES
20	Ionic Liquid catalyzed one pot green synthesis of isoxazolone derivatives via multicomponent reaction.	Adinath Tambe	Chemistry	Indian Journal of Chemistry	2020	ISSN: (online) 0975-0975	LINK	LINK	YES
21	Potential of different fresh water green algae for Larvicidal activity against Aedes aegypti	Dr. V. S. Patil	Botany	Journal of Xidian University	2021	ISSN: 1001-2400	LINK	Printed	YES
22	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	2020	ISSN: 1548-7741	LINK	LINK	UGC Approved

23	Collaborative Teaching Strategies: Fostering Student Engagement and Academic Success	Dr R D Kasar	English	Shodh Sanchar Bulletin	2020	ISSN:2229-3620	LINK	Printed	YES
24	Efficiency of farm pond algae as a liquid biofertilizer on the growth of Spinach (*Spinacia oleracea* L.)	Dr A A Aher	Botany	Bulletin of Environment ,Pharmacology and life Sciences	2022	ISSN:2277-1808	LINK	LINK	YES
25	Promotive Influence of Farm Pond Algae with Aqueous and Cow Urine extracts on Germination and Growth Traits in *Luffa cylindrica* L	Dr A A Aher	Botany	Journal Of Xidian University	2021	ISSN No:1001-2400	LINK	LINK	YES
26	Effect of Algal Biomass on seed germination and seedling growth in Cucumis sativus L	Dr A A Aher	Botany	Bioinfolet	2021	Online ISSN-0976-4755	LINK	LINK	YES
27	Natural surfactants assisted an efficient synthesis of tetrahydro-β-carbolines	Dr V. R. Kadu	Chemistry	Results in Chemistry	2021	Online ISSN: 2211-7156	LINK	LINK	YES

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Natural surfactants assisted an efficient synthesis of tetrahydro-β-carbolines

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ABSTRACT

An expeditious protocol for the synthesis of structurally diversified β-carboline derivatives has been reported using a readily available natural surfactant medium. The synthesis of β-carboline derivatives in good yields under optimized conditions was carried out by the reaction of tryptamine with aldehydes in an aqueous extract of *Acacia Concinna* pods. The use of an aqueous medium, ease of purification, good yield and cost-effective reaction suggest for bulk scale production β-carboline derivatives.

Introduction

Nowadays there are continuous efforts in the development of Green chemistry the main focus of which is the replacement of the toxic or hazardous and expensive catalysts with the greener alternative. Water being safer, non-toxic, inexpensive and accessible is found to be a unique medium for conducting organic chemistry reactions[1–6]. Catalyst is the soul of organic reactions, hence its design, construction and utility is a great challenge before researchers. Numerous reaction transformations have been developed including the use of supercritical solvent[7], clays [8], enzymes[9], animal bone[10], surfactants[11] etc. as reaction medium or catalyst. These materials are found to be convenient to some extent for solving certain incredible synthetic issues. Some serious issues are occurring by use of catalyst in reaction like environmental hazardous nature of the catalyst, expensive, handling problems, use elevated temperature etc. To overcome these problems, use natural feedstocks in organic synthesis has found to be the best remedy. Nature gives an unbelievable collection of biochemicals that can act as biocatalysts for conducting organic transformations[12–15]. The natural material like soaked *Phaseolus Aureus*, the plant cell culture of *Daucus carota* root and coconut juice has been effectively used as a catalyst for conducting organic reactions[16]. The natural surfactants of *Acacia concinna* have been efficiently used for Knoevenagel condensation reaction[13], acylation of amines[17] and synthesis of aryl-hydrazones[16].

β-carbolines are natural products possessing various bioactivities due to their extraordinary chemical structure[18–20]. Reserpine (**A**) is used to treat high blood pressure and to treat mental disorder patients[21]. (-)-Suaveoline (**B**) has nutritional and medicinal applications[22,23]. Moreover, β-carboline derivatives possesses antimalarial[24], antitumor, anti HIV[25] and antibacterial activitites[26], Tadalafil (**C**) is used to treat male sexual function problems[27]. Strictosidine (**D**) is important precursors to medicinally important compounds such as anticancer drugs[28]. Kumujian C (**D**) palys important role as anti-inflammatory agent[29]. 6-oxofascaplysin (**F**) shows weak cytotoxic activity[30]. Evodiamine (**G**) shows anticancer activity[31] (Fig. 1).

Considering the pharmacological potential of β-carboline core, its synthesis using the green chemistry technique is the major concern of the present work. Generally, the synthesis of β-carboline is Pictet-Spengler reaction tryptamine or tryptophan with carbonyl compound in an organic solvent under reflux condition. Trifluoroacetic acid (TFA) and hydrochloric acid were found to be appropriate Bronsted acids for the synthesis of β-carboline derivatives[32]. The use of strong acids as a catalyst and harsh conditions with lacking substrate scope are the major disadvantages of reported methods[33]. Recently, molecular iodine and TFA/H_2O[34–36], zeolites[37,38], microwave irradiation(MWI)[39], aqueos molecular iodine in DMSO[40] has been studied to reduce reaction time and to improve yields of the products[41–43]. β-carboline derivatives are recently synthesized using diphenylphosphoric acid as a catalyst[44]. Pyridyl-phosphine ruthenium(II) catalyzed Pictet-Spengler reaction for the synthesize tetrahydro-β-carbolines is also reported[45]. Trifluoroacetic anhydride (TFAA) and 1,4-diazabicyclo[2.2.2]octane (DABCO) promoted and dimethylacetamide (DMA) medited Pictet-Spengler reaction is also reported[46]. Unfortunately, each method reported in the literature has disadvantages. Therefore, there is still a need

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to develop a more efficient method for the construction of the β-carboline core by utilizing natural, renewable and less hazardous reaction.

Acacia concinna known as Shikakai in India belongs to the family Leguminosae. Due to the cleansing activity of *Acacia concinna,* it has a traditional application as shampoo and detergent. The saponins, acacic acid present in *Acacia concinna* fruit which was found to be 10–11.5% [47] resulted in the acidic nature of its aqueous extract (p^H = 4.1) [48,49]. Also wetting and spreading property of surfactant solution promoted us to use surfactant type catalytic medium for synthesis of β-carboline derivatives. The aqueous extract of *Acacia concinna* is rich in saponins content. Saponins are triglycosides of acacia acid that contain glucose, arabinose and xylose as sugar cores[49,50]. Being amphiphilic, saponin has an existence of both polar and non-polar part as Glycone and Aglycone part respectively. Due to these polar and non-polar parts of saponin, reactant molecules solubilize in an aqueous extract of *Acacia concinna* and preceding the chemical reaction to the product side.

Result and discussion

To the extension of our current research for the development of novel methodologies for the synthesis of essential bioactive molecules [51–54], herein we have reported the use of natural surfactant type catalyst for the synthesis of tetrahydro-β-carboline derivatives (Scheme 1). Tetrahydro-β-carboline derivatives were synthesized using aqueous extracts of different natural surfactants like *Acacia concinna*, *Balanites aegyptiaca*, *Jatropha*, *Sapindus mukorossi.* Normally, the drastic reaction condition (5–6 hrs) is required the synthesis of tetrahydro-β-carbolines. To assess the catalytic effect of all the above natural surfactant on the rate of reaction and yield of the product we performed a model reaction of tryptamine (**1**) (1 mmol) and benzaldehyde (**2**) (1 mmol) in 10 mL aqueous extract giving product **3a** was carried out in respective aqueous solutions (Scheme 1). The use of natural surfactants showed variation in the rate of reaction and yield of product, results are summarised as in Table 1.

Hence, *Acacia Concinna* pods are applied effectively for the synthesis of tetrahydro-β-carbolines derivatives from tryptamine and benzaldehyde. The effect of other natural surfactants like *Balanites aegyptiaca*, *Jatropha*, *Sapindus mukorossi* for the synthesis of β-carboline derivatives has been studied shows less efficiency than *Acacia Concinna* pods. So for the synthesis of β-carboline analogues, aqueous extract of *Acacia Concinna* pods are applied.

For the optimization of reaction, the reaction of tryptamine (**1**) (1 mmol) and benzaldehyde (**2**) (1 mmol) in 5 mL aqueous extract of *Acacia concinna* pods (10% W/V) was conducted by varying temperature from 25 to 98 °C. It was found that 80% of compound **3a** was formed after 5.4 h at 98 °C temperature. The same reaction was conducted in different concentrations of aqueous extract of *Acacia concinna* pods as 20, 30, 40, and 50% to study the effect of catalyst concentration on yield. The result obtained suggested that 20% of the aqueous extract was adequate to get the maximum yield of the product **3a** (82%) in 5.2 h. However, an increase in the concentration of *Acacia concinna* pods (30%, 40%, and 50%) did not show much difference in the yields of the final product (Table 1) (see Table 2).

Similarly, the surface tension of the aqueous extract of *Acacia concinna* pods also plays important role in the determination of the rate of reaction. It was found that the addition of surfactant in water reduces

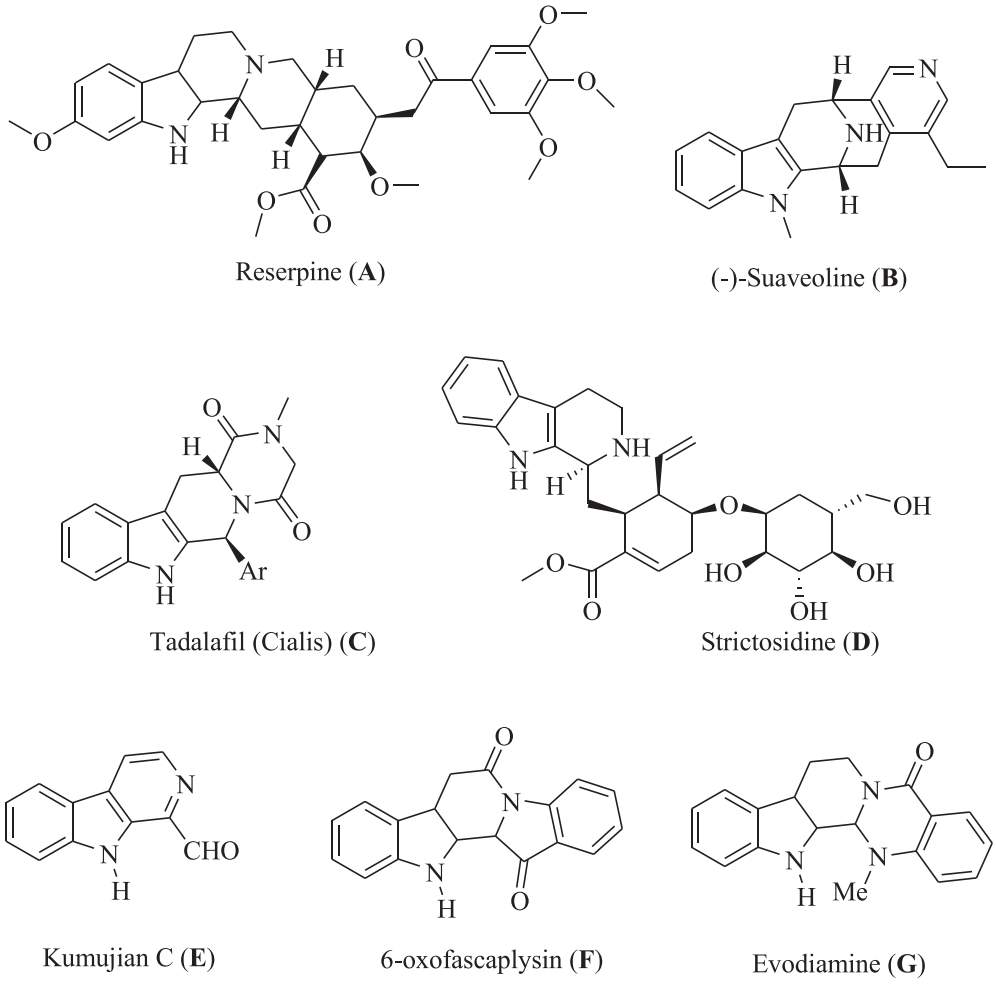
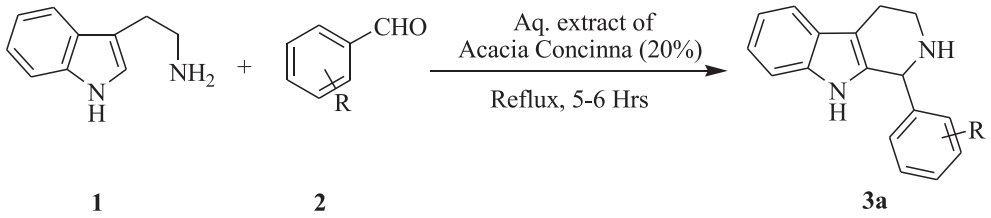


Fig. 1. Some of the potentially active β-carboline derivatives.



Scheme 1. Synthesis of terahydro-β-carboline derivatives.

Table 1
Effect of different surfactant systems in the synthesis of tetrahydro-β-carbolines.

Sr. No.	Surfactant system (Conc. 10%w/v)	Time of reaction (hr)	Yield %
1	***Acacia concinna***	**5.4**	**80**
2	*Balanites aegyptiaca*	6.0	75
3	*Jatropha*	5.2	78
4	*Sapindus mukorossi*	6.5	70

Table 2
Optimization of catalyst concentration.

Entry	Catalyst concentration %(W/V)	Time (h)	Yield(%)[a]
1.	10	5.4	80
2.	20	5.2	82
3.	30	5.8	80
4.	40	5.6	78
5.	50	5.4	75
6.	Water	12	NR[b]

[a]*Isolated yield of* ***3a****.* [b]*No reaction*

the surface tension as compared to water (Table 3). Wetting and spreading property of surfactant solution increase reaction rate. The surface tension and structure of surfactant affects the wetting and spreading property of surfactant solution[55,56]. Hence, several reactions like photochemical, redox, Diels-Alder, enzymatic reactions are found to have an increase in the rate of reactions by use of surfactant [57]. In addition, the hydrophobic groups of surfactant are sequestered in the micelle core[58], which helps in intimate contact with reacting species.

To assess the catalytic efficacy of the aqueous extract of the *Acacia concinna* pods, a model reaction of tryptamine (**1**) and benzaldehyde (**2**) was carried out in aqueous solutions of various cationic, anionic, and non-ionic surfactants such as sodium dodecyl sulphonic acid (SDS), triton X-100, cetyl ammonium bromide (CTAB) and CPB. The results obtained suggested that aqueous extract of the *Acacia concinna* pods was an excellent medium for the synthesis of '**3a**'over other commercial phase transfer catalysts (Table 4).

The superiority of the aqueous extract of *Acacia concinna* pods over other surfactants inspired us for further investigation of the present method for other aldehydes possessing a wide range of substituent (Table 5). The appreciable acidity ($p^H = 4.1$) and surfactant properties of the aqueous extract of *Acacia concinna* increase the rate of reaction. The saponins present in aqueous extract accelerate the solubility of reactant

Table 3
Effect of surface tension of surfactant solution on rate of reaction.

Entry	Catalyst concentration %(W/V)	Surface Tension 'T' (dyne/cm)	Time (h)
1.	50	14.22	5.4
2.	40	19.14	5.6
3.	30	33.52	5.8
4.	20	41.01	5.2
5.	10	47.21	5.4
6.	Water	66.55	–

Table 4
Effect of surfactant for the formation of '3a'

Entry	Surfactant[a]	Time (hr)	Yield (%)[b]
1.	None	12	NR[c]
2.	SDS	6.4	66
3.	Triton X-100	5.6	55
4.	CTAB	6.2	50
5.	CPB	6.4	58
6.	*Acacia concinna* extract 20% (W/V).	5.2	82

[a]*Reaction condition: Trptamine (1 mmol), benzaldehyde (1 mmol), Acacia concinna extract (5 mL),* 98 °C, [b]*Isolated yield.* [c]*No reaction.*

species. This will result in an increased collision between reactant molecules. Due to this reactant molecules are encapsulated into the micellar cage which drives the equilibrium to the product side by giving out water molecule of the hydrophobic interior of the micelle (Fig. 2) [59]. The projected mechanism for the synthesis of the β-carboline derivatives can involve the iminium-catalysed formation of *N*-benzylidene-2-(1*H*-indol-3-yl)ethanamine (**I**), activation by catalyst and ring closure giving a six-member ring (**II**) (Scheme 2)[60].

Conclusion

In conclusion, a greener methodology mediated by an aqueous solution of *Acacia concinna* pods has been reported for the synthesis of tetrahydro-β-carbolines in good to excellent yields via Pictet-Spengler reaction. The water as reaction medium, short reaction time, high purity of the products, biocompatible catalyst, mild reaction conditions and a simple workup procedure are features of the present method.

Experimental

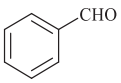
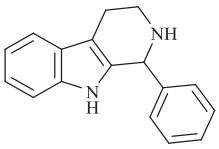
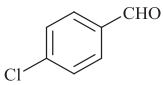
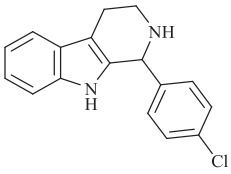
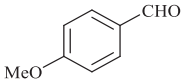
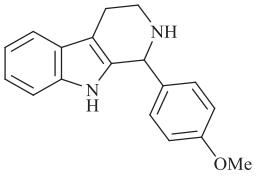
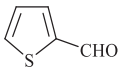
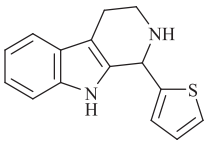
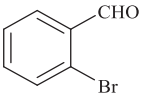
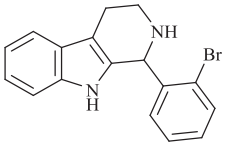
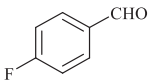
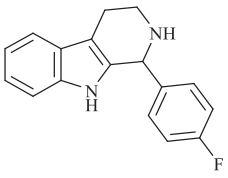
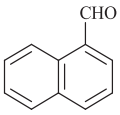
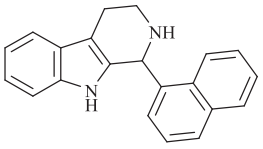
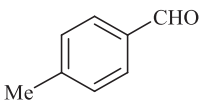
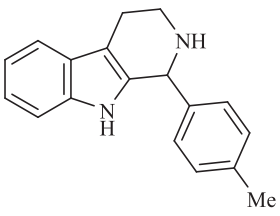
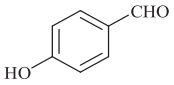
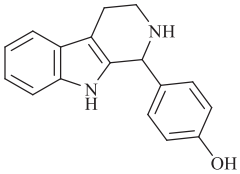
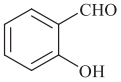
General

Melting points were recorded on Digital Electro thermal Melting point apparatus (VEEGO, VMP-DS) and are uncorrected. The reaction monitoring was conducted using Thin Layer Chromatography (TLC) using pre-coated Silica gel 60 F_{254} plates with layer thickness 0.25 nm purchased from Merck Ltd. TLC plates and were visualized under ultraviolet light. ^{1}H NMR was recorded on Varian-NMR mercury 400 MHz spectrometer using $CDCl_3$ as a solvent. The chemical shifts values (δ) are expressed parts per million (ppm). *Acacia concinna* pods which were purchased from the local market were dried well and seeds were removed. The fine powder was obtained of *Acacia concinna* by using mortar and pestle.

General procedure for the preparation of the catalyst

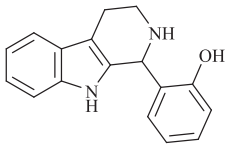
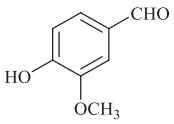
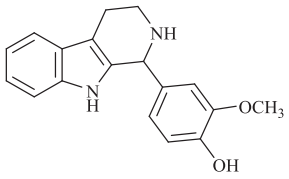
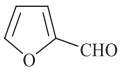
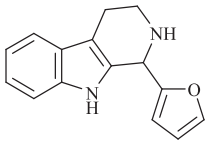
A mixture of fine powder of *Acacia concinna* pods (20 g) in water (100 mL) in a 250 mL conical flask was heated at 100 °C for 20 min. The solid material was separated by filtration and the aqueous extract was collected as a brown coloured solution having a concentration 20% w/v.

Table 5
Synthesis of tetrahydro-β-Carboline derivatives.

Entry	Aldehyde	Product		Time (Hr)	Yield (%)[a]	M.P. (°C)	M.P. (°C)[b]
1.			**3a**	5.2	82	163–164	162–163[61]
2.			**3b**	5	86	205–207	206–207[61]
3.			**3d**	5.4	78	202–204	203–204[61]
4.			**3e**	5.6	76	168–170	169–170[61]
5.			**3f**	4.8	88	196–198	198–199[62]
6.			**3g**	5.4	84	185–187	183–188[62]
7.			**3h**	5.6	78	166–167	167–168[61]
8.			**3i**	5	88	134–136	136–138[63]
9.			**3j**	5.6	78	191–193	192–193[63]
10.			**3k**	5.8	74	211–213	212–213[63]

(*continued on next page*)

Table 5 (*continued*)

Entry	Aldehyde	Product		Time (Hr)	Yield (%)[a]	M.P. (°C)	M.P. (°C)[b]
							
11.			**3l**	5.2	80	184–186	185–186[63]
12.			**3m**	5.4	78	208–210	209–210[63]

[a]*Isolated yield.* [b]*Products were confirmed by using physical methods for characterization and by comparison with that of reported in literature*

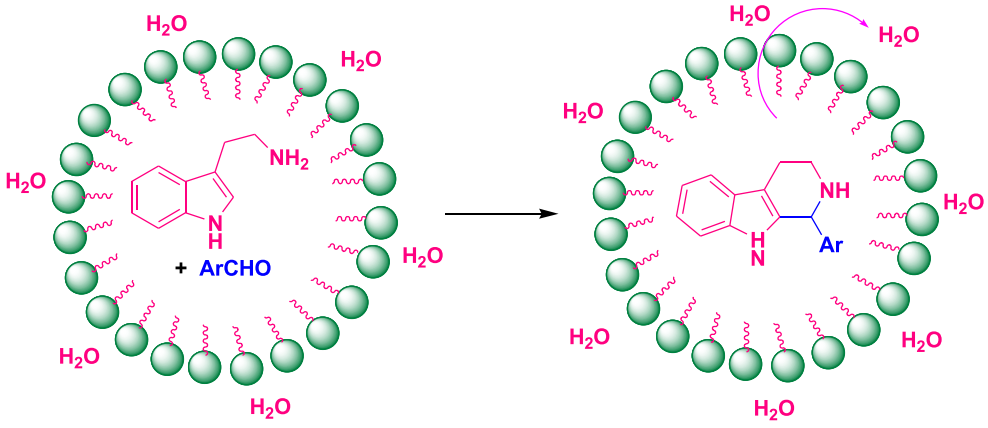
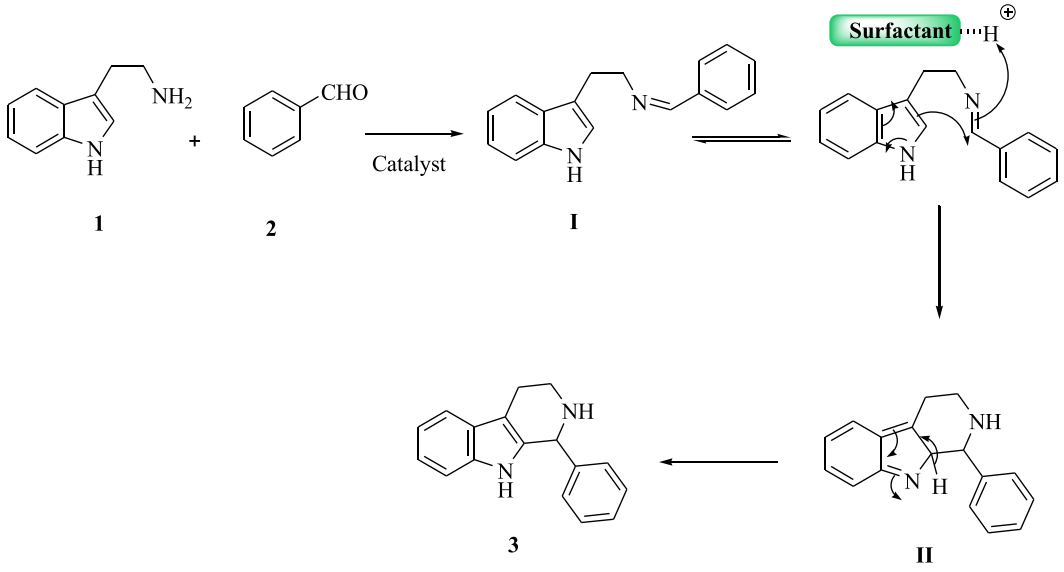


Fig. 2. Micelle-promoted synthesis of tetrahydro-β-Carboline derivatives.



Scheme 2. Proposed mechanism for formation of tetrahydro-β-carboline derivatives **(3).**

General procedure for the synthesis of tetrahydro-β-Carbolines (3a-m)

A mixture of tryptamine (1 mmol) and aldehyde (1 mmol) in surfactantmedium (20%, 5 mL) was stirred at about 60 °C temperature for specified time (Table 5). After completion of the reaction (as indicated by TLC), a separated solid was filtered on Buchner funnel. The obtained product was washed with 100 mL cold water. The product is thus freed from the aqueous extract and further drying the product affords pure tetrahydro-β-carbolines products (**3a-m**) in good yields.

Spectral data of representative compound

1-(4-chlorophenyl)-2,3,4,9-tetrahydro-1H-pyrido[3,4-b]indole (3b): Yield: 86%; White solid; **MP-** 205–207 °C, **LCMS** *m/z*: 282(M^+), **^{1}HNMR** (400 MHz, $CDCl_3$): δ 3.00–3.04(m, 2H), 3.79–3.87(m, 2H), 6.95–6.97(m, 1H), 7.02–7.04(m, 1H), 7.13(br s, 1H), 7.30–7.32(d, 1H), 7.49–7.51(d, 2H), 7.54–7.56(d, 1H), 7.73–7.75(d, 2H), 8.29(s, 1H), 10.78 (br s, 1H) **; ^{13}CNMR (100 MHz, $CDCl_3$):** δ 23.32, 43.44, 58.16, 77.67, 78.16, 78.31, 111.24, 111.77, 119.18, 120.36, 122.76, 128.15, 129.84, 130.78, 134.68, 134.84, 136.81, 141.25.

1-(4-methoxyphenyl)-2,3,4,9-tetrahydro-1H-pyrido[3,4-b]indole (3d): Yield: 78%; White solid; **MP-** 203–204 °C, **LCMS** *m/z*: 178(M^+), **^{1}HNMR** (400 MHz, DMSO): δ 2.62–2.66 (m, 2H), 2.99–3.02 (m, 1H), 3.11–3.14 (m, 1H), 3.90 (s, 3H), 5.23 (s, 1H), 5.31 (s, 1H), 6.99–7.00 (m, 2H), 7.25–7.31 (m, 3H), 7.36–7.41 (m, 3H), 8.14 (s, 1H) **; ^{13}CNMR (100 MHz, $CDCl_3$):** δ 23.57, 43.93, 56.39, 58.52, 77.78, 78.10, 78.42, 111.15, 111.88, 115.18, 119.26, 120.40, 122.71, 128.47, 130.71, 134.91, 135.86, 136.88, 160.55.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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STATE BANK OF INDIA'S CORPORATE SOCIAL RESPONCIBILITY

(with Special Reference to Supporting Education)

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ABSRACT:

CSR as an ever-growing topic of discussion in the corporate world goes beyond what is required by law or regulators and promotes the betterment of business practices for sustained positive change for all stakeholders. Companies create shared value for business and society through their forward thinking and getting involved in society welfare activities via CSR initiatives. Business has emerged today, as one of the most powerful institutions on the earth. Globalization is making the world smaller and business worldwide, expanding like never before. By crossing geographical boundaries, companies are expanding their business arms.

Indian economy is one of the fastest growing economies, acknowledged by large multinationals. Considering the global competition on every front, companies no longer expected to behave in traditional way and play the traditional role of profit maximizing. The increasing role of civil society and their demands from companies has started to put pressure on companies to act in economically, socially and environmentally sustainable way. There is a growing pressure on companies to be transparent and accountable for their employees, customers, shareholders, media and civil society.

Key-word: CSR, Globalization, socio-economic, environment, corporate world, Education.

INTRODUCTION:

Corporate Social Responsibility (hereafter mentioned as CSR) has emerged as topic of concern in government, corporation and international business forums due to its multidimensional benefits. Considering the corporate world, corporate stakeholders are getting increasingly conscious about various socio-economic challenges across the globe and ethical business practices of companies.

Today, it is expected from business organizations that they become seriously concerned about their responsibilities towards their stakeholders and the society at the large. Hence, CSR has emerged as an unavoidable priority in corporate world in present times.1 The most successful companies in the world have a reason for being ethical or responsible that goes beyond reaching commercial targets of their business. Contribution in community development, which they impact and depend upon, is now an important consideration for all type of business: large, medium or small.

The common understanding amongst most CSR definitions concern with how the profits are made and how they are used, keeping in mind the stakeholders‟ interest.

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Inventory Management in Indian Industry (A study of Maruti Udyog Limited)

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ABSTRACT

The material constitutes a very important position in the total cost of the finished product in most of the manufacturing industries. Therefore, proper recording and control over material costs are essential. Material control may be as, the regulation of the procedures for requisitioning, buying receiving, storing, handling and uses of material, also it applies the system for A, B, C classification of components is based mainly on cost and consumption of a particular component. This system also provides for various risk factors. The inventory management in the Indian industry is developed in a systematically in the modern business world and also to evaluate the concept as well as precepts pertaining to inventory management develop in Indian industry, as a special reference of Maruti Udyog Limited (MUL)

Keywords— *Inventory, Management, Industry, Manufacture, Material Control, Production*

1. INTRODUCTION

Material control is a system, which ensures the availability of the right quantity of material, of the right quality, at the right time which the minimum amount of capital by purchasing them at the right price from the right source.

2. OBJECTIVES OF AN EFFECTIVE INVENTORY CONTROL SYSTEM

(a) Maintaining adequate inventory so as to avoid production stoppages.
(b) Avoiding excess inventory holding thereby reducing the material holding cost chances of obsolescence, storage loss, pilferage, etc.
(c) Fixation, of Economic Order Quantity, maximum level, minimum level Reordering level, safety stock level, etc.
(d) Avoiding slow-moving and non- moving dormant surplus and obsolete stock, etc.
(e) Avoiding the blocking of the Capital amount i.e. minimum investment in the inventory.

3. REQUIREMENT OF MATERIAL CONTROL SYSTEM

(a) Material control is a matter of coordination among the various departments concerned viz purchases, production, maintenance, inspection, stores, accounts & cost accounting departments.
(b) Classification, codification, standardization, rationalization, and simplification of materials.
(c) Use of standard forms and documents in all the stages.
(d) Centralization of purchasing under an efficient purchase department.
(e) Perpetual inventory system and continuous physical stock verification.

In the mid-eighties "Maruti Limited" started to manufacture the first high quality, low cost, and fuel-efficient car of India. In the factory 1981, the company was nationalized as "Maruti Udyog Limited" (MUL) one of the foremost tasks before MUL was to determine the most suitable product mix. Towards this end, the company was in search of suitable foreign partner whosoever be willing to accept requirements in terms of product mix technology transfer equity participation and others.

After extensive discussions with several major European and Japanese car manufactures, MUL chose Suzuki Motor Co. (SMC) of Japan as its partner. The joint venture was set up with a 25% equity share from SMC with an option to increase its share to 40% within 5 years. In 1992 the Government of India approved foreign partner's request to increase its equity from 40% to 50%. A subscription and amendment agreement was signed between the Government of India and SMC in 1992. As a result, MUL becomes a non-Government Co., which is now Board managed.

The factory is located at Gurgaon 50 Kms west of Delhi- with a licensed capacity of 1,40,000/- vehicles per annum during 1994. The factory started production in December 1983. It is equipped with the most modern machinery. On average almost six hundred

१८. महाराष्ट्र राज्य मार्ग परिवहन महामंडळाचा प्रवासी ग्राहक व्यवसाय: आर्थिक विश्लेषण

डॉ. पुलाटे एस. के.
वाणिज्य विभागप्रमुख कला, वाणिज्य व विज्ञान महाविद्यालय राहाता.
गोपाळे स्वप्नील दामोदर
पद्मश्री विखे पाटील कला, विज्ञान आणि वाणिज्य महाविद्यालय, प्रवरानगर.

प्रस्तावना

महाराष्ट्र राज्य मार्ग परिवहन महामंडळाची स्थापना सन १९४८ मध्ये महाराष्ट्र शासनाने केली. याच वर्षामध्ये नगर ते पुणे अशी पहिली एस.टी धावली. महाराष्ट्र राज्य मार्ग परिवहन महामंडळातील महाराष्ट्रातील ग्रामीण व शहरी भागात महत्त्वपूर्ण वाहतूक सेवा प्रदान करत आहे.'सुरक्षित व अपघात विरहित बससेवा' या ध्येयाने महाराष्ट्र राज्य मार्ग परिवहन महामंडळ आपले योगदान देत आहे. वाहतूक व्यवस्था हा विकसित होण्याचा महत्त्वाचा आधारस्तंभ आहे. आज पेट्रोकेमिकल्स चे साठे वाचवायचे असतील तर सार्वजनिक वाहतूक हाच एकमेव पर्याय उपलब्ध आहे. आणि याच सार्वजनिक वाहतुकीचा महत्त्वाचा पर्याय म्हणजे बससेवा आहे.

संशोधनाची आवश्यकता

महाराष्ट्र राज्यातील सर्वसामान्य लोकांना खेड्यापासून ते शहरापर्यंत जोडणारी एस.टी ची सेवा हे एक सामाजिक बांधिलकी निर्माण करणारी सेवा आहे. अनेक खेड्यापासून शाळेत जाण्यासाठी विद्यार्थी वर्गाचे हक्काचे वाहन म्हणजे एस.टी होय. तसेच रुग्णांना, वृद्धांना, विकलांग लोकांना प्रवास करण्यासाठी हक्काचे व सुरक्षित प्रवासाचे साधन म्हणजे एस.टी आहे. महाराष्ट्र राज्य मार्ग परिवहन महामंडळाचे ३१ विभागीय कार्यालय असून महामंडळात एकूण १८९८८ गाड्यांचा ताफा आहे तसेच ६०८ बसस्थानके व २५० बस आगरे आहेत. दररोज महामंडळाच्या बसने ६७ लाख प्रवासी प्रवास करतात. वरील आवश्यकता लक्षात घेऊन संशोधकाने महामंडळाच्या आर्थिक घटकांचे अध्ययन करण्यासाठी वरील विषय संशोधनासाठी घेतला आहे.

संशोधनाच्या मर्यादा

वरील संशोधनात संशोधकाने महाराष्ट्र राज्य मार्ग परिवहन महामंडळातील फक्त आर्थिक घटकांचे अध्ययन केलेले आहे. तसेच वरील संशोधनाचा कालावधी हा २०१५-१६ ते २०१७-१८ आहे.

20. Sustainable Rural Development in India

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Abstract

National development in a country like India, where 74 per cent of the population resides in Villages, is not possible without the development of its rural areas. Rural development is an essential Component. Recognizing the fact since independence, the government and various voluntary organizations have attempted to focus their effort on designing and implementing number of integrated rural development and commmity development activities.

Community development is a process in which the people, unserved and underserved achieve a state of welfare by their initiation, motivation and efforts, initially in association with the schemes supported by the government as well as other funding agencies. Change for better standard of living by means of enhancing one's income through available resources such as agriculture, animal husbandry, etc., attain essential education, awareness, values and meeting the health needs, is the expected outcome of community development.

Introduction

Rural Development is a subsed of the broader term "development" We defint it, developement is a universally cherished goal of individuals, families, communities and nations all over the world. Development is also natural in the sense that all forms of life on -planet earth have an inherenturge to Survive and development.

Concepts of Rural Development

Development is a subjective and value-loaded, Concept and hence, there cannot be a Consensus as to its meaning. It basically means unfolding revealing of opening up something which is latent. When applied to human beings, it therefore means unfolding or opening up their potential powers. Generally speaking the term development. implies change that is desirable.

Some of the Objectives that are Usually Included in the Set are as Follows.

1. Increase in real income per capital (Economic growth).
2. Improvement in distribution of income.

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Women Social Problems: Special Reference To Indian Agricultural Sector And Women Entrepreneurs

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Abstract:

Agriculture is a main occupation in India. It provides employment opportunities around 60 percent of total work force in the country. Most of the business depends on agriculture for raw material. Agriculture also provides employment opportunities and business to women. The agriculture in India is an important source of employment for women than men. Most of the agricultural work is done by the women. Women have to perform dual role as a homemaker and as an entrepreneur. So the agriculture related business is the best option for them. But still women entrepreneurs in agriculture are facing lots of problems. The basic aim of the paper is to focus the problems faced by the women entrepreneurs in agricultural sector.

1.1 Introduction:

The agriculture is the backbone of Indian economy. The share of agriculture is declining in Indian economy but in spite of it majority of workforce still depend on agriculture for employment particularly in rural area. Agriculture is main occupation of people. The demand of row material for the industrial products depends upon agricultural income because rural consumption for industrial product is nearly three times more than that of urban consumption. There is a direct relationship between agricultural income and demand for industrial goods. Economic development is not possible without the development of agriculture in India.

Woman education in India plays important role in the development of the country. After the independence, the government has taken various measures to provide education to all Indian woman. As a result woman literacy rate has grown up. So that woman started to go to out of home for wage employment or entrepreneurship career. Woman are started to searching increasing opportunity as an entrepreneurship.

The Central and State government have been working in implementing various schemes to enable more women to undertake entrepreneurial activities in order to improve income level of urban and rural women's. Now a day's Indian women are coming out kitchen and taking up entrepreneurial activities on a per with men. Women are making all efforts to upgrade their standard of living by increasing their income and saving. Their is no field today where women are not approaching. Women plough field, harvest crops, sells food, make handicrafts, work as an entrepreneur

Women entrepreneurs who are working in agriculture sector are facing the problems of poverty and exploitation. It affects the total productivity of Indian agriculture. In India female population is nearly half of the country's population as per the census in 2001. In reality women contributes a lot for the success of business but they are not recognized properly. Their abilities and potentials are not fully utilized. Women can change the shape of economy if they get opportunity to work as an entrepreneur. Women are working in the business related to agriculture such as animal husbandry, vermi compost, floriculture, nursery, rice processing, food processing, bakery product, oil mill, etc. But these women entrepreneurs have to face many problems in terms of growth of their enterprises.

Women entrepreneurs have to manage both home and enterprise efficiently. Women have to face many conflicts in home role such as no sufficient time for children, family, personal hobbies,

PROBLEMS OF WOMEN ENTREPRENEURS IN AGRICULTURAL MARKETING DURING PANDEMIC SITUATION: A CASE STUDY OF AHMEDNAGAR DISTRICT IN MAHARASHTRA

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Abstract

The entrepreneurship is the usefull path to increase women's contribution in economic development. Women should take an important part in production activates. But very few numbers of women entrepreneurs have been seen in business area. Woman education in India plays important role in the development of the country. After the independence the government has taken various measures to provide education to all Indian woman. As a result woman literacy rate has grown up. As a result women's literacy rate has grown up. As education has spread woman, started to go to out of home for wage employment or entrepreneurship career. Woman are seeking increasing opportunity as an entrepreneurship. The research paper highlights the problems faced by women entrepreneurs in Pandemic situation with reference to Ahmednagar district of Maharashtra.

Keywords: *Pandemic Situation, Women, Entrepreneurship, Industries, Problems.*

1.1 Introduction:

In the emerging economic scenario of liberalization, the contribution of woman towords the gross domestic product is important. The entrepreneurship is the use full path to increase women's contribution in economic development. "Women in Business" is considered a recent phenomenon in India. In India, the female population is 48.46%of the country's total population as per the census 2011. It indicates that women should take part in production activates. According to 2011 census there are 940 females behind every 1000 males are working in informal sector. But very few numbers of women entrepreneurs have been seen in business area.

Woman education in India plays important role in the development of the country. After the independence the government has taken various measures to provide education to all Indian woman. As a result woman literacy rate has grown up. As a result women's literacy rate has grown up. As education has spread woman, started to go to out of home for wage employment or entrepreneurship career. Woman are seeking increasing opportunity as an entrepreneurship.

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1.2 Entrepreneurs:

'The word entrepreneur originate from the French word 'Entreprendre' which means 'to undertake' in business context. It means to start business'[1]

The entrepreneur is commonly known as a business leader who promotes the unit, establish the factors of production and manage the affairs of the business. Management skill and strong team building abilities are needed to become successful entrepreneur. The entrepreneur is define in following approach. 1. 'Entrepreneur' is a business leader an innovator of new ideas in the business process'.[2]

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दुसऱ्या बाजीराव पेशव्यांच्या काळातील इंग्रज वकीलाची राजकारणातील भूमिका

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[illegible] इतिहास विभाग, कला, विज्ञान व वाणिज्य महाविद्यालय, राहाता, ता राहाता, जि. अहमदनगर, महाराष्ट्र

[illegible]

[illegible] कंपनीशाहीच्या अखेरच्या पर्वामध्ये दुसरे बाजीराव पेशवे यांच्या कारकीर्दीमध्ये इंग्रज वकीलांनी साम्राज्य [illegible] करण्यासाठी मराठ्यांच्या राजकारणात प्रवेश करत इंग्रज वकीलांनी आपल्या भातुर्ता [illegible] ते [illegible] [illegible] कारकीर्दीमध्ये मराठा सरदार, पेशवे, टिपू सुलतान, फ्रेंच, पोर्तुगीज, डच या सर्वांबरोबर इंग्रजांनी राजकीय क्षेत्र [illegible] अवलंबुन इंग्रज वकीलांनी हिंदुस्थानात साम्राज्य विस्तार करण्यासाठी वेगवेगळ्या प्रकारे युध्द, तह, [illegible] करार करून इंग्रजांनी एक एक साम्राज्य संपुष्टात आणुन त्यांनी फार मोठ्या प्रमाणात इंग्रजांनी राजवट [illegible] प्रस्थापित केली. इंग्रज वकीलांनी अतिशय हुशारीने मराठा सरदारामध्ये कला पध्दतीने फुट पाडली व [illegible] त्यांच्या बरोबर मैत्रीचे ही संबंध निर्माण करून दुसऱ्या बाजीराव पेशव्यापुढे म्हणजे मराठी [illegible] कला पध्दतीने आव्हाने टाकली होती. त्या आव्हानातुन मराठा सरदारांनी बरेच दिवस इंग्रज [illegible] आव्हान देवुन मराठा साम्राज्याचा बचाव केला होता. परंतु इंग्रज वकीलाचे हेतु हे [illegible] [illegible] अखेर मराठा साम्राज्य इंग्रजांनी गिळंकृत केले. मराठा साम्राज्यातील जे अंतर्गत हेवेदावे होते [illegible] इंग्रजांनी करून घेतला. त्यामुळे इंग्रज वकीलांना पेशवे दरबारात फार मानाचे स्थान मिळाले होते. [illegible] इंग्रज वकीलांनी भारतीय समाजाशी एकरूप होवुन त्यांची संस्कृती आचार विचार समजावुन घेतले. [illegible] मराठा सरदारांनी इंग्रजावरती विश्वास टाकला. राजकीय दृष्टीकोणातुन मराठा पेशवा दुसरा [illegible] हे स्वतः धरसोड वृत्तीने वागल्यामुळे त्यांच्या स्वभावाचाही फायदा इंग्रज वकीलांनी घेतला. मराठा [illegible] होणाऱ्या दररोजच्या हालचाली ते आपल्या इंग्रज वरिष्ठ अधिकाऱ्यांना कळवत असे. म्हणजेच इंग्रज [illegible] दुसऱ्या बाजीराव पेशव्यांच्या काळात महत्वपूर्ण भूमिका बजावली आहे हे निश्चित आहे.

[illegible] -

[illegible] बाजीराव पेशव्यांच्या काळात इंग्रज वकीलांनी जे राजकीय दृष्टीकोनातून ज्या घडामोडी केल्या त्या [illegible]

[illegible] बाजीराव पेशव्यांच्या काळात मराठा साम्राज्यात विविध सरदारां बरोबर जे डावपेच खेळले ते स्पष्ट [illegible]

[illegible] बाजीराव पेशव्यांच्या काळात मराठ्यांचे राज्य कसे हस्तगत केले ते स्पष्ट करणे.

[illegible] बाजीराव पेशव्यांच्या दरबारात राहून इंग्रज राजवटीला वकीलांनी कशा पध्दतीने सहकार्य केले ते स्पष्ट [illegible]

[illegible] -

[illegible] बाजीराव पेशव्यांच्या काळात इंग्रज वकीलांनी राजकीय दृष्टीकोणातून कार्य केले.

[illegible] बाजीराव पेशव्यांच्या काळात मराठा साम्राज्यात विविध सरदारां बरोबर डावपेच खेळले.

[illegible] बाजीराव पेशव्यांच्या काळात मराठ्यांचे राज्य हस्तगत केले.

[illegible] बाजीराव पेशव्यांच्या दरबारात राहून इंग्रज वकीलांनी इंग्रज राजवटीला सहकार्य केले.

[illegible] -

[illegible] -

[illegible] म्हणजे अखेरच्या पर्वात दुसऱ्या बाजीराव पेशव्यांकडे पेशवे पद आल्यानंतर मराठ्यांमध्ये [illegible] कारणाने सुरु झाली होती. या पद काळखंडात पेशवे पद कोणाकडे जावे हा एक महत्वपूर्ण

२. वहता तालुक्यातील दुसऱ्या बाजीराव पेशव्यांच्या काळातील अन्याबा राहातेकरांचा

प्रा. मते अनिल बापुराव
इतिहास विभाग कला, विज्ञान व वाणिज्य महाविद्यालय, राहाता, ता. राहाता, जि. अहमदनगर.

प्रस्ताविना

मराठेशाहीच्या अखेरच्या पर्वातील म्हणजे सन १७९५ ते १८१८ या काळात दुसरे बाजीराव पेशवे यांच्या बरोबर राजकिय दृष्टीकोनातुन अनेक सरदारांचा उदय झाला होता. परंतु मराठ्यांच्या राजकारणात अनेक प्रकारच्या अडचणी निर्माण झालेल्या असतांना त्या काळात दुसरे बाजीराव पेशवे यांना सहकार्य करणाऱ्या सरदारांमध्ये खऱ्या अर्थाने अन्याबा राहातेकर उर्फ परशराम खंडेराव यांचे फार मोठ्या प्रमाणात सहकार्य लाभले होते. एक विश्वासु सरदार या नात्यातुनच त्यांचे कौटुंबिक संबंध चांगल्या प्रकारे निर्माण झाले होते. अन्याबा राहातेकरांनी जी दुसरे बाजीराव पेशवे यांनी अनेक सरदार त्यांचे रावटीत असतांनाही आपल्या कुटुंबाची योग्य जबाबदारी फक्त अन्याबा राहातेकर पार पाडू शकेल म्हणूनच दुसरे बाजीराव पेशवे यांनी त्याची नियुक्ती केली होती. या कौटुंबिक नियुक्तीबरोबरच त्यांच्यावर जुन्नर परगण्यांची व इतर प्रांतांची राजकिय जबाबदारी त्यांच्यावर टाकलेली होती व अन्याबा राहातेकर यांनी यशस्वीरीत्या पार पाडली होती.

अन्याबा राहातेकर हे अहमदनगर जिल्ह्यातील राहाता येथील ते वतनदार कुलकर्णी होते. त्याच्या घराण्याचा मोगलाईच्या कालखंडात उल्लेख सापडतो म्हणजेच राजकिय दृष्टीकोणातुन राज्यकारभार करणे हा त्या घराण्याला फार पुर्वीपासुन अनुभव होता. सन १७९६ ते सन १७९७ मध्ये म्हणजे दुसरे बाजीराव पेशवे यांना पेशवेपद मिळाल्यानंतर अन्याबा राहातेकरांचा संबंध निर्माण झालेला होता असे ऐतिहासिक कागदपत्रांवरुन दिसुन येते. या राजकिय घडामोडीतुनच त्यांच्या वरती पेशव्यांनी आपल्या कुटुंबाची जबाबदारी टाकल्याचे दिसुन येते.

या काळात नाना फडणीस यांचे अनुभवी राजकिय डावपेच, त्यांची हुशारी, मुत्सद्दीपणा, त्यांचेकडे असणारे अनुभवी सरदार या सर्व गोष्टीमुळे दुसरे बाजीराव पेशवे यांना अनेक अडचणींना तोंड द्यावे

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Research Paper -Hindi

मन्नू भंडारी के नाटक 'महाभोज' में मूल्यहीनता

डॉ. दादासाहेब नारायण डांगे

सहायक प्राध्यापक, हिंदी विभाग, कला, विज्ञान एवं वाणिज्य महाविद्यालय, राहाता

नाटक मनुष्य जीवन की मूर्त अभिव्यक्ति है। व्यक्ति का संपूर्ण जीवन नाटक में प्रतिबिम्बित होता है। सामाजिक जीवन का यथार्थ ही नाटक में अभिव्यक्त किया जाता है। इस दृष्टि से नाटक विधा अन्य गद्य विधाओं की तुलना में अधिक प्रभावी है। भारतेंदू युग से ही नाटक सशक्त रूप से मानव जीवन को प्रस्तुत करता रहा है। स्वतंत्रता के उपरांत तो नाटक के स्वरूप एवं कथ्य में काफी बदलाव दिखायी देने लगा।

समकालीन नाटक समय के साथ चलने में सक्षम दिखायी देता है। आज हर वह घटना, जो मनुष्य जीवन के साथ जुडी है, समकालीन नाटक उसे यथार्थ रूप में उजागर करता है। आजादी के बाद जनतंत्र की स्थापना हुई। प्रत्येक व्यक्ति अपने कर्तव्यों एवं अधिकारों के प्रति सजग हुआ। उसे लगने लगा कि, अब प्रजातंत्र में उसे परंपरा से चली आयी समस्याओं एवं तकलिफों से मुक्ति मिलेगी। परंतु ऐसा कुछ भी नहीं हुआ।

प्रजातंत्र के सभी अधिकार हमारे नेताओं के हाथ में चले गए। आजादी के बाद हमारी राजनीति ने सभी को प्रभावित किया। एक प्रकार से भारतीय राजनीति सत्ता एवं अधिकार का पर्याय बन गयी और एक बार फिर देश में मोहभंग की स्थिति उत्पन्न हुई। समकालीन नाटक जनता की इसी मोहभंग की स्थिति को यथार्थ रूप में प्रस्तुत करने लगा। स्वतंत्रता के उपरांत सामान्य व्यक्ति के मोहभंग को तथा नेताओं की स्वार्थी एवं अवसरवादी प्रवृत्ति को उजागर करने में समकालीन नाटककारों ने महत्वपूर्ण भूमिका निभायी। मन्नु भंडारी का नाम उनमें अग्रणी है। उन्होंने अपने नाटकों के माध्यम से समकालीन युगबोध को ही उजागर किया है। इस दृष्टि से उनका 'महाभोज' नाटक बहुत ही सशक्त नाटक है। उन्होंने महाभोज में तत्कालीन राजनीतिक मूल्यहीनता तथा निम्न वर्ग के शोषण की गाथा का वास्तविक चित्र प्रस्तुत किया है। प्रस्तुत शोध आलेख में इसी मूल्यहीनता पर भाष्य करने का प्रयास किया गया है।

मन्नू भंडारी समकालीन युग की एक सशक्त लेखिका है। समकालीन युगबोध का चित्रण उनके साहित्य का प्रमुख स्वर रहा है। उनका जन्म मध्यप्रदेश के मंदसौर जिले में भानुपुरा गांव में ०३ अप्रेल, १९३१ में हुआ था। उनका बचपन का नाम महेंद्र कुमारी था परंतु लेखन के लिए उन्होंने मन्नू इस नाम का चयन किया था। लेखन के संस्कार उन्हें अपने पिताजी से विरासत में ही मिले थे। उन्होंने विपुल मात्रा में साहित्य लेखन किया है। कहानी, उपन्यास, नाटक, आत्मकथा आदि विधाओं में मन्नू भंडारी लिखती है।

'आपका बंटी' उनका बहुचर्चित उपन्यास है। जिससे उन्हें साहित्य जगत में ख्याति मिली। उन्होंने सन २००७ में 'एक कहानी यह भी' शिर्षक से अपनी आत्मकथा लिखी है। उन्होंने फिल्मों के लिए पटकथाएं भी लिखी हैं। उनकी 'यही सच है' कहानी पर रजनीगंधा नाम से फिल्म बनी थी। 'महाभोज' उनका अत्यधिक सशक्त एवं लोकप्रिय नाटक है, जो समकालीन यथार्थ का नग्न रूप प्रस्तुत करता है। उनका यह नाटक पहले सन १९७९ में उपन्यास के रूप में छपा था। बाद में सन १९८२ में उन्होंने उसे नाटक के रूप में प्रकाशित किया। इस नाटक

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डॉ. शंकर शेष के नाटक 'रक्तबीज' में मिथकीय प्रयोग

डॉ. दादासाहेब नारायण डागे

हिंदी विभाग,

कला, विज्ञान व वाणिज्य महाविद्यालय, राहाता तहसिल- राहाता, जिला- अहमदनगर,महाराष्ट्र

डॉ. शंकर शेष को समकालीन युग के सुप्रसिद्ध एवं प्रयोगधर्मी नाटककार के रूप में विशेष ख्याति मिली। समकालीन जीवन की ज्वलंत समस्याओं का सामना करनेवाले संघर्षशील मध्यमवर्गीय व्यक्ति की त्रासदी का चित्रण उनके अधिकतर नाटकों का केंद्रीय विषय रहा है। मोहन राकेश के बाद के नाटककारों में उनका महत्वपूर्ण स्थान है। उनके द्वारा लिखित विभिन्न नाटकों एवं एकांकियों का समय-समय पर रंगमंच पर सफलता सेप्रदर्शन होता रहा। मंचीयता की दृष्टि से उनके लगभग सभी नाटक सफल हैं। उनके अधिकतर नाटकों में मिथक का प्रयोग मिलता है। वे मिथक का आधार लेकर वर्तमान जीवन की विसंगतियों एवं समस्याओं को यथार्थ रूप में उद्घाटित करते हैं। मानो मिथक उनके लिए एक हथियार है, जिसके माध्यम से डॉ. शेष वर्तमान समय में मनुष्य के भीतर पनप रही विभिन्न प्रवृत्तियों पर प्रहार करते हैं। मिथक में हमारा पुरातन आख्यान समाहित रहता है। मिथक इसी पुरातनता को नवीन संदर्भ प्रस्तुत कर सत्य की खोज करता है। डॉ. शेष ने वर्तमान समय में मनुष्य के भीतर उत्पन्न हो रही विभिन्न मानसिक विकृतियों को रेखांकित करने के लिए मिथक का सुंदर प्रयोग किया हैं। इस संदर्भ में डॉ सुनील कुमार लवटे ने कहा है, "रक्तबीज नाटक में डॉ. शेष ने 'रक्तबीज' के पौराणिक मिथ का प्रयोग कर आधुनिक जीवन की व्याख्या करने का प्रयास किया है। पौराणिक कथा में 'रक्तबीज' एक ऐसा राक्षस था, उसे यह वरदान प्राप्त हुआ था की, अगर उसे मारने की कोशिश की जाएगी तो जमीन पडे रक्त से दूसरे नये रक्तबीज पैदा होंगे। और यह सिलसिला जारी रहेगा। डॉ. शेष ने आधुनिक समाज में ऐसे रक्तबीजों का अनुभव किया।"1इसीलिए डॉ. शेष ने आज के रक्तबीजों का खात्मा करने के लिए पौराणिक मिथ 'रक्तबीज' का प्रयोग किया है। इस शोध आलेख में 'रक्तबीज' नाटक में प्रस्तुत मिथक पर विचार किया गया है।

रक्तबीज नाटक में डॉ. शंकर शेष ने मिथक का प्रयोग किया है। पुराणों में एक रक्तबीज नामक राक्षस का उल्लेख मिलता है, जिसे रक्तबीज का वरदान प्राप्त था। उस रक्तबीज को केवल दूसरों को मारकर अपना स्वार्थ सिद्ध करने में रुचि थी। पुराणों में लिखा है कि, उसे मारने की हर कोशिश नाकामयाब हो जाती थी। क्योंकि उसकी टपकती रक्त-बून्दों से हजारों रक्तबीज पैदा हो जाते थे, जिससे समाज का केवल अहित होता था। वर्तमान समय में मनुष्य के भीतर भी इसी प्रकार की प्रवृत्ति उत्पन्न हो रही है। अपनी इच्छा अपेक्षाओं को पूर्ण करने तथा प्रसिद्धि के लिये किसी का भी इस्तेमाल करने की राक्षसी मनोवृत्ति आज बढ़ती जा रही है। इसे डॉ. शंकर शेष ने अपने नाटक 'रक्तबीज' में सूक्ष्मता से प्रस्तुत किया है। असल में रक्तबीज एक पौराणिक पात्र है, जिसके माध्यम से डॉ. शेष ने महानगरीय व्यक्तियों की मनोवृत्तियों को उजागर करने का प्रयास किया है। उन्होंने आज के व्यापक परिवेश में व्याप्त रक्तबीज की पहचान करायी है। नाटक में बताया गया है कि, सफलता पाने के लिए लोग दूसरों का कैसे इस्तेमाल करते हैं। इसके लिए वह अपनों को भी दाँव पर लगाने में संकोच नहीं करते। पति अपनी पत्नी का, बॉस अपने अधीनस्थ का हर जगह इसी तरह इस्तेमाल करता है। डॉ. शेष ने इस नाटक में मानवीय कमजोरियों को अत्यंत सूक्ष्मता से अंकित किया है।'रक्तबीज' में बताया गया है कि, हत्या और आत्महत्या तो केवल एक परिणाम है। नाटक के आरंभ में ही सी का यह कथन इस बात को स्पष्ट करता है। वह कहती है, "....हत्या और आत्महत्या तो परिणाम है। असली है वे कारण जिनके कारण ये होती हैं। ..... असली है वह रक्तबीज। हमारी व्यवस्था की सांस-सांस में बैठा वह रक्तबीज।"2 डॉ. शेष ने इस नाटक में मध्यवर्गीय व्यक्ति से उस राक्षस को मारने के लिए कहते है, जो दूसरों का खून चूसता है। वे कहते है , अगर इस रक्तबीज को नहीं मारा गया, तो यह व्यवस्था ऐसे ही चलती रहेगी और हत्या और आत्महत्याओं का यह क्रम भी चलता रहेगा। आवश्यकता इस बात की है कि, इन हत्या-आत्महत्याओं के कारणों की तलाश की जाए यही इस नाटक का मूल स्वर है।

डॉ. शंकर शेष हिन्दी नाट्य साहित्य क्षेत्र में सर्वश्रेष्ठ नाटककारों में से एक है। उनके नाटकों में मध्यवर्गीय व्यक्ति के संघर्ष का तथा उसके महत्वाकांक्षी जीवन की त्रासदी का चेहरा साफ नजर आता है। वर्तमान समाज में आर्थिक विपन्नताओं के कारण मध्यवर्गीय व्यक्तियों में तनाव, कुण्ठा, घुटन और निराशा एवं असुरक्षा की भावना उत्पन्न हुई है। इसीलिए मध्यवर्गीय व्यक्ति इस समस्या से मुक्ति पाने के लिए कुछ करना चाहता है और उसकी यही चाह उसे दूसरों का इस्तेमाल करने के लिए मजबूर करती है।

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Research Paper -Hindi

"वर्तमान परिप्रेक्ष्य में विवाह का बदलता स्वरूप"

डॉ. दादासाहेब एन. डांगे

सहायक प्राध्यापक, हिंदी विभाग कला, विज्ञान व वाणिज्य महाविद्यालय तहसिल– राहाता, जिला– अहमदनगर,महाराष्ट्र

प्राचीन काल से विवाह एक पवित्र बंधन माना जाता है। विवाह हमेशा–से दो परिवारों के बीच बहुमूल्य संबंध स्थापित करता आ रहा है। परंतु वर्तमान समय मे जिंदगी की तेज रफ्तार में यह बहुत ही कमजोर साबित हो रहा है। उसका वह मूल्य कम हो रहा है, जो पहले था। आज नयी पीढी विवाह में 'लिव ईन रिलेशनशिप' को बेझिजक स्वीकार रही है। उन्हें विवाह गले में गुलामी का पट्टा लग रहा है। विवाह को लेकर अब उनकी सोच बदल रही है।अब वे छोटे–छोटे कारणों से भी एक–दुसरे से अलग होने की बात करने लगे है। इसमें लडकियां लडकों से भी अधिक स्वतंत्र हुई है।

इसका मतलब यही है कि, आज की पीढी विवाह को, विवाह की पवित्रता को समझनानहीं चाहती या समझने में नाकाम है। प्राचीन और नयी शादियों में आज काफी अंतर दिखायी देता है। पहले माता–पिता और परिवार–जनों की सहमति से शादियां होती थी। उसमें कई परिवार, रिश्तेदार, मित्र–परिवार शामिल होकर विवाह के साक्षी बनते थे। ऐसे में जब कभी रिश्तों में दरार उत्पन्न होती, तो उसे बचाने में सभी एकसाथ जूट जाते। परंतु विपरित उसके, आज विवाह कुछ खास गिने–चुने लोगों के सहयोग से तय होते है और असमय टूट भी जाते है।

सामाजिक प्रतिष्ठा का आज किसी को भय नहीं रहा है। पहले यही सामाजिक प्रतिष्ठा रिश्तों को बचाती थी।आज उसे कोई महत्व नही दे रहा है। आज सभी आत्मनिर्भर है।सभी अकेले–अकेले जीवन जीने की कोशिश कर रहें हैं और जीवन जीने की इसी पद्धति ने विवाह जैसी पवित्र संस्था को खोखला कर दिया है। यह मानव जीवन एवं संस्कृति के लिए एक दिन घातक सिद्ध हो सकता है।

विवाह हमेशा जोडने का काम करते आया है। वह दो व्यक्तियों को ही नहीं बल्कि दो परिवारों और उनसे जुडें अन्य सभी सगे–संबंधियों तथा दो भिन्न–भिन्न स्थानों को भी प्रत्यक्ष अप्रत्यक्ष रूप से जोडने का काम करता है। प्रारंभिक काल में समाज में विवाह को लेकर अलग–अलग मान्यताएं थी। लोगों को जीवन–यापन की विभिन्न समस्याओं से टकराना पडता था। खराब आर्थिक स्थिति के चलते उन्हें बच्चों की आवश्यकता महसूस होती थी ;क्योंकि बच्चें उनके काम में उन्हें सहयोग देते थे और उनके बुढापें का सहारा भी बनते थे। बावजुद इसके, विवाह में प्रेम और सहयोग की भावना दिखायी देती थी। दो परिवारों के बीच परस्पर संबंध हो जाने से उन्हें आर्थिक एवं मानसिक आधार प्राप्त हो जाता था। वे अपने आप को सुरक्षित महसूस करते थे।

इसीलिए उस समय घर के बडें–बुजुर्ग लडकें–लडकियों को देखकर नहीं, उनका परिवार, उनकी आर्थिक स्थिति, समाज में उनकी प्रतिष्ठा, उनकी जाति, कुण्डलि तथा लेन–देन आदि को देखकर रिश्ता तय करते थे। लडकें–लडकियों की सहमति–असहमति का कोई महत्व नहीं था। उन्हें अपना जीवन साथी चुनने का कोई अधिकार

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सोशल मीडिया का साहित्य के प्रचार प्रसार में महत्वपूर्ण भूमिका

प्रा. डॉ. ऐनूर शब्बीर शेख

हिंदी विभागाध्यक्षा
कला, विज्ञान एव वाणिज्य महाविद्यालय,
सहाता

मीडिया मनुष्य जीवन की प्रथम आवश्यकता है। जो अपने मन की बात को दूसरे तक संप्रेषित करने एवं दूसरों के मन की बात को जानने की प्रबल इच्छा के फलस्वरूप ही मीडिया का प्रार्दुभाव हुआ। परिणामत: सामाजिक स्वास्थ्य एवं परस्पर एक दूसरे के प्रति सम्मान की भावना जगाकर समता, बंधुता, समाजवाद, स्वातंत्र्य आदि की प्रतिस्थापना करने के उद्देश से मीडिया का प्रभाव आरंभ से ही समाज पर रहा है। सामाजिक विकास की दृष्टि से सेतु की भूमिका निभानेवाले माध्यमों को जनसंचार माध्यम कहते है।

जनसंचार के सशक्त माध्यमों से सूचना क्रांति आई इससे ज्ञात होता है कि विश्व की समरूपता व एकरूपता का श्रेय सूचना प्राद्योगिकी को जाता है। इससे मानव जाति में व्याप्त एकात्म की भावना दृष्टव्य हो गई है। मीडिया जन-जन मे एक अनुभूति का संचरण भी कर रहा है। वर्तमान भूमंडलीकरण के युग में मीडिया की भूमिका अहम् है। जनसंचार के प्रिंट मीडिया और इलेक्ट्रॉनिक मीडिया ये दो भेद माने जाते है। प्रिंट मीडिया का इतिहास काफी पुराना है, मगर वर्तमान युग यह इलेक्ट्रॉनिक मीडिया का युग है। मीडिया में हिंदी का ही वर्चस्व दिखाई देता है। भारत में अधिकांश पत्र-पत्रिकाएँ हिंदी में ही छपती हैं और इलेक्ट्रॉनिक माध्यमों में भी हिंदी का ही उपयोग बडी मात्रा में होता है। वर्तमान समय में हमारे देश में हिंदी ही मीडिया पर छाई है।

8. Cloud Computing

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Abstract

Cloud Computing is new emerging Technology in the Computer industry.it brings innovation in service provider in 21st century.it is more easy way to get access services from cloud computing provider from any corner of the world. This paper will discuss Concept of Cloud Computing, Benefits of Cloud Computing, Characteristics, Cloud Delivery Models, Common Cloud Services, and Advantages of Cloud Computing.

Introduction

Cloud computing is the access services through internet on need based.in this 21st century cloud computing are using mostly. It is easy way to get any types of information or services from any corner of the world.in this method no of private and national network connected each other. Use other computer resources instead of personal created services on your computer. It is directly cost benefit. Maximum use of existing IT infrastructure. The cost of multiplication, application hosting, content storage and delivery is reduced drastically. Cloud computing is taking services and moving them outside an organizations firewall. Application storage and other services are accessed through World Wide Web.

Definition

According to National Institute of Stand and Technology " Cloud Computing as model for enabling ubiquitous, convenient on-demand network access to a shared pool of configurable computing resources that can rapidly provisioned and released with minimal management effort a service provider interaction"

According to Wikipedia Cloud computing involves deploying groups of remote servers and software networks that allow centralized data storage and online access to computer services or resources

Why is it called cloud computing?

A fundamental concept behind cloud computing is that the location of the service, and many of the details such as the hardware or operating system on which it is running, are largely

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GREEN SYNTHESIS OF PYRAZOLONE DERIVATIVES USING IONIC LIQUID AS AN EFFICIENT AND GREEN CATALYST VIA FACILE MULTI-COMPONENT REACTION PATH.

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Abstract :
A rapid and efficient protocol for the synthesis of pyrazolone derivatives has been developed from multi-component reaction of various 3-aryl-1-phenyl-1*H*-pyrazole-4-carboxaldehyde, ethyl acetoacetate and substituted phenyl hydrazine in the presence of green catalyst [HNMP][HSO_4]. These derivatives have been synthesized by three different method includes conventional reflux method, ultrasound, and microwave irradiation. The combination of ionic liquid as a green media with ultrasound and microwave irradiation makes the protocol environmentally benign. The major benefits of these green techniques are excellent yield at ambidient temperature, very short reaction time, simple work-up procedure and use of inexpensive catalyst.

Keywords:
3-aryl-1-phenyl-1*H*-pyrazole-4-carboxaldehyde, pyrazolone, multi-component strategy, ionic liquid, ultrasound irradiation, microwave irradiation etc.

Introduction:
Now a days ionic liquids (ILs) have incredible interest due to attractive alternatives to hazardous organic solvents as well as catalyst in various branches of synthetic chemistry. Moreover, ILs exhibits energetic physicochemical properties such as superior solvating capability, elevated polarity, excellent ionic conductivity, good electrical as well as thermal stability, large selectivity, low toxicity, non-flammability, non-volatility, vapor pressure and wide liquid range. Besides the acidic ionic liquids confirm the significant properties of excellent acidity, greater proton conductivity, excellent chemical stability **[1-10]**.
Multicomponent reactions (MCRs) are powerful approach for the synthesis of chemically and biological active heterocyclic compounds. This strategy have several unique compensation such as the formation of extremely diverse and complex molecules from readily available substrates in a single synthetic operation without isolation of intermediates, and with

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Synthesis and Biological Assessment of Carbazole Linked Pyrazole Schiff bases and Diarylthiourea Derivatives

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Abstract: In this study, (*E*)-9-ethyl-*N*-((1,3-diphenyl-1*H*-pyrazol-4-yl)methylene)-9*H*-carbazol-3-amine **(3a–f)** and 1-(9-ethyl-9*H*-carbazol-6-yl)-3-phenylthiourea **(5a–f)** derivatives were synthesized and their *in vitro* antimicrobial and antimalarial activities were evaluated. The structures of the synthesized compounds were elucidated and confirmed by using IR, ^{1}H NMR, ^{13}C NMR, and mass spectra.

Keywords: antimicrobial, antimalarial activities, carbazole, diarylthiourea, Schiff base.

INTRODUCTION

THE carbazole skeleton is a key structural motif possesses desirable electronic and charge-transport properties as well as large π conjugated system. Due to this, the various functional groups are easily introduced into the structurally rigid carbazolyl ring. These characteristics result in the extensive potential applications of carbazole-based derivatives in the field of medicinal,[1–5] organic[6,7] and material chemistry.[8,9]

Aminocarbazoles and its derivatives have gained much attraction due to their prominent biological activities.[10–15] They have been identified as Bcl-2 protein inhibitors[16] NPY5 antagonists[17] and anion receptors.[18] They are also useful intermediates for the synthesis of various amino derivatives, dyes and pigments, stabilizers for polymers, pesticides, photographic materials and diagnostic reagents in cytochemical studies.[19]

Pyrazole derivatives represent one of the most active class of compounds and possess a wide spectrum of biological activities.[20–25] Schiff bases have also been shown a broad range of biological activities, including antifungal, antibacterial, antimalarial, anti-inflammatory, antiviral, and antipyretic properties.[26,27] The new tacrine carbazole hybrids having imines moiety reported to possess multifunctional agents for the treatment of AD and potent activity against AChE inhibitory and antioxidant action.[28,29] Although some drugs containing pyrazole and Schiff bases exhibit antiviral activities,[30,31] carbazole based diarylthiourea, pyridopyrimidine-substituted urea and thiourea derivatives have been reported as potent anticancer agents [32] and polyphenol oxidase inhibitors.[33] Inhibitory activities of carbazole-linked urea and thiourea derivatives on lipopolysaccharide-induced NO production have been also reported.[34] Also *p*-nitrodiarylthiourea derivative contains carbazole core have been evaluated on breast (MCF-7, T-47D, MDA-M8-453) and prostate (DU-145, PC-3, LNCaP) cancer cell lines.[35]

Based on the above information, we inferred that carbazole frame linked at 4-position in the pyrazole ring and aryl thiourea core could lead to significant increase in the potency and improve physicochemical properties.

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Ionic liquid catalyzed one pot green synthesis of isoxazolone derivatives *via* multicomponent reaction

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A series of 3-methyl-4-((3-aryl-1-phenyl-1*H*-pyrazol-4-yl)methylene)isoxazol-5(4*H*)-one derivatives have been efficiently synthesized by environmentally benign, one-pot three component condensation of substituted 1,3-diaryl-1*H*-pyrazole-4-carboxyaldehyde, β-keto ester and hydroxyl amine hydrochloride in the presence of ionic liquid [HNMP][HSO_4] as a catalyst in ethanol. These derivatives have been synthesized by conventional, ultrasound and microwave irradiation methods. The combination of ionic liquid with ultrasound as well as microwave irradiation makes the protocol fascinating and environmentally benign. In addition, it has several benefits such as simple work-up procedure, clean reaction profile, short reaction time and good yields.

Keywords: 1,3-Diaryl-1*H*-pyrazole-4-carboxyaldehyde, isoxazolone, ionic liquid, ultrasound, microwave

Recently ionic liquids (ILs) have grown interest in diverse areas of chemistry; because of considerable interest as eco-friendly reaction solvent and catalyst in the organic synthesis. They exhibit significant properties such as negligible vapor pressure, broad liquid range, non-flammability, adequate ionic conductivity, potentially recyclable properties and capacity to dissolve a variety of organic and inorganic solids. Acidic ionic liquids have been employed in divergent areas due to their fascinated physical and chemical properties. [HNMP][HSO_4] is also a brønsted acidic ILs has successfully used in various organic reactions such as cyclocondensations reactions, Oxa-Michael addition, Prins reaction and trans-esterification reactions[1-6].

Literature survey revealed that, the isoxazol-5(4*H*)-ones and their derivatives have vital importance in divergent areas such as organic synthesis, liquid crystalline materials, filter dyes in photographic films, light-conversion molecular devices, optical storage and nonlinear optical research[7-11]. The isoxazol-5(4*H*)-ones scaffold bearing both nitrogen and oxygen atoms are an important class of five member heterocycles, which display good pharmaceutical and biological activities[12, 13]. It is considered a major core in the discovery of protein kinase inhibitors, which is playing an important role in the growth of chemotherapeutic agents[14, 15]. They also show significant analgesic, antibacterial, anti-HIV, antifungal, anti-inflammatory, anti-mycobacterial, anticancer, antioxidant, antitumor, antiprotozoal, anti-tubercular, nematicidal and antiviral activities[16-28]. The some important illustrations of isoxazol-5(4*H*)-one nucleus containing agents are shown in Figure 1.

Several protocols have been studied in the literature for the synthesis of isoxazol-5(4*H*)-one and their analogues. Among them some illustrations are *N*-bromosuccinimide (NBS)[29], Ag/SiO_2[30], phthalimide-*N*-oxyl salts (POPINO and TBAPINO)[31], NaOAc/visible light[32], boric acid[33], catalyst free[34], citric acid[35], NaH_2PO_4[36], pyridine/reflux[37], sodium benzoate[38], sodium saccharin[39], pyridine/US[40], pottasium phthalimide[41], sodium sulfide[42], $H_3PW_{12}O_{40}$, clinoptilolite, nano Fe_2O_3[43], *etc.*

Ultrasound (US) and Microwave (MW) assisted transformations are well established class of synthetic organic chemistry. The significant benefit of MW and US irradiated organic synthesis is of rapidly synthesize library of organic compounds with improved yields and selectivities. The MW and US assisted multicomponent reaction with various green catalysts such as ionic liquids, nano-particles, vitamins and zeolites etc. makes protocol more interesting, fascinating and environmentally benign[44-54].

Potential of Different Fresh Water Green Algae for Larvicidal Activity against *Aedes aegypti*

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ABSTRACT

The algae are essentially aquatic organisms. It is well acknowledged that different algal species or strains may yield a degree of products including fuels, bioplastics, animal feeds, food, fertilizers and pharmaceutical applications. Therefore present effort was made to study the fresh water green algae for their larvicidal potential from the study area belonging to Ahmednagar district (Maharashtra). For testing larvicidal activity crude extracts of different fresh water green algae like *Chara, Enteromorpha* and *Cladophora* were used. These extracts were studied against larvae of mosquito (*Aedes aegypti)*. From the observed data for larvicidal activity of extracts from *Chara zeylanica, Enteromorpha intermedia* and *Cladophora crispata*, it is clearly seen that, *Enteromorpha intermedia* and *Cladophora crispata* does not showed significant results but *Chara zeylanica* showed larvicidal activity against mosquito larvae.

Key words: *Chara, Enteromorpha, Cladophora*, Larvicidal, *Aedes aegypti.*

INTRODUCTION

Microbes colonized this planet more than 3.5 billion years ago. Braving the harsh environment, they modified the surroundings and made them more congential for the higher forms of life. In the process, about 1.5 billion years ago, some of the microbes particularly algae learnt the art of oxygenic photosynthesis. Thus algae are a large and diverse group of simple, typically autotrophic organisms, ranging from unicellular to multicellular forms and fall under the category macro-algae. Algae are extremely fast growing marine and fresh water plants that can grow to considerable size (up to 60m in length. Micro-algae are, as the name suggests, microscopic photosynthetic organisms. Like macro algae, these organisms grow very rapidly, and are found in both marine and fresh water environment.

The algae are essentially aquatic organisms. The important requirement for the life of an alga is water and its abundance may vary in different habitats. Stagnant and flowing fresh water

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 15°C, 30°C or 45°C according to observations. In Fuzzy Logic it is expressed as *'cold'*,

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COLLABORATIVE TEACHING STRATEGIES: FOSTERING STUDENT ENGAGEMENT AND ACADEMIC SUCCESS

❒ **Dr. Rohini D. Kasar***

ABSTRACT

Collaborative teaching has gained increasing attention as an effective pedagogical approach to enhance student learning outcomes. This research article explores various collaborative teaching strategies and their impact on student engagement, academic achievement, and the development of essential skills. Drawing upon a review of existing literature and empirical studies, this research aims to provide insights into the benefits and challenges of collaborative teaching, offering practical recommendations for educators seeking to implement these strategies in diverse educational settings.

Keywords: Collaborative teaching, Pedagogical approach, Educators seeking

Introduction

Collaborative teaching is a dynamic approach that emphasizes active student participation, shared responsibility, and cooperative learning. This section provides an overview of the importance of collaborative teaching in fostering a positive learning environment and introduces the key objectives of the research. Collaborative teaching-learning, also known as collaborative learning or cooperative learning is an educational approach that emphasizes the active participation of students in group activities and projects. The key idea is to promote learning through collaboration, where students work together to achieve common goals, share knowledge, and contribute to each other's understanding.

Literature Review

This section examines the theoretical foundations of collaborative learning, drawing on prominent educational theories such as constructivism and social learning. Additionally, it reviews empirical studies that have investigated the impact of collaborative teaching on student outcomes, including academic achievement, critical thinking, and interpersonal skills.

Theoretical Framework

Collaborative teaching strategies find their roots in educational theories that emphasize active learning, social constructivism, and the importance of peer interaction in the learning process. Scholars such as Vygotsky and Dewey have underscored the significance of social environments in shaping cognitive development. Collaborative teaching, aligned with these theories, aims to create a dynamic, interactive learning space that goes beyond traditional didactic methods.

Social Learning and Constructivism

Social learning theories posit that individuals learn by observing, imitating, and interacting with others. Collaborative teaching aligns with this framework, fostering a community of learners where knowledge is co-constructed through shared experiences. Constructivism emphasizes the role of learners as active participants in building their

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ORIGINAL ARTICLE **OPEN ACCESS**

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.

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Promotive Influence of Farm Pond Algae with Aqueous and Cow Urine extracts on Germination and Growth Traits in *Luffa cylindrica* L

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Abstract-

Agriculture sector has always remained a main contributor in GDP and a source of employment for many people across the country. However, the later effect of green revolution technologies have asked serious questions in the form of many diseases which have been introduced through food and water contamination. The alternative and reliable options for the chemical fertilizers and pesticides have been always at the center of various research studies since last few decades. Hence, an attempt was made to study the promotive role of farm pond algae on seed germination and seedling growth in *Luffa cylindrica* L. The seeds were treated in various concentrations of algal aqueous and cow urine extracts and percent seed germination and seedling growth was observed. It is found that, 15 % concentration of both algal aqueous and cow urine extract has significant effect in promotion of seed germination, root length, shoot length and overall height of *Luffa cylindrica* L. Algal cow urine extract reported significantly better growth over the algal aqueous extract.

Key words- ***Luffa cylindrica* L., Farm Pond Algae, Algal Extract, Cow Urine Extract.**

I. INTRODUCTION

Ever since invention, agriculture has been the mainstay of human civilization. India is known as an agriculture driven country, and agriculture being a major industry has played a vital role in gross domestic production (GDP) of the country. The agriculture sector of India contributes to around 18 % to gross domestic product and offers employment opportunities to 50 % of the countries workforce. [1] India witnessed the Green Revolution in the 1960s with an increase in food grain production and met the food demand of the millions of malnourished people across the country. Green revolution broadly represented a major change in the stakeholders focusing on increased use of chemical-based pesticides and fertilizers to increase the crop yield in multiple folds. The striking quantitative increase in food production as a result of increased chemical input in agriculture was the welcoming sign but the long term health impacts of these chemicals started drawing attention of scientific community. Chemical pesticides adversely affects skin, eyes, respiratory system, and other body organs. [2] Over the last thirty years, the indiscriminate application and ignorance towards appropriate handling of agricultural pesticides have induced various health-related morbidities in emergent nations. [3] Pesticides become a reason for congenital anomalies and affect fetal growth, and some pesticides can cause cancer in human beings. [4] Researchers across the world have reported that the detrimental agricultural habits and excessive use of the chemicals have allowed the contamination of the food chain and the environment. [5] Hence, 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. An increased focus on the use of biofertilizers across the world on the environmental ground is observed in the recent past. These biofertilizers are the organisms that improve the soil quality without any effects on the agriculture system and environment. The primary source of biofertilizers includes blue-green algae, bacteria, and fungi. [6]

Hence, in present investigation an attempt was made to investigate the promotive role of farm pond algae on the percent seed germination and seedling growth using aqueous as well as cow urine extract.

II. MATERIAL AND METHODS

The experimental material used was seeds of *Luffa cylindrica* L., freshwater algae and cow urine which was collected from local sources. Two samples of algae were collected from two farm ponds at village Sawargaon Tal, Tal-Sangamner and Village Wakadi, Tal- Rahata of Ahmednagar district, Maharashtra, India. The algae was dried and powdered [7] for further preparation of algal extract. The algal extracts were prepared in the concentrations of 1 %, 5 %, 10 %, 15 %, 20 % and 25 %. The distilled water was used as control. [8] Same concentrations were prepared using cow urine for both samples and only cow urine was treated as control. The seeds of *Luffa cylindrica* L. were soaked in aqueous/cow urine algal extracts of Sample 1 and Sample 2 and control for 24 hrs. Paper Towel method was used [9] to study the effect of different algal extracts on seed germination and early seedling growth. The experiment was conducted in triplicate. The Study parameters measured are seed germination in percentage, Root length, Shoot length and total height of seedling in centimeters.

III. RESULTS AND DISCUSSION

A. Effect of Algal Extract on Seed Germination in Luffa cylindrica L.

Table I- Effect of algal extract on percent seed germination in *Luffa cylindrica* L.

		Percent Seed Germination									
		Algal Aqueous Extract					Algal Cow Urine Extract				
	Algal Conc^{n}	Trial 1	Trial 2	Trial 3	Mean	SD	Trial 1	Trial 2	Trial 3	Mean	SD
Sample 1	1%	80.0	83.3	90.0	84.4	0.36	83.3	76.7	86.7	82.2	0.38
	5%	83.3	86.7	90.0	86.7	0.34	86.7	80.0	86.7	84.4	0.36
	10%	86.7	86.7	90.0	87.8	0.33	90.0	83.3	90.0	87.8	0.33
	15%	93.3	93.3	96.7	94.4	0.23	93.3	93.3	93.3	93.3	0.25
	20%	90.0	90.0	93.3	91.1	0.29	93.3	93.3	90.0	92.2	0.27
	25%	83.3	86.7	93.3	87.8	0.33	93.3	90.0	86.7	90.0	0.3
	Control	80.0	80.0	90.0	83.3	0.38	83.3	73.3	83.3	80.0	0.4
Sample 2	1%	80.0	93.3	93.3	88.9	0.32	83.3	86.7	83.3	84.4	0.36
	5%	73.3	93.3	93.3	86.7	0.34	86.7	83.3	83.3	84.4	0.36
	10%	80.0	100	93.3	91.1	0.29	93.3	86.7	86.7	88.9	0.32
	15%	83.3	100	96.7	93.3	0.25	93.3	96.7	96.7	95.6	0.21
	20%	76.7	100	93.3	90.0	0.3	90.0	86.7	90.0	88.9	0.32
	25%	76.7	96.7	93.3	88.9	0.32	90.0	90.0	90.0	90.0	0.3
	Control	76.7	96.7	90.0	87.8	0.33	80.0	90.0	80.0	83.3	0.37

The average minimum and maximum seed germination in algal aqueous extract in sample 1 was 83.3 % at control and 94.4 % at 15 % respectively, however the average minimum and maximum seed germination in algal cow urine extract was 80 % and 93.3 % at control and 15 % respectively. Sample 2 reported germination of 87.8 % at control and 93.3 % at 15 % in algal aqueous extract and 83.3 % and 95.5 % at control and 15 % algal extract in algal cow urine extract respectively. The results of percent seed germination obtained in the present investigation are in agreement with various studies conducted by the researchers across the world. Pandey *et. al.*[10] reported some promising effects in the germination percentage after treating the seeds with 5% extract of *Chroococcus* sp. Maximum seed germination in okra seeds was reported by Divya *et. al.*, [11] followed by application of 5 % of algal extract derived from sea weed.

B. Effect of Algal Extract on Shoot Length in Luffa cylindrica L.

Table II- Effect of algal extract on shoot length in *Luffa cylindrica* L.

		Shoot Length in cm									
		Algal Aqueous Extract					Algal Cow Urine Extract				
	Algal Conc^{n}	Trial 1	Trial 2	Trial 3	Mean	SD	Trial 1	Trial 2	Trial 3	Mean	SD
Sample 1	1%	12.31	12.32	9.42	11.29	3.43	14.12	14.84	11.91	13.57	4.17
	5%	12.68	13.26	11.95	12.62	2.87	17.1	14.28	14.25	15.24	4.31
	10%	10.61	11.52	11.24	11.13	2.49	13.86	13.68	12.66	13.39	4.27
	15%	15.89	13.57	12.86	14.09	3.03	16.21	17.59	14.57	16.12	5.72
	20%	10.98	15.27	11.73	12.65	3.08	13.81	19.41	12.87	15.4	5.2
	25%	9.85	12.81	11.29	11.34	3.11	11.18	14.59	11.69	12.48	4.92
	Control	10.94	9.88	9.9	10.23	2.75	12.28	13.05	9.58	11.58	3.2
Sample 2	1%	7.16	8.38	9.74	8.49	2.06	10.46	9.23	10.7	10.12	2.5
	5%	13.06	10.67	11.04	11.48	2.91	12.64	11.12	12.75	12.18	2.96
	10%	10.8	11.55	12.26	11.58	3.17	13.05	11.99	12.43	12.51	2.81
	15%	13.82	12.52	12.76	12.99	3.18	15.71	14.53	13.93	14.71	3.79
	20%	11.58	11.1	11.84	11.49	2.75	13.19	14.73	14.89	14.26	4.36
	25%	9.97	10.43	10.9	10.47	2.88	10.99	12.02	9.97	10.99	3.0
	Control	9.14	9.69	9.15	9.34	2.86	10.38	9.53	10.49	10.11	2.36

Algal aqueous extract of sample 1 reported average minimum shoot length 10.23 cm at control and average maximum 14.09 at 15 % . The average minimum shoot length in algal cow urine extract was 11.58 cm at control and average maximum of

16.12 cm at 15 % . However, sample 2 reported average minimum shoot length of 9.15 cm at control and average maximum 12.76 cm at 15 % in algal aqueous extract. For algal cow urine extract average minimum shoot length was 10.11 cm at control and average maximum was 14.71 cm at 15 % . Algal cow urine extract has reported to enhance the shoot length of *Luffa cylindrica* L. over the algal aqueous extract. Algal cow urine extract of sample 1 has reported 14.40 % more length in the shoot of *Luffa cylindrica* L. *over* algal aqueous extract. In the same way, algal cow urine extract of sample 2 has also reported 13.24 % more shoot length. Hence, cow urine extract has shown more growth potential over aqueous extract of both algal samples under study. The results of present investigations show similarity with the earlier studies on various crop plants. Basavaraja et.al., [12] reported significant increase in shoot length following application of blue green algae in maize, cucumber and ragi. Patil *et.al.,* [13] studied the growth promoting activity of *Chlorella, Scenedesmus and Chlamydomonas* on cucumber. The research team including Arun et.al., [14] also presented that, liquid sea weed fertilizer with 60 % concentration is more effective in increasing the shoot length.

Table III- ANOVA: Two Way - Luffa Cylindrica L. - Shoot Length

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Algal Concentration	6443.55	6	1073.93	40.70	0.00	0.09
Extract	1155.75	1	1155.75	43.80	0.00	0.02
Algal Concentration * Extract	229.66	6	38.28	1.45	0.19	0.00
Error	66118.28	2506	26.38			
Total	367228.08	2520				
R Squared = .106 (Adjusted R Squared = .101)						

For the Shoot Length of Luffa Cylindrica L. from the two way ANOVA it is seen that there is a significant main effect of Algal Concentration on the overall Shoot Length, F (6, 2520) = 40.70, p = 0.00, np2 = 0.09. The Extract i.e. aqueous vs Cow Urine also had significant effect, F (1, 2520) = 43.80, p = 0.00, np2 = 0.02. The post - hoc test for the algal concentration using Tukey HSD indicated that the 15% had the longest Shoot Length in comparison to 1%, 5%, 10%, 20%, 25% and Control which was statistically significant. Lastly, for the Extract: Cow Urine extract (Mean [CI]): (11.47 [11.18, 11.75]) was significantly better than Aqueous Extract (10.11 [9.83, 10.40]).

C. Effect of Algal Extract on Root Length in Luffa cylindrica L.

Table IV - Effect of algal extract on root length in *Luffa cylindrica* L.

		Algal Aqueous Extract					Algal Cow Urine Extract				
	Algal Conc^{n}	Trial 1	Trial 2	Trial 3	Mean	SD	Trial 1	Trial 2	Trial 3	Mean	SD
Sample 1	1%	12.43	14.3	10.72	12.44	4.53	10.08	12.42	11.78	11.4	2.92
	5%	13.52	14.22	12.73	13.48	3.89	11.2	14.19	11.79	12.34	3.32
	10%	10.98	14.58	11.37	12.3	3.77	9.57	14.44	12.39	12.07	4.16
	15%	13.84	15.31	14.96	14.71	4.01	15.29	12.27	13.25	13.6	4.42
	20%	9.67	15.33	11.74	12.24	4.52	8.35	18.88	12.52	13.26	5.43
	25%	9.58	13.21	9.5	10.75	3.96	9.13	12.96	9.59	10.55	3.68
	Control	11.1	12.92	8.81	10.86	4.42	9.97	12.54	9.59	10.62	3.43
Sample 2	1%	11.22	8.76	9.79	9.86	3.21	8.83	7.82	9.32	8.64	2.21
	5%	11.72	9.53	11.32	10.79	3	11.78	10.91	11.34	11.35	1.99
	10%	12.9	11.32	10.79	11.6	3.24	11.06	11.92	12.18	13.2	3.6
	15%	12.06	14.0	11.89	12.69	3.25	12.62	12.5	12.67	12.59	2.85
	20%	12.7	12.77	10.51	11.97	3.73	12.57	12.74	10.01	11.76	3.04
	25%	10.74	11.23	10.21	10.73	2.94	11.42	10.23	10.83	10.82	2.46
	Control	8.43	7.12	7.93	7.78	2.58	10.48	7.76	9.15	9.07	2.58

The average root length of sample 1 of aqueous extract was presented between 10.75 cm at 25 % and 14.71 cm at 15 %, however it was between 10.55 cm at 25% 13.6 cm at 15 % in algal cow urine extract. Sample 2 presented average minimum and maximum root length between 7.78 cm at control and 12.69 cm at 15 % in aqueous extract and it was between 8.64 cm at 1 % and 12.59 at 15 % cow urine extract. Algal aqueous extract showed better results in terms of root length of *Luffa cylindrica* L as compare to algal cow urine extract as the root length in sample 1 was 8.16 % more and in sample 2 it was 0.79 % more. Sample 1 has shown better root length as compare to sample 2. The increased root length in *Cucumis sativus* L. and *Luffa cylindrica* L. in present study is in accordance with the earlier studies. Odgerel Bumandalai and Rentsenkhand Tserennadmid,

[15] reported increased growth in the seeds of tomato and cucumber following the application of the suspension of *C. vulgaris*. The results are in agreement with Basavaraja *et.al*., [12] who reported significant increase in root length following application of blue green algae. The study confirmed significantly higher root length in maize as compare to control. The study conducted by Divya *et.al.*, [11] also reported the stimulating effect of seaweed liquid fertilizer on the growth of root length in Okra.

Table V - ANOVA: Two Way - Luffa Cylindrica L. - Root Length

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Algal Concentration	4970.23	6	828.37	33.32	0.00	0.07
Extract	36.00	1	36.00	1.45	0.23	0.00
Algal Concentration * Extract	176.62	6	29.44	1.18	0.31	0.00
Error	62297.05	2506	24.86			
Total	328548.04	2520				
R Squared = .077 (Adjusted R Squared = .072)						

For the Root Length of Luffa Cylindrica L. from the two way ANOVA it is seen that there is a significant main effect of Algal Concentration on the overall Root Length, F (6, 2520) = 33.32, p = 0.00, np2 = 0.07. The Extract i.e. aqueous vs Cow Urine did not have any significant effect, F (1, 2520) = 1.45, p = 0.23, np2 = 0.00. The post - hoc test for the algal concentration using Tukey HSD indicated that the 15% had the longest root length in comparison to 1%, 5%, 10%, 20%, 25% and Control which was statistically significant.

D. Effect of Algal Extract on Total Height in Luffa cylindrica L.

Table VI - Effect of algal extract on total height *Luffa cylindrica* L.

		Algal Aqueous Extract					Algal Cow Urine Extract				
	Algal Conc^{n}	Trial 1	Trial 2	Trial 3	Mean	SD	Trial 1	Trial 2	Trial 3	Mean	SD
Sample 1	1%	24.75	26.61	20.14	23.72	7.07	24.2	27.27	23.68	24.97	5.6
	5%	26.2	27.48	24.68	26.1	5.81	28.3	28.47	26.05	27.58	5.61
	10%	21.59	26.1	22.61	23.42	5.37	23.43	28.12	25.04	25.47	6.42
	15%	29.73	28.88	27.82	28.8	5.52	31.5	29.86	27.82	29.73	8.18
	20%	20.65	30.61	23.46	24.89	6.82	22.16	38.3	25.4	28.66	8.84
	25%	19.44	26.02	20.79	22.08	6.03	20.31	27.54	21.28	23.03	6.9
	Control	22.04	22.8	18.71	21.09	6.14	22.25	25.59	19.16	22.2	5.46
Sample 2	1%	18.38	17.14	19.52	18.35	3.83	19.28	16.76	20.02	18.66	3.85
	5%	24.79	20.2	22.36	22.27	4.45	24.42	22.03	24.09	23.53	3.87
	10%	23.7	22.87	23.05	23.18	4.64	26.52	23.05	24.36	24.69	4.11
	15%	25.88	26.51	24.66	25.68	3.92	28.33	27.02	26.6	27.31	5.14
	20%	24.29	23.86	22.35	23.46	5.06	25.76	27.47	24.9	26.02	5.98
	25%	20.72	21.67	21.11	21.2	4.25	22.41	22.25	20.79	21.82	4.41
	Control	17.57	16.81	17.07	17.12	3.96	20.87	17.29	19.63	19.18	4.02

Luffa presented average total height between 21.09 cm at control and 28.8 cm at 15 % in aqueous extract of sample 1, however the average total height was between 22.2 cm at control and 29.73 cm at 15 % in cow urine extract. In algal aqueous extract of sample 2, the average height was between 17.12 cm at control and 25.68 at 15 %, the same was 18.66 cm at 1 % and 27.31 cm at 15 % in cow urine extract. Algal cow urine extract of sample 1 showed 25.12 % more growth as compare to algal aqueous extract, similarly it was 6.86 % more in sample 2. Sample 1 has shown better growth as compare to sample 2 in both aqueous and cow urine extract. Castellanos-Barriga *et.al.*, [16] also found that the application of sea weed extract to mung bean (*Vigna radiata*) had significantly increased the seed germination, shoot and root length as well as other parameter under study. Pandey *et.al*, 2013 studied the effect of different concentrations on the seedling development in Okra and reported maximum height of seedling of 11.23±1.62 cm in Okra after application of *Chroococcus* sp. extract.

Table VII -ANOVA: Two Way - Luffa Cylindrica L. - Total Height

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Algal Concentration	22584.76	6	3764.13	43.71	0.00	0.09
Extract	775.56	1	775.56	9.01	0.00	0.00
Algal Concentration * Extract	455.25	6	75.88	0.88	0.51	0.00
Error	215790.20	2506	86.11			
Total	1347056.74	2520				
R Squared = .099 (Adjusted R Squared = .095)						

For the Total height of Luffa Cylindrica L. from the two way ANOVA it is seen that there is a significant main effect of Algal Concentration on the overall Total height, F (6, 2520) = 43.71, p = 0.00, np2 = 0.09. The Extract i.e. Aqueous vs Cow Urine had a significant effect, F (1, 2520) = 9.01, p = 0.00, np2 = 0.00. The post - hoc test using Tukey HSD indicated that the for algal concentration 15% had the longest Total height in comparison to 1%, 5%, 10%, 20%, 25% and Control which was statistically significant. Lastly, for the Extract: Cow Urine extract (Mean [CI]): (21.52 [21.06, 22.03]) was significantly better than Aqueous Extract (20.41 [19.90, 20.92]).

IV. CONCLUSION

It is concluded that the 15 % concentration of both algal aqueous and cow urine extract shows better result in terms of percent seed germination, shoot length, root length and total height in *Luffa cylindrica* L. The algal cow urine extract has significantly better growth over algal aqueous extract in all parameters studied in both algal samples from farm pond.

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ORIGINAL ARTICLE **OPEN ACCESS**

Efficiency of Farm Pond Algae as a Liquid Bio-Fertilizer on the Growth of Spinach (*Spinacia oleracea* L.)

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ABSTRACT
Efficiency of farm pond algal extracts as a liquid bio- fertilizer on the growth of spinach was studied by considering seed germination, seedling growth and seedling vigour index (SVI). The experimental analysis was carried out by soaking the seed overnight in various concentrations of algal extracts. viz., 1%, 5%, 10%, 15%, 20%, 25% and control. Results revealed that algal extracts at 20% concentration showed maximum activity in terms of increase in seed germination, root length, shoot length and seedling vigour index as compared to other concentrations and control.
Keywords: *Algal, Bio-fertilizer, seed germination, seedling growth, seedling vigour index, spinach*

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INTRODUCTION

Spinach (*Spinacia oleracea* L.) is an edible flowering plant and a nutritious leafy vegetable also known as Palak, belonging to the family Amaranthaceae. It is an important source of vitamin-A, vitamin-B (Folate), vitamin-B1 (Thiamine), vitamin-C, vitamin-K, magnesium, potassium, phosphorus, dietary fibers, calcium, carbohydrates and proteins. The plant is cultivated within the country as a leafy vegetable. Various inorganic fertilizers are used for growing the crop, but continuous use of such fertilizers has started showing their adverse effects on the soil as a result the soil is losing its fertility and responsible for increasing salinity [3. 15].

Time has arisen to move towards organic farming to avoid the harmful effects of inorganic fertilizers. Use of algal biofertilisers is one of the important approaches of organic farming. Certain blue green algal members are rich in minerals and have the ability to fix the atmospheric nitrogen that can be used for the growth of the crop. These algae are easily available and some of them are known to improve seed germination [4, 5, 10, 14].

Hence in present investigation an attempt was made to study the Efficiency of farm pond algae as a liquid bio-fertilizer on the growth of spinach (*Spinacia oleracea* L.) with reference to seed germination, root length, shoot length and seed vigor index.

MATERIAL AND METHODS

Algae collected from the farm pond of Wakadi village were identified with the help of monographs viz. [7, 11, 12, 8, 6, 13].

Healthy seeds with uniform size, colour and weight of Indian summer variety were obtained from agricultural centre Loni. A mixture of fresh water alga used in the experiments was collected from the agricultural pond of a farmer from Wakadi village. Fresh material was handpicked and brought to the laboratory, washed thoroughly under running tap water and epiphytes found were removed. The material was shade dried for 4 to 6 days and grinded to get the powder, which was stored in airtight plastic bottles.

10 gm fine powder of algae was mixed separately in 100ml of sterile distilled water and boil at 100^{0}C to reduce the volume up to 10ml. This extract was filtered through a muslin cloth and cooled. The extract

was used as stock solution (100%). The extract was diluted with sterile distilled water for preparing 1%, 5%, 10%, 15%, 20% and 25% concentrations respectively and stored in airtight bottles for further study. Algal extracts was prepared by using the method of Bhosle *et. al.,* [5].

To analyze the effect of fresh water algal extract on Spinach as test plant, paper towel method [2] was used. Identical size fifteen healthy seeds were presoaked in different concentrations of algal extracts for 24 hours. The experiment was carried in triplicates. Moist and disinfected paper towel was stretched on a clean polythene paper and fifteen seeds were arranged on its half portion containing three rows each of five seeds. About 3 inch space was left on lower and right side of the paper towel. The paper towel was rolled from the right end with plastic paper and the ends were tightened with rubber bands. Paper towel was placed vertically in beaker containing little water.

First count for germination percentage was recorded after 7 days and final count after 21 days for total seedling growth. Different parameters were used in the present investigation as follows.

- Germination percentage
- Shoot length
- Root length
- Total height of seedling
- Seedling vigour index (SVI)

Above mentioned parameters were calculated by using the following formulae

$$\text{Germination percentage} = \frac{\text{No. of Seed Germinated} \times 100}{\text{Total No. of Seeds placed}}$$

Total height of seedling = Shoot length + Root length.

SVI = (Mean root length + Mean shoot length) × % of seed germination [1]

RESULTS AND DISCUSSION

Algal members like *Hydrodictyon, Coelastrum, Mougetia, Ulotrix, Cladophora, Pithophora, Rhizoclonium, Ocillatoria, Lyngbya, Scytonema, Microcoleus, Navicula, Pinnularia, Melosira, Fragilaria* and *Nitzschia* were recorded in the agricultural pond fresh water.

Results revealed that all the parameters under study were generally influenced by the application of algal extract as compare to the control. Seeds treated with 20% concentration of algal extract showed maximum shoot length, root length, total height of seedling, maximum seed germination and seedling vigour index as compared to control (Table-1). However, total height of plant and percent seed germination was also significant at 1% algal extract treatment. The increase trend has been reported in the outcome of all parameters starting from 1%, 5%, 10%, 15% and 20% algal concentrations. However all parameters have shown significant decrease in the outcome at concentrations higher than 20%. It was reported that, algal concentration of 20% was more effective in the seed germination (Fig-1), seedling vigour index and seedling growth as compared to control.

Table -1: Effect of Fresh Water Algal Extracts on the Seedling Growth of Spinach.

Boiled water algal extract (%)	Shoot length(cm)	Root length(cm)	Total height of seedling (cm)	Seedling vigour index (SVI)	Seed germination (%)
1	5	7.11	12.95	1089.9	90%
5	4.92	7.36	12.28	921	75%
10	3.26	5.38	8.65	691.2	80%
15	3.92	6.06	9.98	848.3	85%
20	**5.47**	**8.48**	**13.96**	**1325.25**	**95%**
25	4.98	7.16	12.15	849.8	70%
Control	6.32	7.38	12.65	822	60%

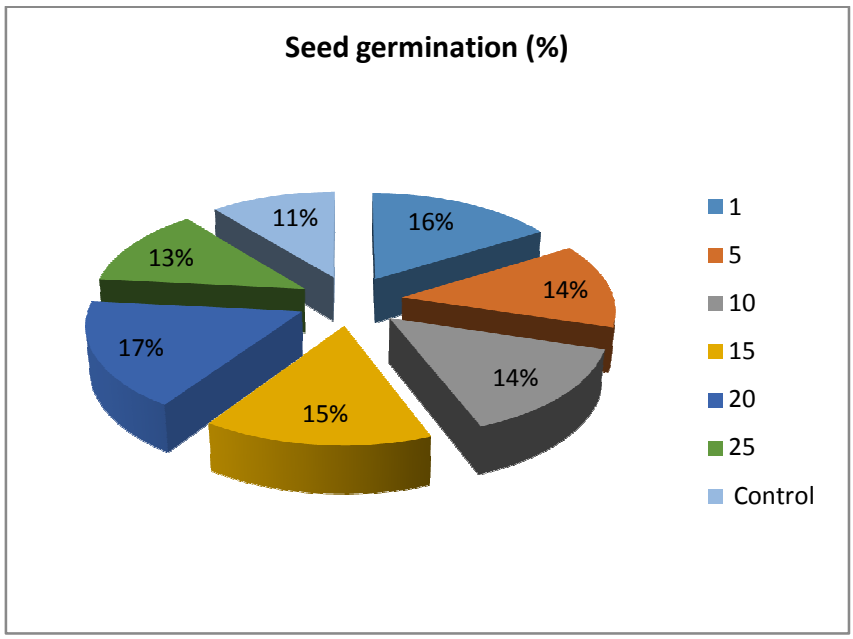

Fig 1: Effect of Fresh Water Algal Extracts on the Seed Germination in Spinach

Results have shown that, 20% concentrations of algal extract have stimulated the germination, SVI and the growth of the spinach seeds and seedling respectively. Other concentrations have also proved to be effective in stimulating at least one or more parameters of spinach under study. The total height of seedling at algal concentrations of 1%, 5%, 10%, and 15% was 12.95cm, 12.28cm, 8.65cm and 9.98cm respectively. Only the concentration of 20% had shown more seedling height (Fig.1) and seedling vigour index than control. Percent seed germination at 1%, 5%, 10%, 15%, and 20% was 90%, 75%, 80%, 85%, 95% which was more than the control (60%).

Pise and Sabale, [10] also reported significant shoot growth in fenugreek seeds treated with sea weed extracts. Extract of *Ulva* was found slightly more effective than that of *Sargassum* and *Gracilaria.* They have further concluded from their study that, liquid sea weed extracts are more effective in stimulating the growth of fenugreek seedlings.

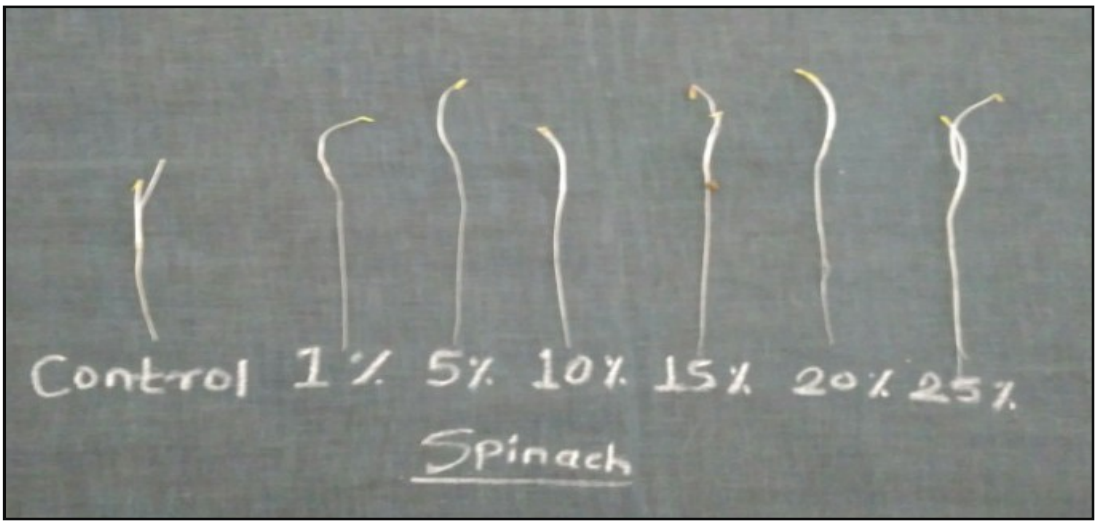

Fig.2. Seedling Growth at different concentrations

CONCLUSIONS

Above experimental results clearly indicates that the seed germination percentage, seedling vigour index (SVI) and total height of seedling in spinach has increased due to the application of algal extract as compare to control. The percentage findings will be useful to the marginal farmers for utilizing fresh water algal extract as liquid fertilizers. Utilization of algal extracts in fertilizers will produced low cost eco-friendly, commercial products which will help in reducing environmental pollution and pesticide

tolerance. Moreover, the algal material will be available to the farmers in their own agricultural ponds and these biofertilisers are easy for farmers to handle. Further study will be carried out to screen out the algal mixture and find out exactly which of the algal species is more effective in enhancing the growth.

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Natural surfactants assisted an efficient synthesis of tetrahydro-β-carbolines

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ABSTRACT

An expeditious protocol for the synthesis of structurally diversified β-carboline derivatives has been reported using a readily available natural surfactant medium. The synthesis of β-carboline derivatives in good yields under optimized conditions was carried out by the reaction of tryptamine with aldehydes in an aqueous extract of *Acacia Concinna* pods. The use of an aqueous medium, ease of purification, good yield and cost-effective reaction suggest for bulk scale production β-carboline derivatives.

Introduction

Nowadays there are continuous efforts in the development of Green chemistry the main focus of which is the replacement of the toxic or hazardous and expensive catalysts with the greener alternative. Water being safer, non-toxic, inexpensive and accessible is found to be a unique medium for conducting organic chemistry reactions[1–6]. Catalyst is the soul of organic reactions, hence its design, construction and utility is a great challenge before researchers. Numerous reaction transformations have been developed including the use of supercritical solvent[7], clays [8], enzymes[9], animal bone[10], surfactants[11] etc. as reaction medium or catalyst. These materials are found to be convenient to some extent for solving certain incredible synthetic issues. Some serious issues are occurring by use of catalyst in reaction like environmental hazardous nature of the catalyst, expensive, handling problems, use elevated temperature etc. To overcome these problems, use natural feedstocks in organic synthesis has found to be the best remedy. Nature gives an unbelievable collection of biochemicals that can act as biocatalysts for conducting organic transformations[12–15]. The natural material like soaked *Phaseolus Aureus*, the plant cell culture of *Daucus carota* root and coconut juice has been effectively used as a catalyst for conducting organic reactions[16]. The natural surfactants of *Acacia concinna* have been efficiently used for Knoevenagel condensation reaction[13], acylation of amines[17] and synthesis of aryl-hydrazones[16].

β-carbolines are natural products possessing various bioactivities due to their extraordinary chemical structure[18–20]. Reserpine (**A**) is used to treat high blood pressure and to treat mental disorder patients[21]. (-)-Suaveoline (**B**) has nutritional and medicinal applications[22,23]. Moreover, β-carboline derivatives possesses antimalarial[24], antitumor, anti HIV[25] and antibacterial activitites[26], Tadalafil (**C**) is used to treat male sexual function problems[27]. Strictosidine (**D**) is important precursors to medicinally important compounds such as anticancer drugs[28]. Kumujian C (**D**) palys important role as anti-inflammatory agent[29]. 6-oxofascaplysin (**F**) shows weak cytotoxic activity[30]. Evodiamine (**G**) shows anticancer activity[31] (Fig. 1).

Considering the pharmacological potential of β-carboline core, its synthesis using the green chemistry technique is the major concern of the present work. Generally, the synthesis of β-carboline is Pictet-Spengler reaction tryptamine or tryptophan with carbonyl compound in an organic solvent under reflux condition. Trifluoroacetic acid (TFA) and hydrochloric acid were found to be appropriate Bronsted acids for the synthesis of β-carboline derivatives[32]. The use of strong acids as a catalyst and harsh conditions with lacking substrate scope are the major disadvantages of reported methods[33]. Recently, molecular iodine and TFA/H_2O[34–36], zeolites[37,38], microwave irradiation(MWI)[39], aqueos molecular iodine in DMSO[40] has been studied to reduce reaction time and to improve yields of the products[41–43]. β-carboline derivatives are recently synthesized using diphenylphosphoric acid as a catalyst[44]. Pyridyl-phosphine ruthenium(II) catalyzed Pictet-Spengler reaction for the synthesize tetrahydro-β-carbolines is also reported[45]. Trifluoroacetic anhydride (TFAA) and 1,4-diazabicyclo[2.2.2]octane (DABCO) promoted and dimethylacetamide (DMA) medited Pictet-Spengler reaction is also reported[46]. Unfortunately, each method reported in the literature has disadvantages. Therefore, there is still a need

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to develop a more efficient method for the construction of the β-carboline core by utilizing natural, renewable and less hazardous reaction.

Acacia concinna known as Shikakai in India belongs to the family Leguminosae. Due to the cleansing activity of *Acacia concinna,* it has a traditional application as shampoo and detergent. The saponins, acacic acid present in *Acacia concinna* fruit which was found to be 10–11.5% [47] resulted in the acidic nature of its aqueous extract (p^H = 4.1) [48,49]. Also wetting and spreading property of surfactant solution promoted us to use surfactant type catalytic medium for synthesis of β-carboline derivatives. The aqueous extract of *Acacia concinna* is rich in saponins content. Saponins are triglycosides of acacia acid that contain glucose, arabinose and xylose as sugar cores[49,50]. Being amphiphilic, saponin has an existence of both polar and non-polar part as Glycone and Aglycone part respectively. Due to these polar and non-polar parts of saponin, reactant molecules solubilize in an aqueous extract of *Acacia concinna* and preceding the chemical reaction to the product side.

Result and discussion

To the extension of our current research for the development of novel methodologies for the synthesis of essential bioactive molecules [51–54], herein we have reported the use of natural surfactant type catalyst for the synthesis of tetrahydro-β-carboline derivatives (Scheme 1). Tetrahydro-β-carboline derivatives were synthesized using aqueous extracts of different natural surfactants like *Acacia concinna*, *Balanites aegyptiaca*, *Jatropha*, *Sapindus mukorossi.* Normally, the drastic reaction condition (5–6 hrs) is required the synthesis of tetrahydro-β-carbolines. To assess the catalytic effect of all the above natural surfactant on the rate of reaction and yield of the product we performed a model reaction of tryptamine (**1**) (1 mmol) and benzaldehyde (**2**) (1 mmol) in 10 mL aqueous extract giving product **3a** was carried out in respective aqueous solutions (Scheme 1). The use of natural surfactants showed variation in the rate of reaction and yield of product, results are summarised as in Table 1.

Hence, *Acacia Concinna* pods are applied effectively for the synthesis of tetrahydro-β-carbolines derivatives from tryptamine and benzaldehyde. The effect of other natural surfactants like *Balanites aegyptiaca*, *Jatropha*, *Sapindus mukorossi* for the synthesis of β-carboline derivatives has been studied shows less efficiency than *Acacia Concinna* pods. So for the synthesis of β-carboline analogues, aqueous extract of *Acacia Concinna* pods are applied.

For the optimization of reaction, the reaction of tryptamine (**1**) (1 mmol) and benzaldehyde (**2**) (1 mmol) in 5 mL aqueous extract of *Acacia concinna* pods (10% W/V) was conducted by varying temperature from 25 to 98 °C. It was found that 80% of compound **3a** was formed after 5.4 h at 98 °C temperature. The same reaction was conducted in different concentrations of aqueous extract of *Acacia concinna* pods as 20, 30, 40, and 50% to study the effect of catalyst concentration on yield. The result obtained suggested that 20% of the aqueous extract was adequate to get the maximum yield of the product **3a** (82%) in 5.2 h. However, an increase in the concentration of *Acacia concinna* pods (30%, 40%, and 50%) did not show much difference in the yields of the final product (Table 1) (see Table 2).

Similarly, the surface tension of the aqueous extract of *Acacia concinna* pods also plays important role in the determination of the rate of reaction. It was found that the addition of surfactant in water reduces

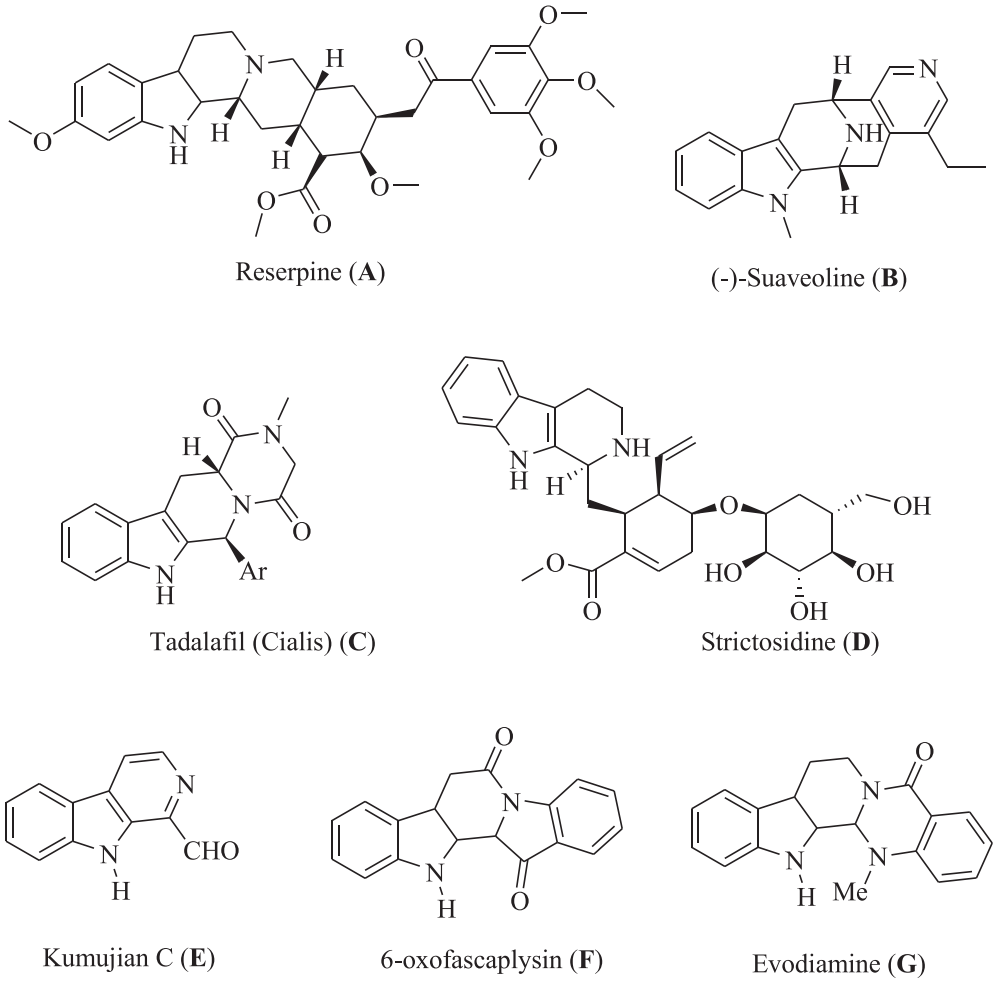
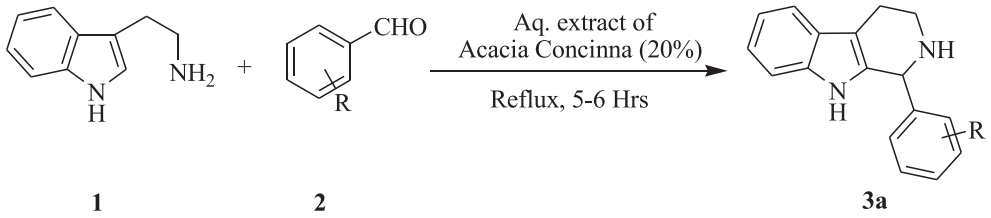


Fig. 1. Some of the potentially active β-carboline derivatives.



Scheme 1. Synthesis of terahydro-β-carboline derivatives.

Table 1
Effect of different surfactant systems in the synthesis of tetrahydro-β-carbolines.

Sr. No.	Surfactant system (Conc. 10%w/v)	Time of reaction (hr)	Yield %
1	***Acacia concinna***	**5.4**	**80**
2	*Balanites aegyptiaca*	6.0	75
3	*Jatropha*	5.2	78
4	*Sapindus mukorossi*	6.5	70

Table 2
Optimization of catalyst concentration.

Entry	Catalyst concentration %(W/V)	Time (h)	Yield(%)[a]
1.	10	5.4	80
2.	20	5.2	82
3.	30	5.8	80
4.	40	5.6	78
5.	50	5.4	75
6.	Water	12	NR[b]

[a]*Isolated yield of* ***3a****.* [b]*No reaction*

the surface tension as compared to water (Table 3). Wetting and spreading property of surfactant solution increase reaction rate. The surface tension and structure of surfactant affects the wetting and spreading property of surfactant solution[55,56]. Hence, several reactions like photochemical, redox, Diels-Alder, enzymatic reactions are found to have an increase in the rate of reactions by use of surfactant [57]. In addition, the hydrophobic groups of surfactant are sequestered in the micelle core[58], which helps in intimate contact with reacting species.

To assess the catalytic efficacy of the aqueous extract of the *Acacia concinna* pods, a model reaction of tryptamine (**1**) and benzaldehyde (**2**) was carried out in aqueous solutions of various cationic, anionic, and non-ionic surfactants such as sodium dodecyl sulphonic acid (SDS), triton X-100, cetyl ammonium bromide (CTAB) and CPB. The results obtained suggested that aqueous extract of the *Acacia concinna* pods was an excellent medium for the synthesis of '**3a**'over other commercial phase transfer catalysts (Table 4).

The superiority of the aqueous extract of *Acacia concinna* pods over other surfactants inspired us for further investigation of the present method for other aldehydes possessing a wide range of substituent (Table 5). The appreciable acidity ($p^H = 4.1$) and surfactant properties of the aqueous extract of *Acacia concinna* increase the rate of reaction. The saponins present in aqueous extract accelerate the solubility of reactant

Table 3
Effect of surface tension of surfactant solution on rate of reaction.

Entry	Catalyst concentration %(W/V)	Surface Tension 'T' (dyne/cm)	Time (h)
1.	50	14.22	5.4
2.	40	19.14	5.6
3.	30	33.52	5.8
4.	20	41.01	5.2
5.	10	47.21	5.4
6.	Water	66.55	–

Table 4
Effect of surfactant for the formation of '3a'

Entry	Surfactant[a]	Time (hr)	Yield (%)[b]
1.	None	12	NR[c]
2.	SDS	6.4	66
3.	Triton X-100	5.6	55
4.	CTAB	6.2	50
5.	CPB	6.4	58
6.	*Acacia concinna* extract 20% (W/V).	5.2	82

[a]*Reaction condition: Trptamine (1 mmol), benzaldehyde (1 mmol), Acacia concinna extract (5 mL),* 98 °C, [b]*Isolated yield.* [c]*No reaction.*

species. This will result in an increased collision between reactant molecules. Due to this reactant molecules are encapsulated into the micellar cage which drives the equilibrium to the product side by giving out water molecule of the hydrophobic interior of the micelle (Fig. 2) [59]. The projected mechanism for the synthesis of the β-carboline derivatives can involve the iminium-catalysed formation of *N*-benzylidene-2-(1*H*-indol-3-yl)ethanamine (**I**), activation by catalyst and ring closure giving a six-member ring (**II**) (Scheme 2)[60].

Conclusion

In conclusion, a greener methodology mediated by an aqueous solution of *Acacia concinna* pods has been reported for the synthesis of tetrahydro-β-carbolines in good to excellent yields via Pictet-Spengler reaction. The water as reaction medium, short reaction time, high purity of the products, biocompatible catalyst, mild reaction conditions and a simple workup procedure are features of the present method.

Experimental

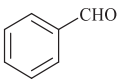
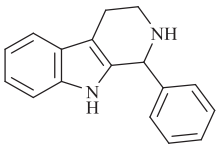
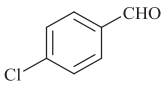
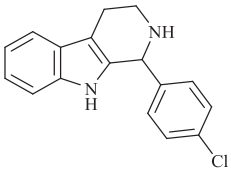
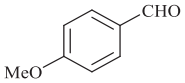
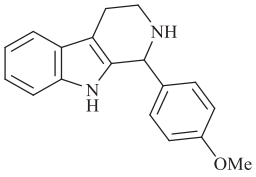
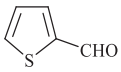
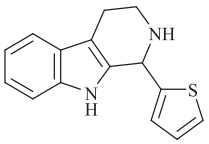
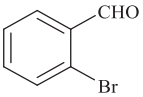
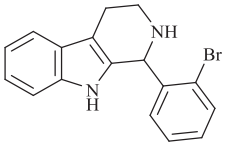
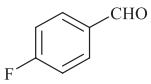
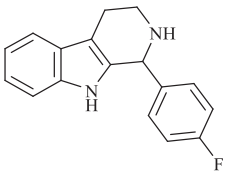
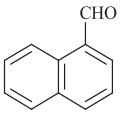
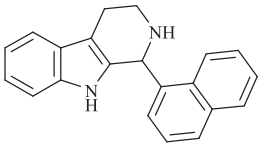
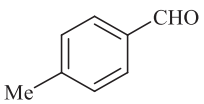
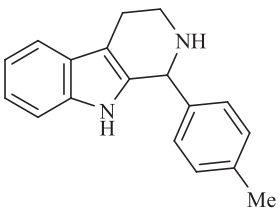
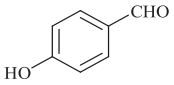
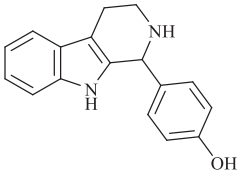
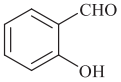
General

Melting points were recorded on Digital Electro thermal Melting point apparatus (VEEGO, VMP-DS) and are uncorrected. The reaction monitoring was conducted using Thin Layer Chromatography (TLC) using pre-coated Silica gel 60 F_{254} plates with layer thickness 0.25 nm purchased from Merck Ltd. TLC plates and were visualized under ultraviolet light. ^{1}H NMR was recorded on Varian-NMR mercury 400 MHz spectrometer using $CDCl_3$ as a solvent. The chemical shifts values (δ) are expressed parts per million (ppm). *Acacia concinna* pods which were purchased from the local market were dried well and seeds were removed. The fine powder was obtained of *Acacia concinna* by using mortar and pestle.

General procedure for the preparation of the catalyst

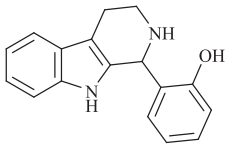
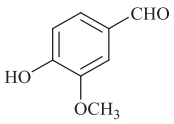
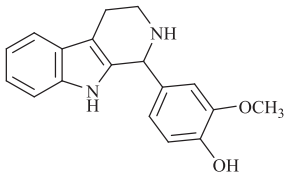
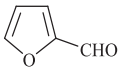
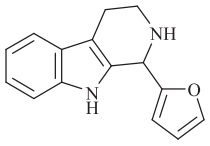
A mixture of fine powder of *Acacia concinna* pods (20 g) in water (100 mL) in a 250 mL conical flask was heated at 100 °C for 20 min. The solid material was separated by filtration and the aqueous extract was collected as a brown coloured solution having a concentration 20% w/v.

Table 5
Synthesis of tetrahydro-β-Carboline derivatives.

Entry	Aldehyde	Product		Time (Hr)	Yield (%)[a]	M.P. (°C)	M.P. (°C)[b]
1.			**3a**	5.2	82	163–164	162–163[61]
2.			**3b**	5	86	205–207	206–207[61]
3.			**3d**	5.4	78	202–204	203–204[61]
4.			**3e**	5.6	76	168–170	169–170[61]
5.			**3f**	4.8	88	196–198	198–199[62]
6.			**3g**	5.4	84	185–187	183–188[62]
7.			**3h**	5.6	78	166–167	167–168[61]
8.			**3i**	5	88	134–136	136–138[63]
9.			**3j**	5.6	78	191–193	192–193[63]
10.			**3k**	5.8	74	211–213	212–213[63]

(*continued on next page*)

Table 5 (*continued*)

Entry	Aldehyde	Product		Time (Hr)	Yield (%)[a]	M.P. (°C)	M.P. (°C)[b]
							
11.			**3l**	5.2	80	184–186	185–186[63]
12.			**3m**	5.4	78	208–210	209–210[63]

[a]*Isolated yield.* [b]*Products were confirmed by using physical methods for characterization and by comparison with that of reported in literature*

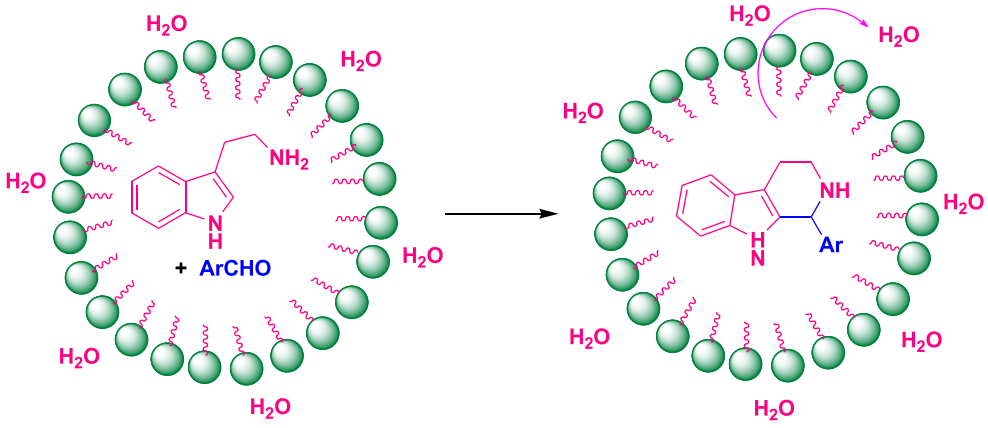
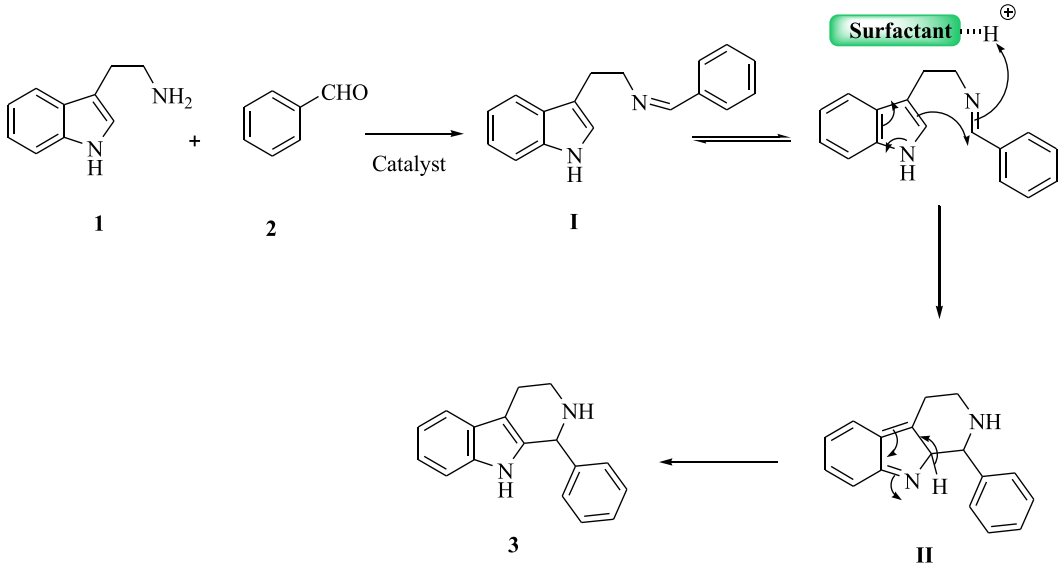


Fig. 2. Micelle-promoted synthesis of tetrahydro-β-Carboline derivatives.



Scheme 2. Proposed mechanism for formation of tetrahydro-β-carboline derivatives **(3).**

General procedure for the synthesis of tetrahydro-β-Carbolines (3a-m)

A mixture of tryptamine (1 mmol) and aldehyde (1 mmol) in surfactantmedium (20%, 5 mL) was stirred at about 60 °C temperature for specified time (Table 5). After completion of the reaction (as indicated by TLC), a separated solid was filtered on Buchner funnel. The obtained product was washed with 100 mL cold water. The product is thus freed from the aqueous extract and further drying the product affords pure tetrahydro-β-carbolines products (**3a-m**) in good yields.

Spectral data of representative compound

1-(4-chlorophenyl)-2,3,4,9-tetrahydro-1H-pyrido[3,4-b]indole (3b): Yield: 86%; White solid; **MP-** 205–207 °C, **LCMS** *m/z*: 282(M^+), **^{1}HNMR** (400 MHz, $CDCl_3$): δ 3.00–3.04(m, 2H), 3.79–3.87(m, 2H), 6.95–6.97(m, 1H), 7.02–7.04(m, 1H), 7.13(br s, 1H), 7.30–7.32(d, 1H), 7.49–7.51(d, 2H), 7.54–7.56(d, 1H), 7.73–7.75(d, 2H), 8.29(s, 1H), 10.78 (br s, 1H) **; ^{13}CNMR (100 MHz, $CDCl_3$):** δ 23.32, 43.44, 58.16, 77.67, 78.16, 78.31, 111.24, 111.77, 119.18, 120.36, 122.76, 128.15, 129.84, 130.78, 134.68, 134.84, 136.81, 141.25.

1-(4-methoxyphenyl)-2,3,4,9-tetrahydro-1H-pyrido[3,4-b]indole (3d): Yield: 78%; White solid; **MP-** 203–204 °C, **LCMS** *m/z*: 178(M^+), **^{1}HNMR** (400 MHz, DMSO): δ 2.62–2.66 (m, 2H), 2.99–3.02 (m, 1H), 3.11–3.14 (m, 1H), 3.90 (s, 3H), 5.23 (s, 1H), 5.31 (s, 1H), 6.99–7.00 (m, 2H), 7.25–7.31 (m, 3H), 7.36–7.41 (m, 3H), 8.14 (s, 1H) **; ^{13}CNMR (100 MHz, $CDCl_3$):** δ 23.57, 43.93, 56.39, 58.52, 77.78, 78.10, 78.42, 111.15, 111.88, 115.18, 119.26, 120.40, 122.71, 128.47, 130.71, 134.91, 135.86, 136.88, 160.55.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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