

3.3.1		Research papers published per teacher in the Journals notified on UGC care list during the last five years								
								Link to the recognition in UGC enlistment of the Journal /Digital Object Identifier (doi) number		
		Title of paper	Department of the teacher	Name of journal	Year of publication	ISSN number	Link to website of the Journal	Link to article / paper / abstract of the article	Is it listed in UGC Care list	
							Link to website of the Journal	Link to article / paper / abstract of the article	Is it listed in UGC Care list	
1	1	Isolation, Screening, And Characterization Of Plant Growth Enhancing Endophytic Bacteria From Halophytic Heliotropium Curassavicum L. Collected From Salt Stress Areas Of Srikakulam, Andhra Pradesh	Smt.M.Sridevi Dept of Botan	SCOPUS - Journal of Applied and Natural Science	Sep 19, 2023	0974-9411	https://journals.ansfoundation.org/index.php/jans/index	https://doi.org/10.31018/jans.v15i3.4727	Yes	
2	2	Screening Of Salt Tolerant Endophytic Bacteria With Plant Growth Promoting Characters Isolated From Acanthus Illicifolius L., A Species Of Mangrove Ecosystem Located At Corangi Wildlife Sanctuary, Andhra Pradesh	Smt.M.Sridevi Dept of Botany	SCOPUS - Journal of Applied and Natural Science	20th June 2023	0974-9411	https://journals.ansfoundation.org/index.php/jans/index	https://doi.org/10.31018/jans.v15i2.4384	Yes	
3	3	Immortalizing Affinity Towards His Beloved In The Poem "One Day I	Mrs.B.Janaki English	International Journal of All Research	5th May 2023	2455-6211	http://www.ijaresm.com/	http://www.ijaresm.com/immortalizing-6affinity-	Yes	

		Wrote Her Name Upon The Strand” By Edmund Spenser		Educational and Scientific Methods(IJARESM)				towards-his-beloved-in-the-poem-one-day-i-wrote-her-name-45upon-the-strand-by-edmund-spenser	
4	4	Artificial Intelligence In Future Smart Cities	BallaBhuvan eswari Dept.of Computer science	INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN TECHNOLOGY	12th May 2023	2349-6002	https://ijirt.org/index	https://ijirt.org/Article?manuscript=160059	Yes
5	5	Exploring Black Music As A Form Of Cultural Expression: A Textual Analysis On The Select Lyrics In Black Music.	Dr.B.Anuradha Surya Kumari Dept.of English	TIJER – INTERNATIONAL RESEARCH JOURNAL : ISSN : 2349 - 9249	5th May 2023	2349 -9249	https://www.tijer.org/track.php	https://tijer.org/track.php?r_id=105785	Yes
6	6	Isolation And Culturing Of Four Pathogens Causing Diseases In Banana Crops At Rajamahendravaram, East Godavari District, AP, India.	Smt.T.Nagamuni Dept of Botany	International Journal of Current Science: ISSN : 2250-1770	22nd April 2023	2250-1770	https://ijespub.org/	https://ijespub.org/track.php	Yes
7	7	Isolation And Culturing Of Four Pathogens Causing Diseases In Banana Crops At Rajamahendravaram, East Godavari District, AP, India.	KumP.Sridevi Dept of Botany	International Journal of Current Science: ISSN : 2250-1770	22nd April 2023	2250-1770	https://ijespub.org/	https://ijespub.org/track.php	Yes

8	8	Isolation And Culturing Of Four Pathogens Causing Diseases In Banana Crops At Rajamahendravaram, East Godavari District, AP, India.	B.AshaLatha Dept of Botany	International Journal of Current Science: ISSN : 2250-1770	22nd April 2023	2250-1770	https://ijespub.org/	https://ijespub.org/tack.php	Yes
9	9	Isolation And Culturing Of Four Pathogens Causing Diseases In Banana Crops At Rajamahendravaram, East Godavari District, AP, India.	Smt.M.Sridevi Dept of Botany	International Journal of Current Science: ISSN : 2250-1770	22nd April 2023	2250-1770	https://ijespub.org/	https://ijespub.org/tack.php	Yes
10	1	Important Medicinal Plants Of Dhanvantharimedical Garden At SKR Government Degree College, Rajamahendravaram To Maintain Sustainable Health And Well Being	B.AshaLatha Dept of Botany	INFOKARA RESEARCH ISSN NO: 1021-9056 (Impact Factor 5.3)	March 2023	1021-9056	https://infokara.com/	https://infokara.com/index.php/volume-12-issue-3-2023//	Yes
11	2	Important Medicinal Plants Of Dhanvantharimedical Garden At SKR Government Degree College, Rajamahendravaram To Maintain Sustainable Health And Well Being	Smt.M.Sridevi Dept of Botany	INFOKARA RESEARCH ISSN NO: 1021-9056 (Impact Factor 5.3)	March 2023	1021-9056	https://infokara.com/	https://infokara.com/index.php/volume-12-issue-3-2023//	Yes
12	3	Important Medicinal Plants Of Dhanvantharimedical	KumP.Sridevi	INFOKARA RESEARCH ISSN NO: 1021-	March 2023	1021-9056	https://infokara.com/	https://infokara.com/index.php/volume-12-issue-3-2023//	Yes

		Garden At SKR Government Degree College, Rajamahendravaram To Maintain Sustainable Health And Well Being	Dept of Botany	9056 (Impact Factor 5.3)					
13	4	Important Medicinal Plants Of Dhanvantharimedical Garden At SKR Government Degree College, Rajamahendravaram To Maintain Sustainable Health And Well Being	Smt.T.Nagamuni Dept of Botany	INFOKARA RESEARCH ISSN NO: 1021-9056 (Impact Factor 5.3)	March 2023	1021-9056	https://infokara.com/	https://infokara.com/index.php/volume-12-issue-3-2023//	Yes
14	5	Isolation And Categorization Of Plant Growth Promoting Endophytic Bacteria Isolated From Halophytic Suaedanigra At Salt Stress Area Of Srikakulam, Andhra Pradesh	Smt.M.Sridevi Dept of Botany	Journal of Pure and Applied Microbiology (JPAM) Received: 08 May 2022 Accepted: 05 November 2022 Published online:	28 November 2022 Issue online: December 2022	2581-690X	https://microbiologyjournal.org/	https://microbiologyjournal.org/isolation-and-categorization-of-plant-growth-promoting-endophytic-bacteria-isolated-from-halophytic-suaedanigra-at-salt-stress-area-of-srikakulam-andhra-pradesh/	Yes
15	6	Screening And Isolation Of Plant Growth Promoting, Halotolerant Endophytic Bacteria From Mangrove Plant Avicennia Officinalis L. At Coastal Region	Smt.M.Sridevi Dept of Botany	SCOPUS-Agricultural Science Digest	Online14-11-2022	0253-150X	https://arcejournals.com/	https://arcejournals.com/journal/agricultural-science-digest/D-5607	Yes

		Of Corangi Andhra Pradesh						
16	7	Heterostructure Composite Of Fewo4/Chitosan Via Hydrothermal For Degradation Of Brilliant Green Dye And Inactivation Of Pathogens	Dr.P.Raghava Kumari, Principal, Dept of Zoology	IJMARTA Peer Reviewed (Referred) International Journal	Vol. X, Issue 2(2) (September – 2022, ISSN : 2349-7408	2349-7408	(IJMARTA) A Peer Reviewed (Referred) International Journal Email: editor.ijmart@gmail.com	ISSN - 2349-7408
17	8	Heterostructure Composite Of Fewo4/Chitosan Via Hydrothermal For Degradation Of Brilliant Green Dye And Inactivation Of Pathogens	Dr.Ch.V.V.Srinivas Dept of Chemistry	IJMARTA Peer Reviewed (Referred) International Journal	Vol. X, Issue 2(2) (September – 2022, ISSN : 2349-7408	2349-7408	(IJMARTA) A Peer Reviewed (Referred) International Journal Email: editor.ijmart@gmail.com	ISSN- 2349-7408
18	9	Heterostructure Composite Of Fewo4/Chitosan Via Hydrothermal For Degradation Of Brilliant Green Dye And Inactivation Of Pathogens	Dr.M.Sunitha, Dept of Chemistry	IJMARTA Peer Reviewed (Referred) International Journal	Vol. X, Issue 2(2) (September – 2022, ISSN : 2349-7408	2349-7408	(IJMARTA) A Peer Reviewed (Referred) International Journal Email: editor.ijmart@gmail.com	ISSN -2349-7408
19	10	संत कवियोंकी सामाजिक समरसता रज्जव वाणीके सन्दर्भ में	Dr.K.Neeraja Dept of Hindi	Yogyatha International Referred Research Journal, ISSN : 2348 - 4225	June 2022	Print -ISSN : 2348 -4225		ISSN : 2348 -4225
20	1	- Samakaleen Hindi Kahaniyo Me Chitrit - Vrudh Jeevan Ki Samasyayem Evam Samadhan	Hindi	Vidyawarta	2021	2319-9318	https://www.vidyawarta.com/02/?p=5345	https://www.vidyawarta.com/02/wp-content/uploads/2021/07/special issue apr-june-2021.pdf

21	2	Jangal Ke Asspass Upanyas Me Chitrit Adivasi Sangharsh Chetana	Hindi	Vidyawarta	2021	2394 5303	https://www.vidyawarta.com/02/?p=5345		
22	3	Rakesh Vasta Ke Upanyas: Dalit Chetana Ki Abhivyakti Auor Shoshan Ka Khandan	Hindi	Vidyawarta	2021	2394 5303	https://www.vidyawarta.com/02/?p=5345		
23	4	Visible Light Induced Photocatalytic Degradation Of Xylenol Orange Dye Using Cowo4- Chitosan Composite And Its Antimicrobial Activity	Chemistry	International Journal of Multidisciplinary Empirical Research (IJMER) A Peer Reviewed (Referred) International Journal	2021	Vol. IX, Issue 2(4) (December - 2021) Impact Factor: 3.9	Email: editor.ijmart@gmail.c om		
24	5	Visible Light Induced Photocatalytic Degradation Of Xylenol Orange Dye Using Cowo4- Chitosan Composite And Its Antimicrobial Activity	Chemistry	International Journal of Multidisciplinary Empirical Research (IJMER) A Peer Reviewed (Referred) International Journal	2021	Vol. IX, Issue 2(4) (December - 2021) Impact Factor: 3.9	Email: editor.ijmart@gmail.c om		
25	6	Visible Light Induced Photocatalytic Degradation Of Xylenol Orange Dye Using Cowo4- Chitosan Composite And Its Antimicrobial Activity	Chemistry	International Journal of Multidisciplinary Empirical Research (IJMER) A Peer Reviewed (Referred)	2021	Vol. IX, Issue 2(4) (December - 2021) Impact Factor: 3.9	Email: editor.ijmart@gmail.c om		

				International Journal					
26	7	Professional Development Of Teachers And Their Academic Achievements – A Perspective	Chemistry	International Journal of Multidisciplinary Advanced Research Trends (IJMART) A Peer Reviewed (Referred) International Journal	2021	ISSN : 2349-7408	Email: editor.ijmart@gmail.com		
27	1	Telugu Sahityam Samakaalinata- Telugu Katha Kaavyalu Samakalinatha	Telugu	Bhava veena (Spl. Add)	2020	2456-4702	https://telugujournalbhavaveena.blogspot.com/2020/	https://drive.google.com/file/d/1c6Lf3kPg2d7czqx6bECXXmCTppivdTxv/view	Yes
28	1	Varthman Bharat Mein Uchha Siksha Ki Chunoutiya	Hindi	Tejaswi Astitwa National	2019	2581-9070	https://www.tejasvstitva.com/visionary-women/#	http://www.tejasvstitva.com/category/proceedings-higher-education-today/	
29	2	Paryavaran Sanrakshan Mein Mahilavom Ki Bhagidari	Hindi	Tejaswi Astitwa National	2019	2581-9070	https://www.tejasvstitva.com/visionary-women/#	https://www.tejasvstitva.com/%e0%a4%aa%e0%a4%b0%e0%a5%8d%e0%a4%af%e0%a4%be%e0%a4%b5%e0%a4%b0%e0%a4%a3-%e0%a4%b8%e0%a4%82%e0%a4%b0%e0%a4%95%e0%a5%8d%e0%a4%b7%e0%a4%a3-	

								%e0%a4%ae%e0%a5%87%e0%a4%82-%e0%a4%ae%e0%a4%b9%e0%a4%bf/	
30	3	Hindi Tatha Telugu Paheliyom Ka Vivechan	Hindi	ASVP Aryavart Shod Vikas Patrika international	2019	2347-2944	https://www-aryavartsvs-org-in.translate.google.com/?x_tr_sl=en&x_tr_tl=hi&x_tr_hl=hi&x_tr_pto=tc	http://www.aryavartsvs.org.in/uploadedbook/74.%20K.%20Nirja,%20Rajmahendrawaram%20(Andhera%20Pradesh).pdf	
31	1	Santh Sahitya Mein Sudharvadi Drushtikon	Hindi	Bhavaveena Spl.Edition	2018	2456-4702		https://telugujournalbhavaveena.blogspot.com/	yes
32	2	Synthesis, Characterization And Visible Light Photocatalytic Degradation Study Of Thiourea Modified Nano Titania Composites	Chemistry	Journal of Applicable Chemistry	2018	ISSN: 2278-1862	http://www.joac.info/Indexing.aspx	http://www.joac.info/ContentPaper/2018/3.pdf	Yes
33	3	Visible Light Photocatalytic Degradation Of Methylene Blue And Malachite Green Dyes With Cuwo4-GO Nano Composite	Chemistry	Scirp-Modern Research in Catalysis	2018	ISSN Print: 2168-4480 ISSN Online: 2168-4499	https://www.scirp.org/journal/mrc	doi: 10.4236/mrc.2018.72002	Yes
34	4	Visible Light Induced Photocatalytic Degradation Of Xylenol Orange Dye Using Cowo4- Chitosan	Chemistry	International Journal of Multidisciplinary Advanced Research Trends (IJMART) A Peer	2018	Vol. IX, Issue 2(4) (December - 2021) Impact Factor: 3.9 ISSN : 2349-9656	Email: editor.ijmart@gmail.com		

		Composite And Its Antimicrobial Activity		Reviewed (Referred) International Journal				
35	5	Visible Light Induced Photocatalytic Degradation Of Xylenol Orange Dye Using Cowo4- Chitosan Composite And Its Antimicrobial Activity	Chemistry	International Journal of Multidisciplinary Advanced Research Trends (IJMART) A Peer Reviewed (Referred) International Journal	2018	Vol. IX, Issue 2(4) (December - 2021) Impact Factor: 3.9 ISSN : 2349-9656	Email: editor.ijmart@gmail.com	
36	6	Visible Light Induced Photocatalytic Degradation Of Xylenol Orange Dye Using Cowo4- Chitosan Composite And Its Antimicrobial Activity	Zoology	International Journal of Multidisciplinary Advanced Research Trends (IJMART) A Peer Reviewed (Referred) International Journal	2018	Vol. IX, Issue 2(4) (December - 2021) Impact Factor: 3.9 ISSN : 2349-9656	Email: editor.ijmart@gmail.com	

Isolation and Categorization of Plant Growth Promoting Endophytic Bacteria Isolated from Halophytic *Suaeda nigra* at Salt Stress Area of Srikakulam, Andhra Pradesh

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Abstract

In search of novel endophytic bacteria capable of producing plant growth promoting phytohormones and providing tolerance against biotic and abiotic stress to the plant, present study was carried out during 2021-22. For this, endophytic bacteria were isolated from halophytic *Suaeda nigra* at salt stress areas of Srikakulam district, Andhra Pradesh. Total of sixteen endophytic bacteria were isolated from roots and aerial parts of *Suaeda nigra*. Isolates were enumerated, purified and preserved for subsequent studies. All isolates were analyzed for their phenotypic, biochemical, enzymatic assay and molecular characterization was carried out by 16S rRNA molecular method. Isolates were tested for their ability in producing plant growth promoting phytohormones, siderophores, exo enzymes and ability to solubilize the phosphate molecules. Among total isolates extracted, bacteria which was labeled as "SNA7" isolated from aerial parts of *Suaeda nigra* showed better characters in producing catalytic enzymes like catalase, amylase, protease, phosphate solubilization ability and Indole-3-acetic acid (IAA) production. Isolate SNA7 was gram negative, motile, aerobic, rod shaped, non-spore forming, and no pigmentation which grows best at 42°C, pH 8.3 with tolerance of 8% NaCl nutrient agar. Based on phenotypic, biochemical, nucleotide homology and phylogenetic analysis isolate SNA7 showed higher relationship with *Pseudomonas pseudoalcaligenes* *Pseudomonas* spp. was characterized as an effective organism to explore its ability in various research fields. In this current study, isolate SNA7 showed higher potential in producing wide range of enzymes and bioactive secondary metabolites and was first of its kind reported and isolated from halophytic *Suaeda nigra*.

Keywords: Catalytic Activity, Endophytic Bacteria, Halophytes, Plant Growth Promoters, *Pseudomonas*, Secondary Metabolites

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INTRODUCTION

Endophytic bacteria are the organisms that has the capacity to harbor inter and intracellular spaces of the host plant and they can spread systemically.^{1,2} Their exact functions for the plants are still uncertain.² Endophytes encourages the growth of the plant and yields and also acts as antagonists bacteria.³

Halophytes are the plants which can tolerate salt and grows well in water with extreme salinity like mangrove forest, marsh lands, sea shores, saline deserts and coastal areas of arid and semi arid regions. Halophytes exists in no more than 2% of the entire kingdom of plants establish on earth. They can tolerate high salinity by adopting diverse techniques such as resistance, tolerance and avoidance, and also they had less opposition in halo environmental surroundings.

Halophytes grows in areas where there had regular floods. *Suaeda monica* grows more vigorously in degraded soils when compare to other halophytes. As salt extractors, they carry out major functions like decreasing the salinity of the soils creating conditions more suitable to growing mangrove plant species. During the course of ecological time halophytes are gradually replaced by mangrove ecosystem. In absence of halophytic plants the rejuvenation of mangrove ecosystem will be very difficult in sea shore areas.

Microorganism interacting in rhizosphere, phyllosphere and endosphere of the host plant are exceptionally diverse.⁴ Symbiotic relationship of microbes with host plant plays a important key role in maintaining plant health, plant growth promotion, resistant to diseases and survival of the host plant.^{5,6} In the midst of diverse microflora, endophytic bacteria shares same environment as that of plant pathogens and makes them as ideal models of antagonistic agents.⁷ There are several studies are made which illustrate that endophytes has the ability to resist plant pathogens, insects and nematodes in addition to promoting plant growth and establishment under stress environments.^{8,9}

Currently, researchers have recognized more than hundreds of endophytic bacteria from medicinal plants of South Indian which showed promising characters against anti-tumour and antimicrobial agents.¹⁰ *Suaeda nigra* formerly

called as *Suaeda amoquinii* is a species of flowering plant belonging to family Amaranthaceae. It grows well in saline and alkaline habitats regularly occurs in inland and occasionally in coastal ecosystems. *Suaeda nigra* grows as shrub from a woody base with several branches growing upto 5.0 feet in tall.

Pseudomonas sp. isolated from soils are of particular attention because of their root forming ability, catabolic adaptability and capability of producing vast ranges of proteins, enzymes and secondary metabolites which helps host plant to tolerate diverse biotic and abiotic stress environments.¹¹ *Pseudomonas pseudoalcaligenes* KF707 isolated at Biphenyl manufacturing industry in Japan¹² is a soil born bacteria. It is well known for its ability to aerobically degrade polychlorinated biphenyls¹³ using biphenyl as secondary metabolites.

In search of novel endophytic bacteria capable of producing promising bioactive molecules, current study was undertaken to screen and identify endophytic bacteria isolated from halophytic *Suaeda nigra*.

MATERIALS AND METHODS

This current investigation was carried out during 2020-21 and 2021-22 at Department of Botany, Andhra University, Visakhapatnam, Andhra Pradesh.

Endophytic salt tolerant bacteria isolation

Explants were collected from aerial and root parts of *Suaeda nigra* located at holophytic zone of Khaspanaupada of Srikakulam district within latitude of 18°34'25.6"N and longitude of 84°18'50.4"E (18.573986, 84.313925) (Figure 3). The explants were sealed in sterile container for further studies.

Surface sterilization of explants

The explants were first washed with sterile water, blotted dry with filter paper dipped in 70% ethanol and kept for about 1min. The sample was removed and again washed in sterile water. After washing the sample was then dipped in 4% Sodium hypochlorite solution and kept for about 5 minutes and again washed in sterile water. Followed by dipped in 70% ethanol and kept for

about 1min. The sample was removed and again washed in sterile water for final preparation of sample into paste.

To test the sterility of the procedure, the explants were kept and rolled on plates containing nutrient agar. 0.1 ml of the water from last wash was also inoculated to nutrient broth. After incubation period if any colonies developed, then all the samples were discarded and again surface sterilization of explants was carried out.

Endophytic bacteria isolated from explants of *Suaeda nigra*

After the surface sterilization of the explants, about 1g of each sample was weighed, cut into small pieces and well grounded into paste using sterile saline water in a mortar. Make the sample pastes into about 10ml using saline water. Each stock sample is further diluted 4 times, ten parts each time. The highest diluted solutions (10⁻⁴) were spread (50µl) on agar plates containing Zobell marine agar (ZM agar) (Composition - Zobell-Marine Broth 2216 Himedia @ 5.5 % + Agar agar @ 1.5 %) with the aid of 'L' shaped glass spreader, and the plates were incubated. Colonies with different morphology were isolated and streaked on ZM agar plates with assigned codes and kept for 24 hours at 32°C. In order to obtain pure culture the streaked cultures were again quaternary streaked on individual ZM agar plate and kept for 24 hours at 32°C for incubation.

After 24 hours, the cultures were obtained from individual colonies were subjected to further studies like biochemical, molecular, property and salt tests.

Preservation and Maintenance of endophytic bacterial isolates

All the test isolates were streaked on nutrient agar plates and stored with 20% glycerol at -20°C. Viability of the cultures was retrieved by periodic sub-culturing into new media at monthly intervals.

Morphological and Microscopic observations of endophytic isolates

The following morphological and microscopic examination which is cell shape, colony morphology, Gram's staining and motility were done to characterize the tentative identity of endophytic bacteria.

All sixteen isolates were inoculated on 3% NaCl Nutrient agar and the phenotypic, colony morphology was observed.¹⁴ According to Aneja, 2006¹⁵ the cells from purified cultures were observed for their morphological characters like cell shape, cell size, endospore forming ability, reaction to gram's stain, pigmentation and cell motility.

Growth at different NaCl concentration

The young cultures were streaked on

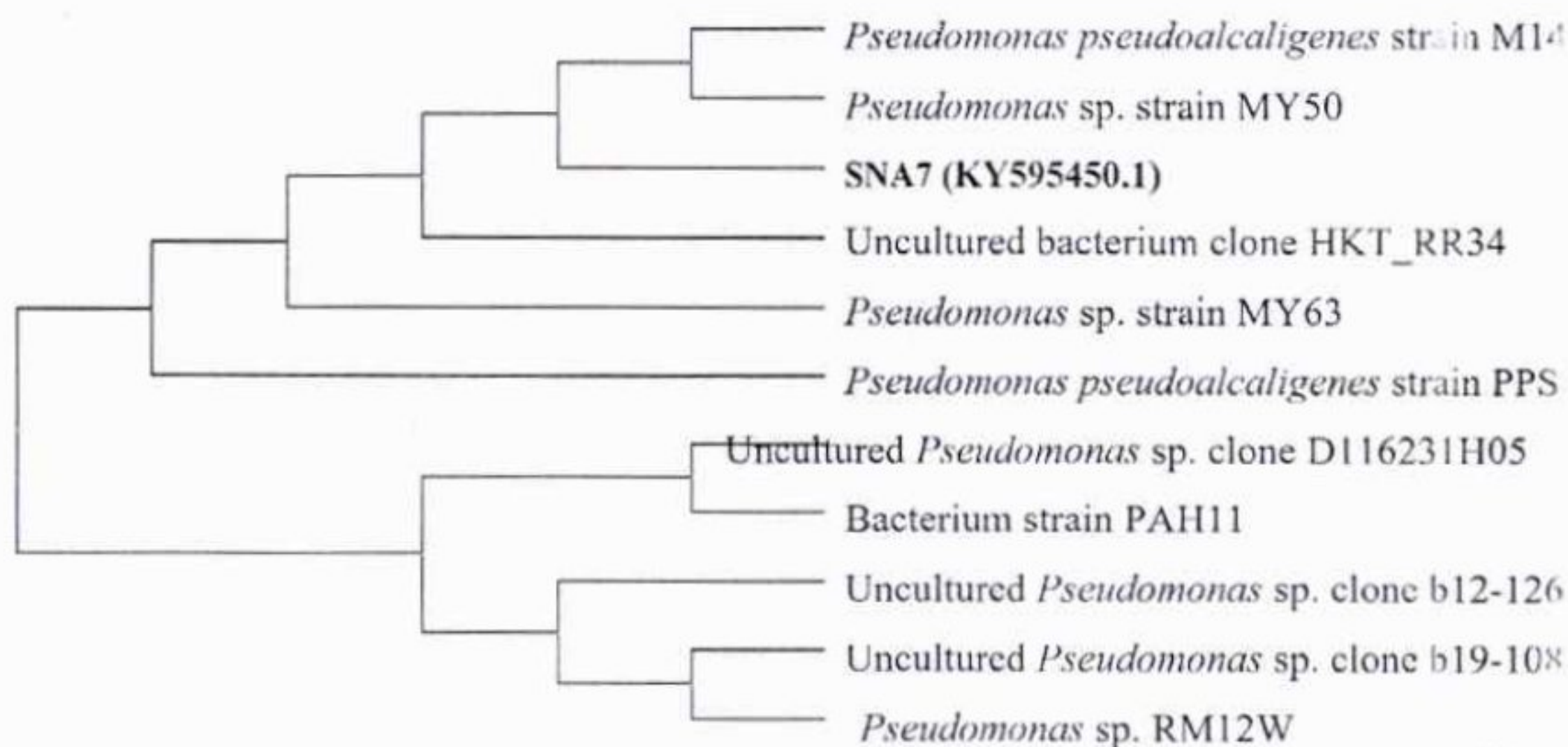


Figure 1. Phylogenetic Tree

Nutrient agar plates with different salt percentages i.e. 8% NaCl, 10% NaCl and 15% NaCl. The streaked plates were incubated at 32°C and observation of growth was made for 24hrs and 48hrs.

Oxygen requirement of endophytic bacterial isolates

Oxygen requirement was tested by growing bacteria in thioglycolate broth. The tubes

were inoculated and incubated at 32°C. Bacterial population concentrate in the test tube where the O₂ concentration is best suited for that particular microorganisms. Strict anaerobes concentrate at the bottom of the test tube, strict aerobes at the top to the test tube, aerotolerant organisms found evenly spread throughout the test tubes.

Biochemical enumeration of endophytic bacterial isolates

Catalase activity¹⁶

Loopfull of 24 hours old cultures of endophytic bacterial test isolates were transported to test tube containing 0.5 ml of sterile water. 3% solution of hydrogen peroxide (0.5ml) was added and thoroughly mixed. Observation was recorded for the production of effervescence give positive test for catalase production.

Oxidase test¹⁷

Trypticase Soy agar medium was used for this test. The test isolates were streaked on petri plates containing media and incubated for 48 hours at 32°C temperature in an upturn position. After incubation few drops of para amino dimethyl aniline oxalate were added. Observation was recorded for any colour changes from pink to maroon within few seconds indicates oxidase positive.

KOH test

Similar to Gram staining reaction, this test is also based on differences in the arrangement of the bacterial cell wall. Small amount of colony was mixed with little amount of 3% KOH. If the cell breaks, the cellular DNA makes the composition viscous or stringy in appearance. If KOH test is positive it indicates a gram negative microorganisms or If KOH test is negative then it indicates a gram positive microorganisms.

IndoleTest¹⁷

Glucose Tryptone broth was used to conduct Indole test. The test isolates was inoculated in sterile test tube containing sterile broth and kept for incubation for 48 hours at 32°C. After incubation time, 0.3 ml of Kovac's reagent was added and thoroughly mixed. Observation was recorded by the formation of red colour alcohol

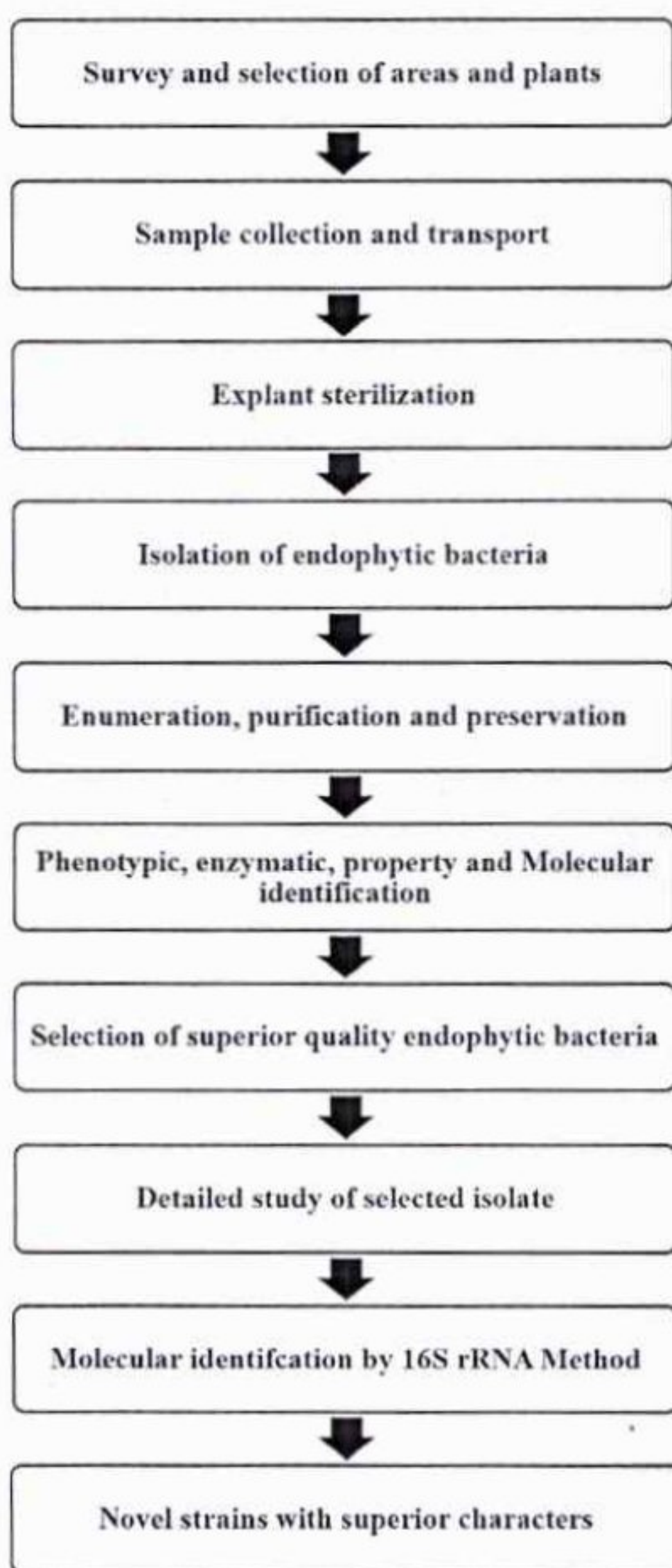


Figure. 2. Flowchart of the study undertaken

ring at the top of the test tube indicates positive test for indole production.

Methyl Red & Voges Proskauer Test¹⁷

Glucose phosphate broth (MR-VP medium) was used to test both Methyl red & Voges Proskauer. Two sets of sterilized broth was inoculated with test organisms and incubated at 32°C. After 48 hours of incubation period few drops of methyl red indicator were added, development of red colour indicates Methyl red test was positive. To another set of test tubes 5-6 drops of 5% α-naphthol and 2-3 drops of 40% potassium

hydroxide solution were added and mixed well. The positive reaction of acetylmethylcarbinol from glucose fermentation was converted into diacetyl in presence of α-naphthol and potassium hydroxide with the development of red colour at the surface within few minutes.

Citrate Test¹⁷

Simmon's Citrate Agar was used to test the consumption of Citrate as only carbon source and ammonium salts as only nitrogen source. All the isolates were inoculated in slants containing simmons citrate agar and incubated for 48 hours

Table 1. Coding of endophytic bacterial isolates

Plant	Plant part	Isolates
<i>Suaeda nigra</i>	Aerial parts (08 isolates)	SNA1, SNA2, SNA3, SNA4, SNA5, SNA6, SNA7, SNA8
	Root (08 isolates)	SNR1, SNR2, SNR3, SNR4, SNR5, SNR6, SNR7, SNR8

*S-Suaeda N-nigra A-aerial parts R-roots

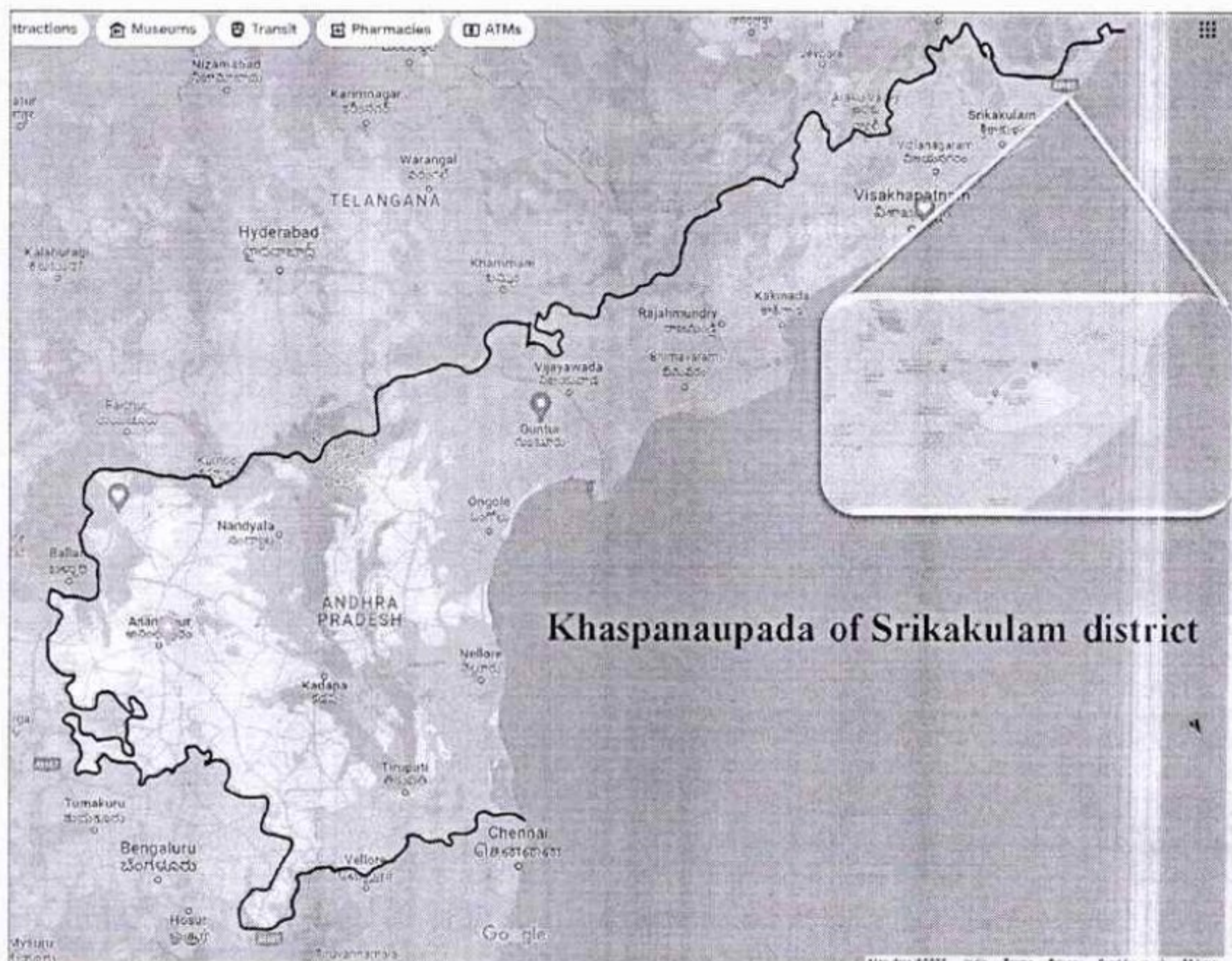


Figure 3. Sample Collection site at salt stress area of Khaspanaupada of Srikakulam district

Table 2. Comparative study of isolated SNA7 strain with other *pseudomonas* spp.

	SNA7 strain	<i>P. alcaligenes</i>	<i>P. pseudo alcaligenes</i>	<i>Pseudomonas alcaligenes</i> strain TPS8	<i>Pseudomonas putida</i> BP25
Morphological identification					
1) Cell shape	Bacillus	Bacillus	Bacillus	Bacillus	Bacillus
2) Gram's staining	-	-	-	-	-
3) Motility	+	+	+	-	+
4) NaCl concentration	8%	*	*	*	*
5) Oxygen requirement	Aerobic	Aerobic	Aerobic	Aerobic	Aerobic
6) Pigmentation	-	+	-	-	*
Biochemical Tests					
1) KOH	+	+	+	+	+
2) Oxidase	+	+	+	+	+
3) Catalase	+	*	*	+	+
4) Indole	+	-	-	-	+
5) Methyl Red	+	+	+	+	-
6) Voges-Proskauer	-	-	-	-	-
7) Citrate	+	+	+	+	+
Enzymatic activity					
1) Gelatin	+	+	+	-	-
2) Starch	+	-	-	*	-
3) IAA production	+	*	*	*	+
4) Phosphate solubilisation	+	*	*	*	-
5) Siderophore production	+	*	*	*	+

*Not reported.

at 32°C. The positive test was indicated by the change of its colour from green to blue because of the change in pH.

Property studies of endophytic isolates

The isolated bacteria were subjected to different property studies like Protease activity (Gelatin hydrolysis), Amylase Production (Starch hydrolysis), IAA production and Phosphate solubilizing ability.

Gelatin and Starch hydrolysis

Gelatin and Starch hydrolysis test was conducted by growing the organism on 1% Gelatin Nutrient Agar and 1% Starch Nutrient agar plates in that order. After 48 hours of incubation the plates were flooded with saturated solution of Ammonium Chloride (5g/10ml) and diluted Iodine solution for Gelatin and Starch utilization respectively.

IAA production and Phosphate solubilizing ability

Bacteria isolated from plant rhizosphere

produce various phytohormones in the form of secondary metabolites, the most common of which is Indole-3-acetic acid (IAA). IAA production was screened for the presence of Indole using Salkowski reagent and colour developed was measured spectrophotometrically at 536 nm using UV Spectrophotometer.

Phosphate solubilization ability was carried out by Pikovskaya's broth and the presence of Phosphate was tested by adding 750 µl of phosphate reagent (Molybdenum Blue) and colour development was measured spectrophotometrically at 680 nm by using UV Spectrophotometer.

Microbial Identification using 16S rRNA gene based molecular method

Nucleic acid was extracted from test isolates using Silica based membrane technology and its quality was detected on 1 per cent agarose gel, a high molecular weight containing single band of DNA was recorded. Fragments of 16S rRNA gene was multiplied by using 16S rRNA

Forward and 16S rRNA-Reverse primers. A distinct PCR amplicon (a piece of RNA or DNA which is the source for amplification or replication reaction) of 1500 base pairs band was observed which was determined on agarose gel and purified. Forward and Reverse DNA sequencing of PCR amplicon was determined by using Big Dye Terminator Version 3.1 cycle on Applied Bio systems 3730 X 1 genetic Analyzer. By using Aligner software tool complete consensus sequence of 16S ribosomal-RNA gene sequence was generated and BLAST was carried out with nucleotide collection database from NCBI GenBank. Primary 10 sequence were selected and aligned by using Clustal W alignment programme. By using Molecular Evolutionary Genetics Analysis (MEGA 10) phylogenetic tree and distance matrix was constructed.

RESULTS

Enumeration of endophytic bacterial isolates in aerial and roots of halophytic plant *Suaeda nigra*

The endophytic bacterial population in aerial parts and roots of halophytic plant *Suaeda nigra* are 3.7×10^5 cfu/g and 4.9×10^5 cfu/g respectively. Total sixteen isolates from both aerial and root parts of *Suaeda nigra* were isolated and purified by quaternary streak plate method and they were coded according to their host plant followed by part (aerial and root) they are collected and finally by numbering in Serial Number. Among 16 isolates, strain SNA-7 showed distinct morphology, phenotypic and biochemical characters which was selected for further studies. The results of cultural, biochemical and enzymatic characters are reorded in Table 2.

Colony and cell morphology

The colonies of SNA7 strain on agar medium were medium, round in shape, colourless, convex in elevation. The cells when viewed microscopically are single rods and motile. Gram's staining was carried out and the cells were gram negative in appearance. When grow in nutrient broth cells showed aerobic in nature. Grows well at temperature 25-30°C with 3% NaCl supplement, pH ranges 05-10 and salt tolerance upto 8% NaCl concentration.

Biochemical characteristic of endophytic bacterial isolates

Biochemical studies were carried out by the isolate SNA7 and compare with strain of other *Pseudomonas* species are presented in Table 2. The results showed that the SNA7 isolate were KOH positive with stringy appearance. Catalase positive when 3% H₂O₂ was added and oxidase positive when para aminodimethyl aniline oxalate solution were added. IMViC test showed Indole positive with red colour when Kovac's reagent was added. Methyl red positive with the production of red colour, Voges-Proskauer test negative with no colour and Citrate utilization positive with production of blue colour due to the change pH in the medium.

Hydrolysis of Gelatin (Protease production)

Agar plates inoculated with SNA7 was tested for geletinase production. The plates were flooded with saturated solution of Ammonium sulphate (5g/10ml) and kept for 30 min. Gelatin hydrolysis was observed by clear zone around the culture inoculated showed positive result.

Hydrolysis of Starch (Amylase production)

48 hrs of SNA7 plates were flooded with diluted Iodine solution. The iodine reacts with the starch present in the agar plate and produces blue colour. Clear zone was observed around the inoculated culture showed positive reaction to starch hydrolysis.

Production of Indole-3-acetic acid (IAA)

IAA production was screened for the presence of Indole compounds by colorimetric assay using Salkowski reagent. Strain SNA7 was cultured and inoculated in 4ml of 3% Nutrient broth in ria vials as detailed in material and methods. After 48 hrs incubation the culture were subjected to centrifugation and the liquid from supernatant was pipetted and mixed with 1.5 ml of Salkowski's reagent. The colour intensities were measured by using UV Spectrophotometer at 536 nm. The OD values were compared with standard graph of IAA and 43µg/l of IAA production was recorded with strain SNA7.

Phosphate solubilizing ability

SNA7 culture were inoculated in 4ml of

3% pikovskaya's broth in 10 ml vials and kept for 48 hrs incubation as mentioned in material and methods. After incubation 750 µl of phosphate reagent to the 4ml of the sample and blue colour intensities were measured by using UV Spectrophotometer at 680 nm wavelength. 2.3 µg/l was recorded with strain SNA7.

Production of Siderophore

To test the siderophore production, all the test isolates were inoculated on blue agar fo Chrome Azurol S and incubated for 72 hours at 30°C. After incubation period the plates inoculated with SNA7 shows colour change from blue to orange which indicates the positive for siderophore production.

Microbial Identification using 16S rRNA gene based molecular method

Nucleic acid from the isolate SNA7 (accession number KY595450.1) was isolated and evaluated on 1% agarose gel and obtained single band of DNA with high molecular weight. Fragments of 16S rRNA gene was multiplied by 16S rRNA-Forward-5'-GCCGTTGGGTTCTTGAGAAC-3' and 16S rRNA-Reverse-5'-CTTAATGCGTTAGCTGCGCC-3' primers using BDT version 3.1 Cycle sequencing kit on ABI 3730 X I Genetic Analyzer. A comparison using 16S ribosomal-RNA gene sequences from the databases revealed that the 16S rRNA gene sequence of the type strain of SNA7 displayed high levels of similarity to those of *Pseudomonas pseudoalcaligenes*. The percentage of 16S rRNA sequence similarity between strain SNA-7 and *Pseudomonas pseudoalcaligenes* was 100%. The phylogenetic tree reconstructed using the neighbour-joining algorithm also confirmed that the strain SNA7 and *Pseudomonas pseudoalcaligenes* clustered together and constituted a separate group from the other closely related species.

DISCUSSION

Similar studies were carried out by difference research workers on endophytic bacterial interaction with the host plant especially on endophytic bacteria belonging to the genus *Pseudomonas* and halophytic *Suaeda* family are discussed in this session.

Yachana Jha et al. in 2011¹⁹ studied on

genus *pseudomonas* and stated that combination of endophytic *Pseudomonas pseudoalcaligenes* and rhizospheric *Bacillus pumilus* in paddy has an ability to promote resistance to the host plant from biotic and abiotic stress condition by inducing osmoprotectant and antioxidant proteins rather than by endophytic or rhizospheric bacteria alone at the early stages of development.

Mieke Rochimi Setiawati et. al.,(2021)²⁰ in their study isolated strain *Pseudomonas stutzeri* K10P4 from Karawang increase Nitrogen uptake (3.5%), dry weight (20.93 mg) and chlorophyll (67.51 µmol) in rice crops under saline environments.

Daniela Soledad Riva et al.,(2020)²¹ in their study revealed that the *P. pseudoalcaligenes* activate changes in plant defense mechanism and sugar metabolism leading to better tolerance against *Sclerotium rolfsii*.

Morahem Ashengroph et al., in 2011²² isolated strain *P. pseudoalcaligenes* TPS8, was screened from tea plantation soil, which has high ability for caffeine tolerance (upto 15g/l) and caffeine degradation (80.2%) without any external carbon/nitrogen source addition.

Recent research findings was also correlated with present study, according to de Vilhena Araujo, E et. al., (2020)²³ Endophytes have been associated with the production of secondary metabolites that may confer environmental advantages to the host. Similar findings was also studied by Eid A.M. Fouda et. al. (2021)²⁴ that Endophytes promote plant growth and fitness through the production of phytohormones or biofertilizers or by alleviating abiotic and biotic stress tolerance and strengthening plant immune system.

Jaborova D. et. al., (2020)²⁵ isolated four endophytic bacterial isolates (GS2, GS5, GS8 and GS10) from Ginger (*Zingiber officinal* Rosc) showed positive for IAA production, siderophore production and phosphate solubilization activity and production of enzymes.

Similar results were obtained by Abdelshafy Mohamad et. al., (2020)²⁶ in their study showed that endophytic bacteria exhibited several plant growth-promoting activities in vitro, including auxin synthesis, diazotrophy, phosphate solubilization, siderophore production, and production of lytic enzymes (i.e., chitinase,

cellulase, protease, and lipase)

Papik J et al., (2020)²⁷ finds that Endophytic bacteria promote plant growth and protect their host plant against pathogens, herbivores, and abiotic stresses including drought, increased salinity and pollution.

CONCLUSION

Pseudomonas spp. having vast potential in production of siderophores, ACC deaminase, variety of bioactive secondary metabolites, phosphate and potassium solubilization and are effective aerobic degraders of polychlorinated biphenyls (PCB) and also used as bio-inoculants in many biological applications such as bioremediation, biological nitrogen fixation, antagonism. Hence, *Pseudomonas* spp. was characterized as an effective organism to explore its ability in various research fields. In this present study, an attempt was made to study *Pseudomonas pseudoalcaligenes* isolated from *Suaeda nigra* which had higher potential in producing bioactive secondary metabolites and was first of its kind reported in halophytic *Suaeda nigra*.

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CONFLICT OF INTEREST

All authors declare that there is no conflict of interest in any manner.

AUTHORS' CONTRIBUTION

All authors listed have made a substantial direct, personal and intellectual contribution to this research work and all authors edited, proofread and approved for publication of this manuscript.

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DATA AVAILABILITY

All datasets generated or analyzed during this study are included in this manuscript.

ETHICS STATEMENT

This research work does not contain any study involving or experimenting on humans and animals performed by any of the authors.

INFORMED CONSENT

Not applicable

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Research Article

Screening of salt tolerant endophytic bacteria with plant growth promoting characters isolated from *Acanthus ilicifolius* L., a species of mangrove ecosystem located at Corangi wildlife sanctuary, Andhra Pradesh

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Abstract

Mangroves harbour many beneficial microorganisms in their rhizosphere, phyllosphere and endophytically, which forms an ideal ecological habitation for isolating halotolerant endophytic bacteria with unique characteristics. Endophytes can produce numerous bioactive secondary metabolites and phytohormones, which may be directly or in some way beneficial to the host plant. The present study aimed to identify novel endophytes capable of producing plant growth-promoting substances. The mangrove plants *Acanthus ilicifolius* L. at Corangi Wildlife Sanctuary were selected, and their leaves and roots were collected for endophyte isolation. Eight isolates from the leaves and roots were collected, purified and preserved. All these isolates were subjected to morphological, phenotypical and biochemical studies. Isolates were grown best at 3% NaCl nutrient agar and could tolerate salinity upto 8%NaCl. Most of them could grow upto 42°C. The majority were gram's positive, motile, aerobic, rod-shaped and some were gram's negative, rod-shaped organisms. Many of the endophytic organisms had the ability to synthesize Indole-3-acetic acid (IAA) varied from 0.7 µg/ml (AIL1) to 51.0 µg/ml (AIL2) and the highest phosphate solubilizing ability was recorded with AIR3 (3.71 ppm) followed by AIR4 (3.00 ppm) and lowest was recorded by AIL4 (1.80 ppm). Among total isolates, AIL2 (51µg/ml) showed promising potential in producing IAA and had phosphate solubilization ability. Based on 16S ribosomal RNA molecular method the isolate AIL2 was identified as *Bacillus altitudinis*. This is the first to report that *B. altitudinis* strain AIL2 isolated from *A. ilicifolius* L. could produce IAA, which can be used as a bioinoculant in agriculture and allied sector.

Keywords: *Bacillus altitudinis*, Endophytes, Indole 3-acetic acid, Mangroves, Plant growth promoting hormones

INTRODUCTION

Corangi Wildlife Sanctuary near Kakinada, Andhra Pradesh, India, is an estuary with the third largest extent of mangrove forest in India. Twenty-four mangrove tree species are found in these ecosystems. *Acanthus ilicifolius* L. is a plant species found in Corangi mangrove forest and has been extensively used by local communities as a traditional medicinal plant. Extracts from flowers, fruits, bark and leaves are used for the preparation of traditional medicines by these local communities (Forest Department, Government of Andhra Pradesh).

Endophytes colonize intercellular and extracellular regions of the tissues and able to enhance the growth of

the host plant. The exact methodology employed by endophytes is not well understood. However, they boost plant growth, which represents an essential step in establishing endophytic bacterial applications (Hardoim *et al.*, 2008). The positive roles include the bacterial characters to improve the nutrients acquirement, acquisition of iron, nitrogen fixation, and phytohormone production (Zhang *et al.*, 2009). The production of phytohormones during colonization with their host plant improves plant biomass and nutrient absorption (Shi *et al.*, 2014).

Treatments of plant growth-promoting bacteria (PGPB) promotes plant growth in biotic and abiotic stress condition by fixing nutritional and hormonal balance by solubilizing nutrients like potassium, phosphorous and

organisms. A small amount of inoculum from the colony is mixed with a small quantity of KOH. If the cells of the isolated get lyse, then the nucleic acid content was released and made the sample viscous or stringy in appearance. Hence, a positive KOH test meant grams of negative cells and a negative KOH test meant gram-positive cells.

Indole production

Glucose tryptone broth was used to conduct the Indole Production test (Seeley and Vandemark, 1981). This test was performed to know the ability of the bacteria to decompose the amino acid tryptophane with the release of Indole in the medium. The test isolates were inoculated in sterilized glucose tryptone broth and incubated for 48 hours at 32°C. After incubation, 0.3 ml of Kovac's reagent was added to the broth and shaken well. The presence of a red alcoholic layer at the top of the tube indicates the production of Indole.

Methyl red and Voges Proskauer test

For Methyl Red and Voges Proskauer test, Glucose phosphate broth was used. The test isolated was inoculated in two sets of sterilized broth and kept for 48 hours at 32°C. After the incubation period in one set of test tubes, methyl red indicator was added, and observe for any colour change, the appearance of red colour indicates a positive test for methyl red. To another set of tubes, six drops of 5% α -naphthol and 2 drops of 40% of KOH solution were added and mixed well.

The development of a red colour ring at the surface of the test tubes within a few minutes indicated a positive reaction for Voges Proskauer test (Seeley and Vandemark, 1981).

Citrate utilization test

Simmon's citrate agar was used to know the ability of the organisms to utilize citrate as the sole carbon and inorganic ammonium salt as the sole nitrogen source. All the test isolates were inoculated in sterile slants containing the Simmon citrate agar and incubated at 32°C for 48 hours. Change from green to blue due to the change in the pH of the medium indicated a positive test for citrate utilization (Seeley and Vandemark, 1981).

Property studies of isolated endophytic organisms

The isolated endophytic organisms were tested for their different properties, like production enzymes like protease and amylase; and plant growth-promoting characteristics like phosphate solubilizing ability and phytohormone Indole 3 acetic acid production.

Protease and amylase production

Protease and amylase enzyme production was screened by Gelatin and Starch hydrolysis. The organisms were grown 1% Starch and 1% Gelatin Nutrient Agar plates for amylase and protease enzyme production, respectively. After incubation, for 48 hours, the starch plates were flooded with diluted Iodine solution,

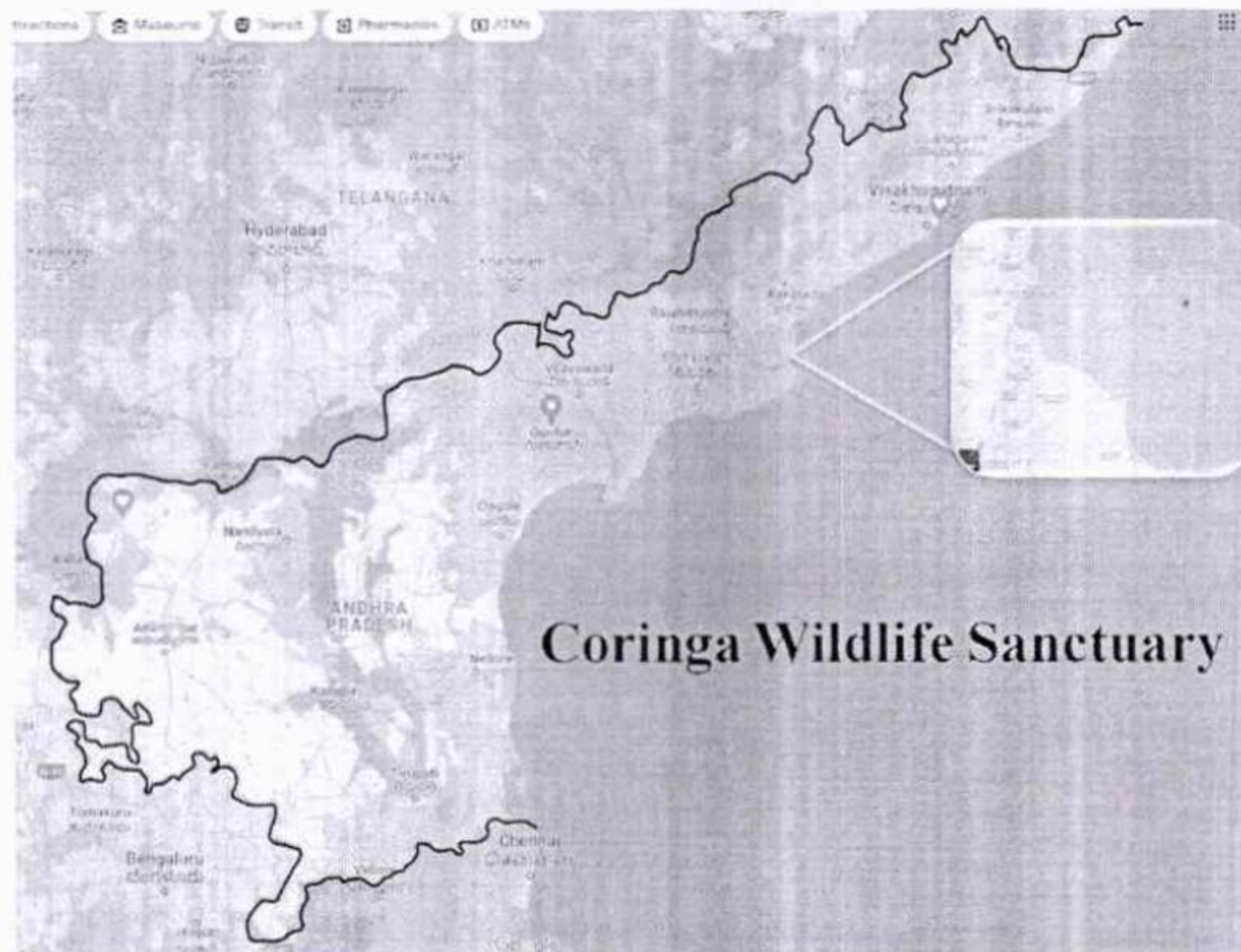


Fig. 1. Map showing Coringa wildlife sanctuary, Kakinada, Andhra Pradesh, the selected area under study

Table 1. Coding of endophytic bacterial isolates

Plant	Plant part	Isolates*
<i>Acanthus ilicifolius</i> L.	Root (04 isolates)	AIR1, AIR2, AIR3 & AIR4
	Leaves (04 isolates)	AIL1, AIL2, AIL3 & AIL4

*A-*Acanthus ilicifolius* R-roots, L-leaves

Table 2. Enzymatic properties of tested isolates from *Acanthus ilicifolius* L.

Plant	Part	Code	Plant Growth Hormone		Enzyme production	
			IAA (µg/ml)	PSB (ppm)	Starch (cm)	Gelatin (cm)
<i>Acanthus ilicifolius</i> L.	Root	AIR-1	0.8	2.69	1.5	1.9
		AIR-2	-	1.00	0.8	0.9
		AIR-3	-	3.71	1.4	1.5
		AIR-4	-	3.00	1.4	2.0
	Leaf	AIL-1	0.7	2.30	2.6	2.5
		AIL-2	51.0	2.86	0.6	2.8
		AIL-3	-	-	0.5	0.8
		AIL-4	16.0	1.80	1.4	1.6

Methyl red test was positive with AIR-3& AIL-4 strains, remaining isolates showed negative reaction with the methyl red indicator. The recorded observation is detailed in Table-3.

Identifying protease production by Gelatin hydrolysis test

All isolates tested for gelatinase production showed that the 48 hours of inoculated plates with tested isolates were saturated with ammonium sulphate and kept for 30 minutes. Hydrolysis of gelatin was examined by the formation of halo zone around the culture, indicating a positive test. Formation of the clear zone varied from strain to strain to range from 1.5 cm (AIR3) to 2.8 cm (AIL2) in diameter (Table-2).

Identifying amylase production by Starch hydrolysis test

Two days old inoculated plates with tested organisms were subjected to starch test by flooding with diluted iodine reagent. The starch present in the agar plates reacts with iodine solution forming blue colour in the plates. The positive test indicates formation of clear halo zone around the cultures. Starch hydrolysis by tested isolates showed varied results ranging from 0.6 cm (AIL2) to 2.6 cm (AIL1) in diameter (Table-2).

Production of Indole-3-acetic acid (IAA):

All the test isolates showed IAA synthesis except AIR3 and AIR4. IAA production was least in AIL1 (0.7 µg/ml) and highest in AIL2 (51.0 µg/ml) (Table-2). Similar studies were carried out by Shah et al. (2021)

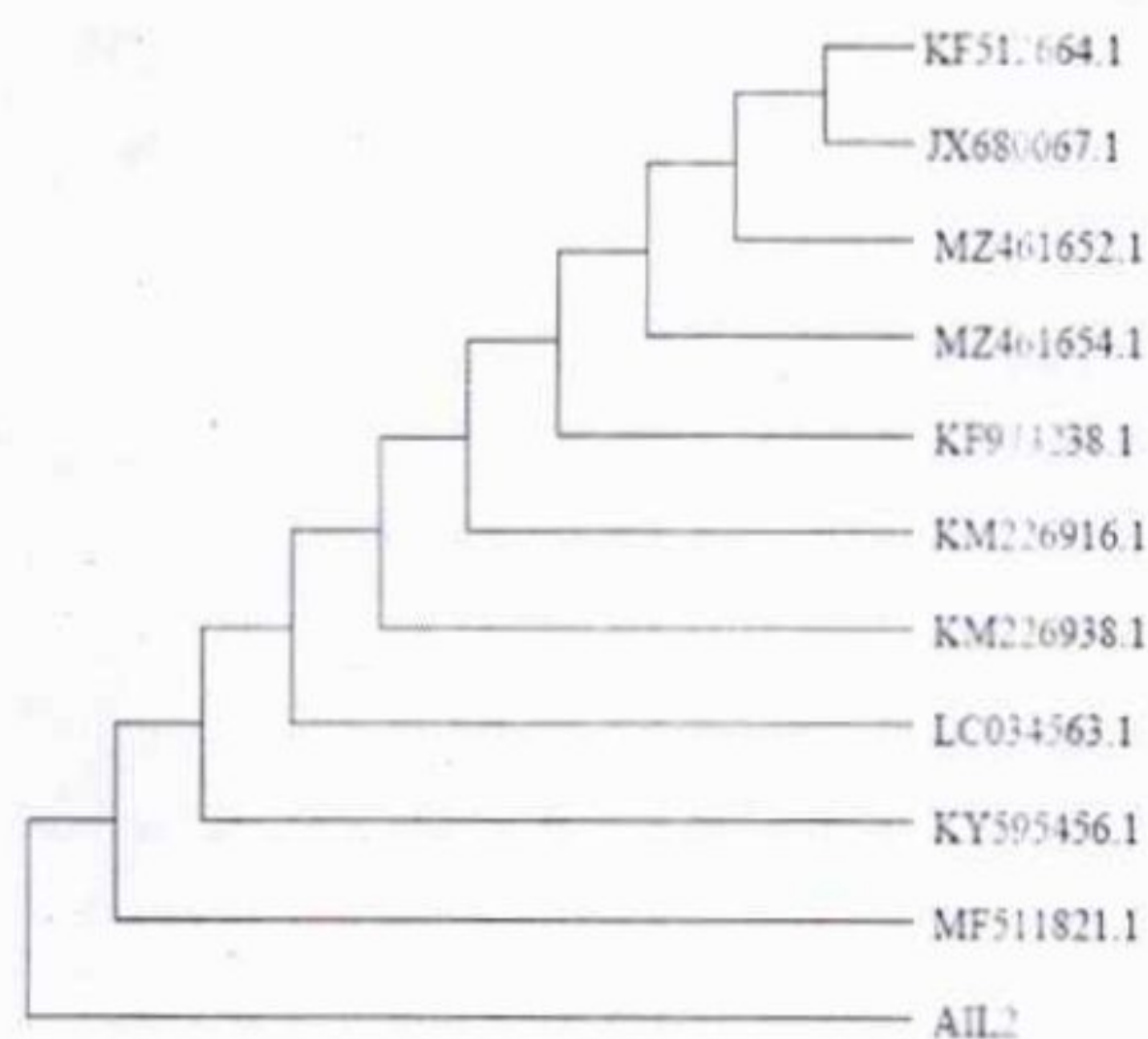


Fig. 2. Phylogenetic tree of 16S ribosomal RNA sequence of AIL2 strain compared with those Maximum similar entries of type strains from NCBI nucleotide database

who reported that 5 different endophytic organisms collected from three diverse wheat varieties showed diverse levels of catalase activity, phosphate solubilization, nitrogen fixation, ability to produce IAA and siderophores, antimicrobial activity against plant pathogens. Zhang et al., (2021) investigated that *B. altitudinis* strain collected from *Glyceria chinensis* uses different novelty molecular pathways and induces transcriptional changes in the host plant that enhance plant growth. However, the present finding is the first to investigate whether *B. altitudinis* strain AIL2 can synthesize IAA isolated from mangrove *A. ilicifolius* L.

Phosphate solubilizing ability

All the test isolates showed phosphate solubilizing ability. Highest phosphate solubilizing ability was recorded with AIR3 (3.71 ppm) followed by AIR4 (3.00 ppm) and the lowest was recorded with AIL4 (1.80 ppm) (Table 2). Kushwaha et al. (2021) in a study, isolated *B. altitudinis* strains (BT3 and CT8) from rhizosphere of chickpea. The isolates showed plant growth-enhancing properties like the synthesis of ammonia, Indole 3-acetic acid, siderophores and the ability to solubilize phosphate. They also showed outstanding abilities to solubilize insoluble zinc compounds.

Identification of isolates by using 16S ribosomal RNA molecular method

Because of its ability to produce a higher amount of IAA compared to other test isolates, AIL2 strain was selected for identification using 16S ribosomal RNA molecular studies.

The RNA was obtained from the cultures of AIL2 and was evaluated by one per cent agarose gel to obtain specific RNA band with high molecular weight. The 16S ribosomal RNA gene fragments were amplified by 16S rRNA-Forward and 16S ribosomal RNA Reverse primers by BDT on ABI 3730 X1 Genetic Analyzer. From the BLAST analysis from the NCBI database revealed that 16S ribosomal RNA genome sequence of the AIL2 strain showed a higher relationship with *B. altitudinis*. The percentage of 16S ribosomal RNA sequence identity between strain AIL2 (Accession no. MF511821.1) and *B. altitudinis* was 100%. The phylogenetic tree was constructed using the neighbour-joining algorithm software (Fig. 2) and also established that the strain AIL2 and *B. altitudinis* grouped together and represented a different group from the other tightly connected species.

Conclusion

The present research findings indicated that endophytes, especially organisms belonging to the genus *Bacillus* living in extreme conditions, can produce many phytohormones and bioactive substances that are beneficial to the host plant. Thus, endophytes isolated from the mangrove plant *A. ilicifolius* L., especially strain *B. altitudinis* (AIL2), might be used as a favourite candidate source for the growth of plants in sustainable agriculture and other allied sectors.

Conflict of interest

The authors declare that they have no conflict of interest.

Ethics Statement

This research work does not contain any study involving or experimenting on humans and animals per-

formed by any of the authors. All datasets generated or analyzed during this study are included in this manuscript.

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Immortalizing Affinity Towards His Beloved in the Poem “One Day I Wrote Her Name upon the Strand” by Edmund Spenser

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ABSTRACT

Edmund Spenser (1552-1599) one of the greatest Elizabethan English poets, is well known for his sonnets. He was the Non-Dramatic poet of the Elizabethan age. He wrote 88 sonnets. He was best known for *Faerie Queene* an epic poem and fantastical allegory and was recognized as one of the premier craftsmen of nascent modern English verse and is often considered as one of the greatest poets in the English language. Spenser is an early modern English writer. Spenser's period at the University of Cambridge was undoubtedly important for the acquisition of his wide knowledge not only of Latin and some of the Greek classics. But also Italian, French, and English literature of his own and earlier times. His knowledge of the traditional forms. And themes of lyrical and narrative poetry provided foundations for him to build his own original compositions. The patterns of meaning in Spenser's poetry are frequently interlaced out of the traditional interpretations developed through classical times and his own pagan myth, divinities, and philosophies and out of an equally strong experience of faith and doctrines of Christianity. Spenser's religious training was the most important part of his education. He couldn't have avoided some involvement in the bitter struggles that took place in his university over the path the new church of England was to run between Roman Catholicism and Extreme Puritanism and his own poetry repeatedly engages with the opposition between Protestantism and catholicism. His early work *The Shepheardes Calender* can be called the first work of the English literary Renaissance. In this paper, I would like to discuss the poem “One day I wrote her name upon the strand” which is the 75th sonnet among the 88 that makeup “*Amoretti*” and the symbolism that took place in it.

Keywords: Mortal, waves, Immortalize, symbolism, reunion

One day I wrote her name upon the strand,
But came the waves and washed it away:

The speaker is in deep thinking and recalls a day in the past when he was at the seashore with his loved one. They are sensing and enjoying their intimacy. He writes her name in an attempt to immortalize her existence. This is the common propensity that we can see in all human beings. There a man attempts to make his love immortal. As he wrote her name, after a moment the wave of the sea comes to the shore and wiped out the name. The wave could be the suggestive and destructive force and power of nature. This implicates the conflict between an insignificant man and powerful nature and this becomes the theme of the poem. “Immortalizing the power of poetry”.

Again I wrote it second-hand,
But came the tide, and made my pains his prey.

The desire to be immortal continues and this reflects in his re-attempt of writing the name. The words second hand here imply ‘second-hand writing’ but the result was just the same. Again the high tide came and affected it.

The poet personified the waves and tide as a dominant person. He (the tide) made the speaker's labor of writing his prey. Therefore, the name of the speaker's lady love on the sand becomes an object of hunting to that powerful tide. As such we see the hungry tide in one hand and the speaker's effort to write his beloved name on the other. In the end, nature wins over man.

“Vain man,” said she, “that dost in vain assay,
A mortal thing so to immortalize;
For I myself shall like to this decay,



And eke my name be wiped out likewise."

The recurrence of the letter "V" in the words "rain man" and "vain assay" emphasizes the speaker's futility of such an action. His beloved's name can be a metaphor for all those things. That a man wants to make an attempt to eternalize the things or eternalize the existence of love. In the second line of the above stanza the phrase "A mortal thing" refers to the name of the speaker's lover. Thus, he is trying to immortalize the name of a mortal being.

So, Here we can sense the entry of his beloved in this stanza: she came up with a logical mind and made a comment on his actions that no matter how many times he may write her name but it will not last. It clearly emphasizes the supreme or ultimate power of nature over man and his creation. She holds a realistic view of the world. She is very clear on the point nothing is immortal in this transitory world. Everything including her love, their love and even herself will lose over time.

"Not so," (quod I) "let baser things devise
To die in dust, but you shall live by fame:

After receiving this undigested comment from his lover, He denied her statement. But one amazing thing we could sense here, he denied her statement but he did not deny the truth. He knows the transitory nature of this world. Hence, he responds to his lover's statement. "Let baser things devise/To die in dust," meaning fewer things will decay. Here, we can sense the classical turn in the tone of the subject. So far the poem has been all about mortality. We thought nothing could live forever in this transitory world. But now we can see some things can. Let us see how it could be.

My verse your virtues rare shall eternize,
And in the heavens write your glorious name:

The above two lines are very substantial and highlight the power of poetry. His verse will eternize her virtue. He wants to write a poem on her virtues in a place where it will not be affected by time. By celebrating her nature, he would write her name in heaven. Heaven suggests a place of immortality. Heaven contrasts with the sand.

Where when as death shall all the world subdue,
Our love shall live, and later life renews."

The lover will write his beloved's shining name in the poetic firmament. He states that death may conquer everything but it couldn't able to do anything to their love. Even if things and people may disappear under the cruelty, and cruel clutches of time, his poetry will endure forever. Time cannot erase their love as now it is immortal.

The poem is full of symbolism. Symbolism is the use of symbols to represent ideas or meanings. They are inculcating certain qualities often only interpretable through context. One of the most important things to remember about symbols is that their meanings usually depend on the context. It is up to the writer to make sure that the setting, character, and circumstances all match up with the writer's perception of what they want their symbol to convey. One aspect that a writer may not be able to control and which may throw ones well crafted written ideas out the window is the outlook a reader can bring out to a poem or a prose work. Symbolism is the use of a symbol which can be a word or an image to communicate a distinct idea. Symbolism in literature works the same way. It is a language, writers use to communicate messages visually, even when their work is not illustrated within a text, symbolism works visually as pieces of imagery that create a picture in the reader's mind. Symbolism is one of the many literary devices writers use to make their work more vivid. In a way, symbolism illustrates a piece of writing by creating a picture in the reader's mind. In fact, some other literary devices like metaphor and allegory are often considered to be types of symbolism. Literary devices are the techniques that are used by writers to communicate ideas and themes beyond what they can express literally.

When the complete work is symbolic, it's all known as an allegory. Animal Farm by George Orwell is one of the most well-known modern allegories. If not symbolism is often worked into a story or other type of creative work that's meant to be read literally. We can recognize symbolism when an image in a piece of text seems to indicate something other than its real or literal meaning. Symbolism is used when literal language is not strong enough to express what the author needs to express. Symbolism is used in every kind of creative writing you may read it in poems and stories as well as creative non-fiction works. This poem is full of symbolism "One day I wrote her name upon the strand". Spenser revealed poetic beauty to his generation. He is the master of the language.

The waves or tides in the poem "One day I wrote her name upon the strand" symbolize the passing or leaving time. As we have seen how waves erase the evidence and labor of the speakers writing by washing the shoreline, time also destroys human beings and erases their identity in this world. And in kind, the problems and sufferings that are being in lifeline also will be washed away one day. Speaker writes his beloved's name on the sea shore but the waves wash it away. He writes it again but in vain it makes the speakers attempt unproductive to immortalize his beloved's name.



Similarly, death is inevitable. The speaker cannot stop death from approaching. As a matter of fact, every object in this world whether it is living or nonliving will be erased with the passing of time. In fact, the writer made an attempt to write his beloved's name on the sand.

"A stone is heavy, and the sand is weighty" – Bible KJV (Proverbs 27th chapter 3rd verse) though his attempt is on a great weight (sand) he failed to make it immortalize. Thus, what does he need to make her name immortalize: that must weigh more than sand.

The speaker writes his mistress name on the shore but the waves wash it away twice. This helps to notice that she too will be erased from this world like her name getting washed away. So, the name becomes a symbol of the beloved herself. Again, we hear the speaker almost say that "Well I have a better plan to do I am going to write your name in my verse then."

My verse your virtues rare shall eternize,
And in the heavens write your glorious name:

As such, the word name is used repeatedly in the poem as a symbol to mean something more substantial, the beloved and her virtues. It signifies one's identity. According to Christian's belief God will write the names of his beloved in the "Book of Life" and nobody or no tide can erase it from there.

This might be the perspective of Edmund Spenser. The lover Expresses his confidence that even when the world will be subdued by death, their 'love shall live' and will be renewed in heaven. William Shakespeare avoids the concept of reunion in heaven and only seeks to prolong in his verse the glory of love that will last till the day of doom. But Spenser goes beyond that and believes in reunification in life after death.

The entire poem is marked by a strong and undisturbed, unshivered sincerity of the poet's feeling of sadness as well as hope that surpasses the feeling of depression. When he and she are together after life their existence will be all the richer because he has praised her in his poems making her almost divine through his verse. So unlike many other poets who attempted to write this sort of poem such as Sir Philip Sidney's *Astrophil with his beloved Stella*, Spenser can be pretty sure that he and his beloved Elizabeth will be together in heaven.

CONCLUSION

In my opinion, this poem is the ultimate expression of unending love. Spenser used many literary techniques like metaphor, personification, alliteration, imagery, and symbolism to make readers able to understand what his point is. Though, we may be able to understand his point by having a glance at literary techniques. But we need a sensible heart to feel what the writer's intention is. In the history of literature, nobody attempted to write of the things which may happen after death. So that people wish to be with their beloved ones until their existence on earth. But Spenser could not imagine himself without Elizabeth even in heaven. It shows the strong fidelity between them. There may be no end in love and he doesn't want an end in his imagination. Many works are there which offer pleasure to readers but this poem creates a great hope. It clearly shows affection never depends on time and place.

"A mind not to be changed by place or time" – John Milton

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Artificial Intelligence in Future Smart Cities

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Abstract—This exploration paper expects to investigate the crossing point of artificial intelligence and future savvy urban communities, featuring the possible effect of man-made intelligence in changing metropolitan scenes and tending to different difficulties and open doors related with its mix. The idea of shrewd urban areas, which influence cutting edge innovations to improve metropolitan living, has acquired huge consideration lately. Among the different innovations that hold guarantee for holding the eventual fate of brilliant urban communities, man-made reasoning (simulated intelligence) stands apart as a key empowering influence. The paper begins by giving an outline of the present status of brilliant urban areas and the job of man-made intelligence in forming their turn of events. It examines the different utilizations of simulated intelligence in brilliant urban communities, including savvy administration, transportation, energy, public security, and maintainability. The paper likewise investigates the expected advantages of simulated intelligence in working on metropolitan preparation and configuration, improving asset distribution, upgrading resident commitment, and advancing supportability rehearses.

Index Terms—Artificial intelligence (AI), Smart cities, Urbanization, Urban planning, Resource allocation, Governance, Transportation, Energy, Public safety, Sustainability, Citizen engagement, Ethics, Privacy, Security, Biases, Governance frameworks, Regulations, Machine learning, Natural language processing, Internet of Things (IoT).

I. INTRODUCTION

Urbanization is a worldwide peculiarity, with the greater part of the total populace currently living in urban communities. As urban areas proceed to develop and advance, there is a rising requirement for imaginative answers for address the difficulties of metropolitan living, like gridlock, energy utilization, squander the executives, and public wellbeing. The idea of savvy urban communities, which influence cutting edge innovations to improve metropolitan

living, has arisen as a promising way to deal with tackle these difficulties and establish maintainable and liveable metropolitan conditions. Among the different innovations that hold guarantee for molding the eventual fate of brilliant urban communities, man-made brainpower (computer based intelligence) stands apart as a key empowering influence. Artificial intelligence, with its capacity to handle huge measures of information, extricate bits of knowledge, and settle on independent choices, can possibly change how urban communities are made due, worked, and experienced. From upgrading asset designation and working on metropolitan wanting to improving resident commitment and advancing manageability rehearses, man-made intelligence can possibly alter how urban areas capability.

This exploration paper expects to investigate the crossing point of simulated intelligence and future savvy urban communities, with an emphasis on the likely effect, applications, advantages, difficulties, and valuable open doors related with the joining of man-made intelligence in metropolitan conditions. Through an exhaustive survey of writing, contextual analyses, and genuine models, this paper looks to give experiences into the job of simulated intelligence in forming the improvement of savvy urban communities and shed light on the open doors and difficulties that lie ahead.

II. LITERATURE REVIEW

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III. METHODOLOGY

There has been a lot of action and change inside the research region focused on the idea of shrewd urban communities. Thus, there exists a huge measure of data that can be used through a coordinated writing survey strategy. To achieve this errand, important insightful distributions were completely accumulated and screened utilizing data sets, for example, Google Researcher and the Web-based Free Index (OPAC) of the Catholic College of the Consecrated Heart. The primary objective was to collect peer-reviewed publications from reputable publishers, with references from these publications being used to find additional resources that could augment the analysis. Inclusion criteria were based on an academic work's relevance to the themes being investigated, with a focus on providing a well-balanced mix of empirical research and qualitative studies. Exclusion criteria, on the other hand, were used to eliminate research that yielded repetitive results or could not be contextualized within the development of a smart city. After thoroughly reviewing all of the recovered academic publications, additional secondary data, such as reports, websites of government agencies,

and newspaper articles from respected publishers, were sought on Google to supplement the emerging conclusions and develop case studies.

Evolution of AI in future smart cities

Artificial intelligence, as a subset of software engineering, includes the utilization of calculations and AI procedures to empower PCs to perform errands that regularly require human knowledge. With regards to savvy urban communities, computer based intelligence can assume a vital part in breaking down huge measures of information gathered from different sources, like sensors, gadgets, online entertainment, and resident commitment stages, to produce experiences, foresee drifts, and robotize processes. This can bring about more educated and productive direction, enhanced asset designation, and worked on metropolitan administrations.

Country	Examples of AI Applications in Smart Cities
Singapore	Traffic management, public safety, energy management, citizen services
United States	Traffic management, public safety, waste management, smart building management
China	Traffic management, public safety, energy management
UAE	Traffic management, public safety, smart waste management, smart grid management
South Korea	Traffic management, public safety, waste management, urban planning

The uses of man-made intelligence in shrewd urban communities are assorted and can traverse across different spaces, including:

Metropolitan Preparation and Plan: computer based intelligence can help metropolitan organizers and originators in creating information driven experiences to upgrade land use, transportation arranging, and framework advancement. It can help in foreseeing metropolitan development designs, dissecting traffic streams, and streamlining city formats to upgrade liveability, supportability, and flexibility.

Public Wellbeing and Security: simulated intelligence can be utilized for video reconnaissance, facial acknowledgment, and constant information examination to work on open wellbeing and security. It can help in recognizing peculiarities, distinguishing potential security dangers, and working with crisis reaction, accordingly upgrading the wellbeing and security of residents in savvy urban areas.

Shrewd Portability and Transportation: computer based intelligence can empower smart traffic the board, advance public transportation courses, and work with shared versatility arrangements. It can likewise uphold independent vehicles, wise leaving frameworks, and ongoing route to diminish blockage, emanations, and travel time, while upgrading openness and availability.

Natural Maintainability: simulated intelligence can help with observing and overseeing ecological boundaries, like air quality, squander the board, and water assets. It can help in foreseeing and moderating natural dangers, streamlining asset use, and supporting manageable practices for a greener and more maintainable metropolitan climate.

Resident Commitment and Administrations: simulated intelligence can empower customized resident administrations, chatbots for resident commitment, and information driven administration. It can likewise work with e-administration, computerized administration conveyance, and participatory direction, enabling residents to take part in forming the arrangements and administrations of their urban areas effectively.

Energy The board: artificial intelligence can advance energy utilization in shrewd structures, work with request side administration, and backing sustainable power coordination. It can likewise empower prescient upkeep, energy estimating, and lattice the board, prompting more effective and feasible energy use in brilliant urban communities.

Medical services and Prosperity: man-made intelligence can uphold telemedicine, remote observing, and wellbeing examination for further developed medical services conveyance in brilliant urban communities. It can help in early sickness discovery, customized therapy plans, and wellbeing

conduct expectation, prompting better wellbeing results for residents.

IV. CASE STUDIES

The capability of artificial intelligence has been widely tended to up to this point; in the accompanying segments, a couple of circumstances will be analyzed to evaluate how computer based intelligence is genuinely adding to urban communities all through the world. The utilizations of simulated intelligence in brilliant urban communities are different and can traverse across different spaces, including:

1. Intelligent Energy Metering

Brilliant meters are likewise valuable on a more limited size. Clients might alter their energy interest thus set aside cash by using them. As a matter of fact, in the Unified Realm alone, one brilliant meter for power and gas is planned to be placed in each house and little organization by 2020, for a sum of 53 million.

2. Park Seats with IoT Ability

Perhaps of the most astounding development that the Paris organization has of late executed is the utilization of sensors to make park seats "savvy." The new IoT-empowered park seats can gather a nonstop stream of information that man-made intelligence can process and break down for an assortment of metropolitan arranging applications.

3. Intelligent observation cameras

Computer based intelligence can recognize people entering a region who match the depiction and give a constant notification. A computer based intelligence controlled surveillance camera in Japan is smart to the point that it can foresee the postures of a dubious person who will direct a shoplifting offense.

4. Taiwanese Streetlights

Taiwan's administration as of late concocted energy capacity gadget. assuming there is no action for over 10 minutes, the lights consequently faint significantly. As per a public statement from Shrewd City Taiwan, this approach has assisted with saving power by 12% in the Taoyuan City.

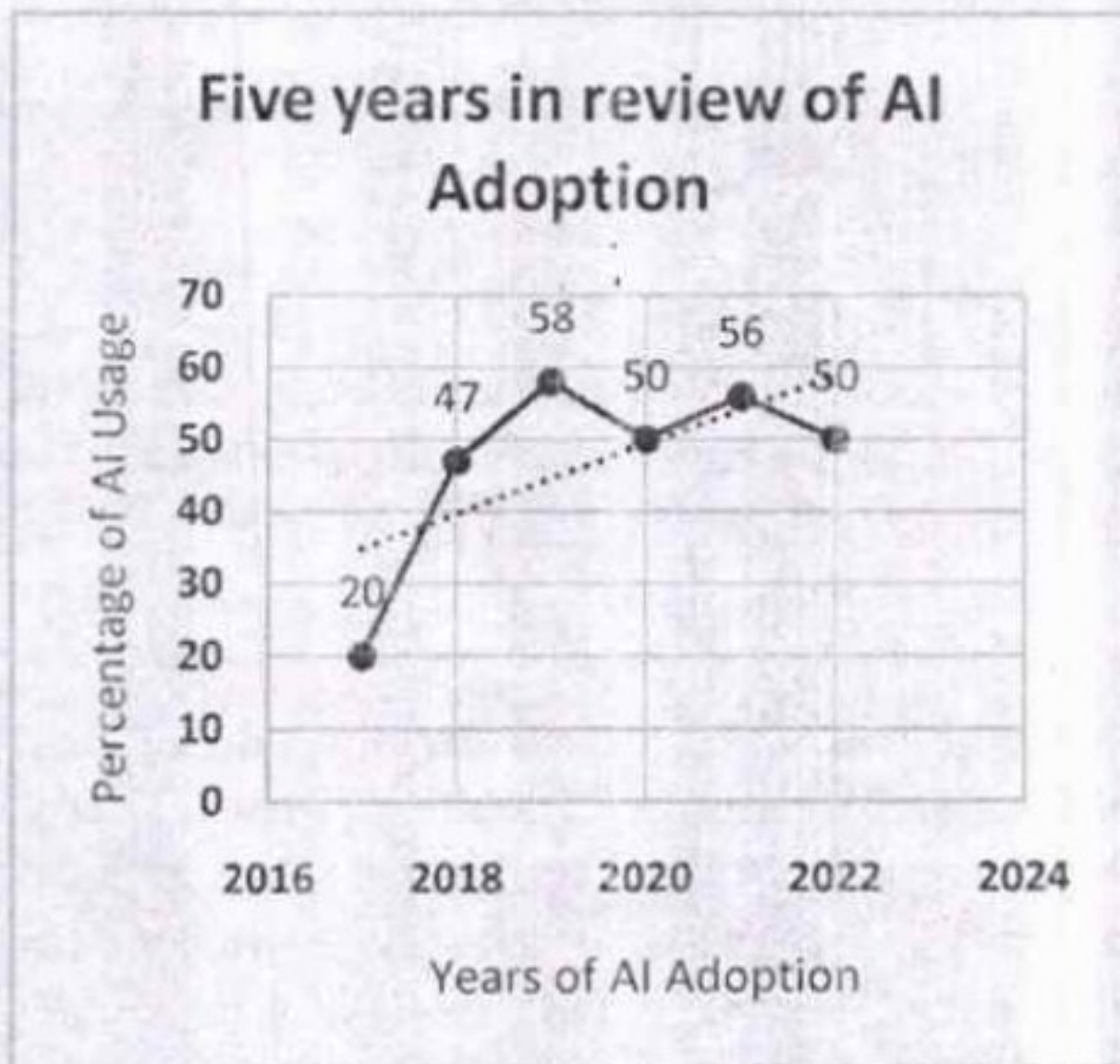
5. The Shrewd Office in Singapore

A simulated intelligence based indoor regulator was worked with the help of Spanos, a teacher at UC Berkeley, to change the temperature inside an office region. The workplace highlights sensors that action

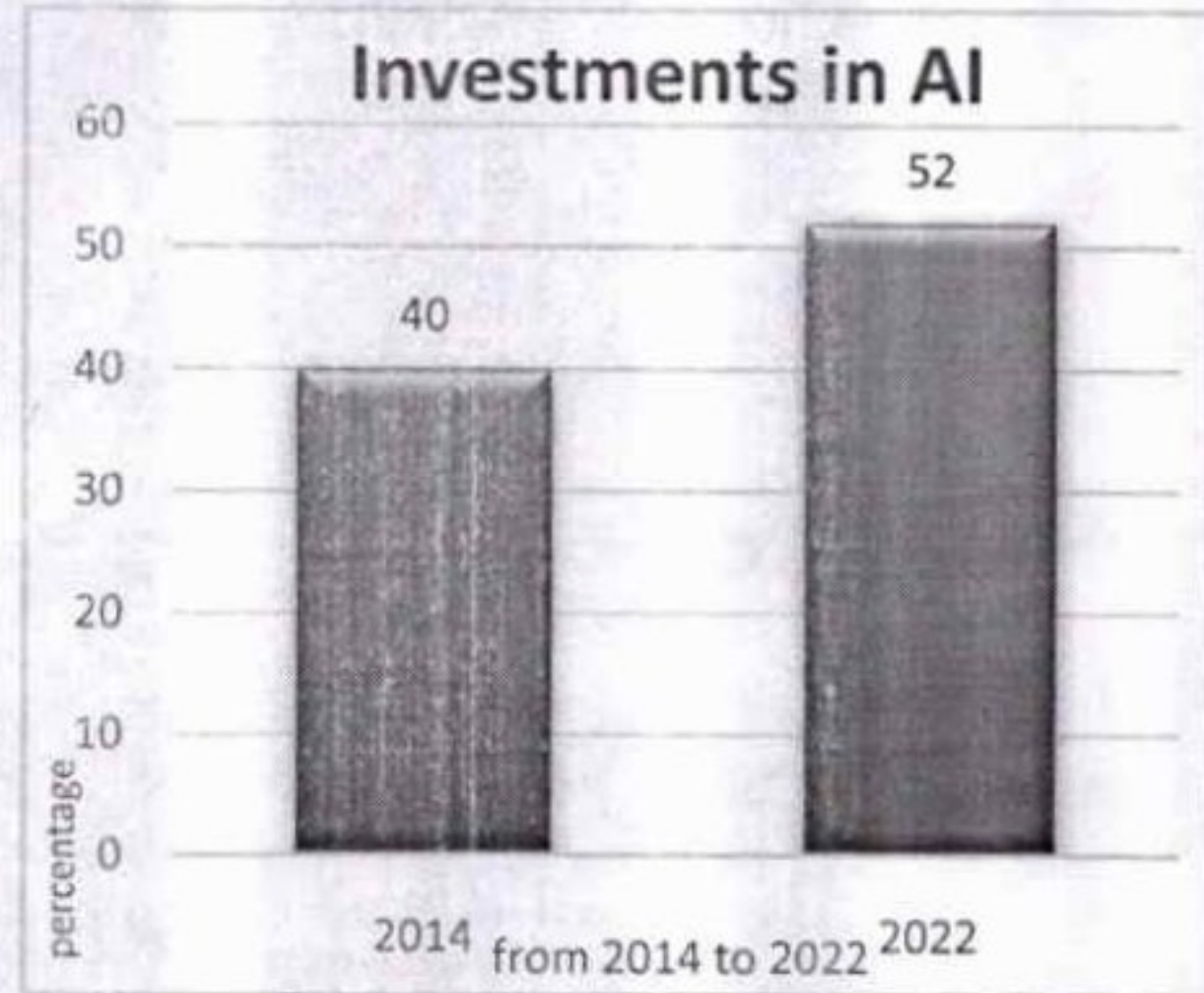
moistness, light, temperature, and CO2 content. Assuming the workers get overheated or underheated, they might use an application to change the temperature.

Comparative Analysis

Most importantly, artificial intelligence reception has dramatically increased. In 2017, 20% of respondents said they were involving man-made intelligence in somewhere around one business area; right now, that proportion is half, while it topped at 58% in 2019.



Second, interest in simulated intelligence has extended pair with its rising acknowledgment. For instance, quite a while back, 40% of respondents at simulated intelligence utilizing associations expressed that over 5% of their computerized consumptions went to artificial intelligence, yet right now the greater part report that degree of buy-in. In the approaching three years, 63 percent of respondents anticipate that their associations' venture should rise.



V. RESULTS AND DISCUSSIONS

The use of artificial intelligence (ai) in smart cities has proved to have positive effects on many aspects of urban living. In this text, we analyze the main discoveries and consequences of ai in the context of smart cities, based on current research and real-life applications. However, the implementation of ai in smart cities can be hindered by various difficulties and limits, such as concerns over data privacy and security, biases in ai algorithms, ethical considerations, and the potential for job displacement as a result of automation. To ensure the responsible and sustainable deployment of ai in the smart city context, it is crucial to guarantee efficient data privacy and security measures, address any bias in ai algorithms, comply with ethical standards and create policies for workforce reskilling and job creation.

VICONCLUSION

The domain of ai in smart cities is undergoing rapid advancements, and there are several areas that call for research and development in the future. These include creating more sophisticated ai algorithms that can predict traffic, optimize resource management, and engage with the public better. It is necessary to undertake further research to tackle the ethical, legal, and social implications of ai in smart cities, and to build governance frameworks and policies for responsible and fair ai deployment. The integration of ai in smart cities has the potential to reshape urban living by improving traffic management, enhancing public safety, optimizing resource utilization, and uplifting citizen services and engagement. However, challenges such as data privacy, biases in ai

algorithms, ethical concerns, and workforce displacement require careful scrutiny. It is crucial to have future research and development, along with responsible governance and policy-making in place, to leverage the full potential of ai in creating intelligent, sustainable cities.

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- [14] "AI in Future Cities: An Interdisciplinary Analysis of Artificial Intelligence and Urbanism" by Pongrácz, E., et al. (2020) - This research paper examines the interdisciplinary aspects of AI and urbanism, exploring how AI technologies can contribute to the development of future smart cities. It discusses the potential benefits, challenges, and social implications of AI implementation in urban environments. [Link: <https://doi.org/10.3390/app10228497>]
- [15] "AI for Smart Cities: Opportunities, Challenges, and Solutions" by Lu, C., et al. (2020) - This article provides an overview of AI applications in smart cities and discusses the opportunities and challenges associated with their implementation. It presents case studies and identifies potential solutions to address the challenges in leveraging AI for smart city

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Exploring Black Music As A Form Of Cultural Expression: A Textual Analysis On The Select Lyrics In Black Music

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Ms. K.M. Nitya (M.A. English with Communication Skills)

Abstract

It is strongly believed by everyone that injustice anywhere is a threat to justice everywhere. Racism refers to not only particular ideologies and intentional, oppressive practices based on them but also to racializing discourses and practices by which racial hierarchies and essentialist, oppressive ideas of some people and cultures are produced and reproduced. In cultural studies, race is a socially constructed, discursive category (Taylor and Francis). The ill-treatment of Black people in the United States is among the most horrific and terrible treatments of a race in global history. In North America, Black music was a method for early slaves to express themselves and communicate while being forcefully transferred and restricted from participating in cultural activities. Black music encompasses not just sounds from the Black experience in the United States but also a worldwide Black experience that reaches from Africa to America. Black recording artists have always used music to expose the dangers of racism and police violence. Recent events like the police shootings of innocent Black people highlighted the perils of racial injustice and oppression. This has stoked their zeal for using music as a sounding board for change, keeping with the history of Black art reflecting the times.

This study tries to comprehend the motivation behind Black cultural expression to shed light on the idea of racism in lyrics written by Black composers in Black music. The songs are a perfect fit for audio research since it emphasises how Black music and culture are expressed via the use of the background scores in the songs.

(Keywords: Racism, ideologies, oppression, hierarchies, Black music, culture)

The purpose of Black music is to portray urban landscapes via amplified noises, societal issues, and cultural pride. It can be traced back to the days of slavery. While slaves were working in the fields, one could hear them singing songs to entertain themselves. They used these songs to tell their life stories.

Levi R. Bryant defines music not as a language, but as a marked-based, problem-solving method such as mathematics (Ashby and Arved 4). Music provided an escape from the toils and responsibilities of enslavement. Slaves were prevented from using the drums as their masters felt that drums might be used

to carry signals to neighbouring estates. Despite this, they discovered a means to save their souls through the power of their instruments. Some, such as the banjo, were created by their hands, while others, such as the fiddle, were supplied by their masters. They sang not for joy or pleasure, but for the yearning to be free. Although their hands and feet were frequently tied, their souls remained free.

Despite the abolition of slavery, racial prejudice against Blacks persisted. They experienced impoverishment since they were immigrants and slaves. As a result, activists such as Martin Luther King Jr., Nelson Mandela, Harriet Tubman, and Desmond Tutu represented the whole Black community in their battle for civil rights. They tried to raise public awareness about how unfairly Black people were treated and demanded reform. This prompted numerous musicians, including James Brown, Bob Marley, Stevie Wonder, Sam Cooke, Nina Simone, Beyoncé, and Kendrick Lamar, to speak out about racial inequality in society. Martin Luther King Jr. held music in the highest regard as a tool for social transformation. Music was a major part of the civil rights struggle. People marched to songs of liberation, and records like "A Change is Gonna Come" and "Blowin' in the Wind" by singers like Sam Cooke and Bob Dylan helped spread the message. King expressed the following about the significance of music in our lives in a piece he composed for the 1964 Berlin Jazz Festival:

"God has wrought many things out of oppression. He has endowed his creatures with the capacity to create, and from this capacity has flowed the sweet songs of sorrow and joy that have allowed man to cope with his environment and many different situations."

Considering the persistence of severe racial prejudice in the United States, the focus of this research has been placed on Black music. The barbaric deaths of African Americans such as George Floyd, Breonna Taylor, and Ahmaud Arbery are painful reminders of the extent to which racism has been prevailing in the United States. As a result, the researcher believes that it is an issue that should be revisited. The Black Lives Matter movement served as a wake-up call to the world to be more humane, but there has been little progress. It is necessary to explore Black music and Black culture to remind society of the sacrifices made by revolutionary activists to make the world a better place to live.

The researchers intend to analyze the aspect of racism because the novels of Toni Morrison had greatly influenced them and particularly the novel *The Bluest Eye*, and the character of Pecola Breedlove. Her story is an African-American female tragedy. The novel is a haunting story of a black girl, the scorned and rejected girl Pecola Breedlove, who longs to be beautiful and to be loved and who wants to have blue eyes, a symbol of white beauty. She strongly believes that such eyes alone would make her beautiful, acceptable, and

admirable. She has struggled to make friends since other children thought her skin colour is dark and strange and refused to play with her. As a result, her quest for blue eyes culminates in madness. Thus, the struggles of the Black community have made the researchers choose the topic.

Aims and Objectives

- To study the history of Black music.
- To examine the soundscapes as a reflection of Black culture and the discrimination faced by the Black community through Black music.
- To understand the utmost racial discrimination faced by Blacks from times immemorial.
- To examine the lyrics of Black music to have a thorough knowledge of the racism that permeates society.

Literature Review

The term racial discrimination includes every form of differentiation in behaviour based on race. The form of racial discrimination is evident in the segregation of certain racial residences in the big cities of the West and the East. There has been a lot of research on racism, the Black community, and Black Music. But most of that research has focused on specific notions, with very few studies discussing this issue on a broader scale. In the journal "Music and Anti-Racism: Musicians' Involvement in Anti-Racist Spaces", the study's notion is that the linkages between music and (anti-) racism are more complicated and multifaceted than has been demonstrated in studies focused on the histories of certain music genres and their relationships to specific political movements. First, the agency of artists and the functions of music in what might be termed as "spaces for anti-racism" in Finnish society during the last several years, when racism and anti-racism have been regular issues of public debate, was investigated.

Second, anti-racist discourses and practices were detected in several contexts of Finnish popular music.

The above study has suggested the need for further research on the potential of music in the fight against racism. The key drawback of the study is that it only examined Finnish music.

In the journal "An Analysis of Racism as Reflected in Bob Marley's Songs: War and Buffalo Soldier", the study emphasized to analyse of Bob Marley's songs 'War' and 'Buffalo Soldier' to learn about the social existence of African people as they deal with racial injustice. This study aimed to provide answers to two questions: What songs of Bob Marley's depict prejudices and how the battle for Black people's rights is represented in the lyrics? Marley stresses in his songs that a person's race is the main factor influencing their characteristics and abilities.

The main limitation of the study is that it only examined a small sample of songs by a single artist.

The thesis "From Bandannas to Berets: A Critical Analysis of Beyoncé's "Formation" Music Video" demonstrated how Beyoncé confronts the sexist and racial mainstream worldview in the United States by using a critical/cultural studies viewpoint lens. The essay critically examined the lyrical and visual elements of "Formation," challenging the messages about race and gender as well as the portrayal of Black women. The results showed that black women have power and domination in society because the songs' words

and imagery recycle stereotyped stereotypes of black women. This directly challenges white androcentric power. As mediated texts re-present everyday reality, the consequences of analysing the way Beyoncé conveys what and how it means to be a Black Woman in "Formation" enrich and explain the social, political, and economic realities of Black Women in the United States today. The only drawback of this research is that it draws only on Beyoncé's song "Formation".

Instead of concentrating on one geographic area, a set of songs by a single Black artist and single song, the current study examines Black music. By doing this, it also discusses the necessity of reviving the Black cultural traditions and practices that are being lost because of modernization.

Theoretical Framework

The primary method of research used for the study is qualitative research. The critical/cultural studies approach is a qualitative methodology that encompasses five significant concepts: culture, power, ideology, the dominant ideology, and hegemony (Barker, C 224). Because cultures are transformational and interact, struggle, and change with their environments, analysing a culture requires a comprehensive understanding of human behaviour. Therefore, this technique focuses on how we view the world, other people, and ourselves.

The social construction of culture involves shared meanings. Therefore, our culture is symbolically produced and reproduced through communication, which is fluid, ever-changing, and active (Fiske, J).

Focusing on the idea of racism in Black music, the researcher hopes to gain a deeper knowledge of Black culture by employing textual analysis.

The idea of power is closely tied to culture and is another crucial aspect of critical/cultural studies. Privilege and oppression are revealed when the issue of power is examined, and a hierarchy of power is identified within a culture. This information sheds light on the historical and current social power structures of that culture. Not only does power have a direct impact on different cultures within a society, but it also has a direct impact on the prevailing ideology that individuals in that culture adhere to. As a result, the critical/cultural studies approach relies on power dynamics to express a culture's dominant ideology.

Critical/cultural scholars may better understand and investigate the effects of representations of race, gender, and class displayed in mediated communication by identifying, recognising, and comprehending these fundamental ideas and their relationships to one another. This research will examine numerous song lyrics from Black music in order to explain how racial prejudice against Blacks has been occurring. By analysing the background score in songs of various genres, the music genres that come under the heading of "Black music" will be explored in order to gain a deeper knowledge of Black culture. Finally, the influence of Black music on the political and social context in which it was created will be examined. Therefore, Black culture will be explored to urge people to be a little more empathetic and to remind them of the prejudice that the Black minority has been facing over the centuries.

Origin of the Black Music

This chapter unravels the birth of Black music with the beginning of slavery between the 10th-15th centuries. The Transatlantic Slave Trade and the forced migration of millions of Africans to the Americas, where they were later sold into slavery, cannot be separated from Black music. It began to represent urban settings through intensified sounds, societal issues, and musical expressions of cultural pride.

Spirituals are one of the earliest genres of Black music. According to a May 2012 PBS interview, they were religious folk songs, often rooted in biblical stories, woven together, sung, and passed along from one slave generation to another. They emphasised the tremendous suffering that African Americans who were held in slavery from the 17th century to the 1860s experienced; for many, freedom only changed the nature of slavery, not its continuation. The spirituals songcraft gave rise to several other derivative musical genres. One example is gospel music, which is performed to honour one's connection to Christ.

Black Americans created the musical style known as "rhythm and blues," or "R&B," in the 1940s. It developed alongside rock 'n' roll and draws influences from gospel, jazz, folk, and traditional blues music. Compared to the 1950s and 1960s, the modern R&B scene has undergone significant change, yet it still ranks among the most widely-listened-to subgenres of American music.

The late 19th and early 20th century saw the development of Jazz music in the African-American neighbourhoods of New Orleans, Louisiana. Ragtime and blues served as its foundations. Swing and blue notes, intricate chords, call-and-response singing, polyrhythms, and improvisation are its distinguishing features.

Blues is secular folk music created in the early 20th century. It is characterized by expressive "microtonal" pitch inflections, a three-line textual stanza of the form AAB, and a 12-measure form. Blues artists communicate their emotions through lyrical rather than narrative blues songs; they do not narrate stories. As it has been demonstrated, the chapter discusses the history of black music, some of its subgenres, and the rationale for its evolution.

Contextualizing the Racist Elements in Lyrics

This chapter analyses the lyrics of songs chosen from Black music that talk about police brutality, racism, and discrimination against blacks. The first song of choice is "This is America" by Childish Gambino.

The main theme is about firearms and violence in America and how Americans cope with them and consume them as entertainment on one hand and as a topic of the national discussion on the other. Stephon Clark, who was killed by Sacramento police in 2018 because they believed he was wielding a gun when, in fact, he was holding a phone, may be linked to phrases like "celly" and "tool" in the song. Other similar references to instances of racial prejudice against Blacks is seen throughout the song.

The chapter also examines the lyrics to H.E.R.'s song "I Can't Breathe." This song was specifically created in response to the demonstrations that have engulfed America since George Floyd was killed. And just before he passed away, he was heard saying, "I can't breathe." The song also serves as a metaphor for the institutionalized prejudice that African Americans endure.

The song "Black Parade" by Beyonce supports Black activism and acts as a celebration of Black culture. The singer honoured her African roots by making references to the "Ankh," an ancient Egyptian sign, and "Oshun," a Nigerian Yoruba deity of femininity, love, sexuality, and fertility. The word "picket sign" refers to the protests that rose due to the inhuman killing of George Floyd. Picket fences are often related to middle-class, white, suburban communities, which have traditionally excluded Black people for far too long. Its inclusion in the song's lyrics implies that she is dedicated to tearing down the white supremacist institutions that have long permitted systematic racism and discrimination to exist. Beyonce also sings an ode to Black hair in the song.

To underline the idea of racism the Black community encounters daily, the chapter decodes the lyrics of select songs by Black musicians, including Childish Gambino, Beyonce, H.E.R., and others.

Analyzing the Soundscapes in Black Music

To investigate the soundscapes and comprehend the motivation behind their use, this chapter examines the sounds in a few songs of Black music. A soundscape is a mélange of musical and non-musical sounds. It involves the use of sounds to produce a mood or atmosphere in a play or film. The purpose of soundscapes is to enhance the visuals and create a natural effect in an artificial setting.

John Legend's "Preach" addresses a multitude of unsettling societal concerns affecting America, including senseless violence, police brutality, and mass immigration, as shown in the music video. The production is gloomy from the start, which establishes the mood. The deep, nuanced vocals of John Legend give this song the distinction it deserves, regardless of how fantastic the atmosphere, music, and feel are. Additionally, John receives assistance in the form of backup vocals, which highlights his strong lead during the pre-chorus and chorus positions. The chorus is completely "amped-up" and is loud and catchy reflecting the overwhelming feeling the protagonist in the story has. Beyoncé's "Formation" is an ode to Black women around the world. "Formation" is an intricate and meticulous work of art that illuminates the dark past of Black Americans in the United States, while also conveying the hope for a brighter and just future for younger generations. A powerful bass rhythm and rubbery synthesizers make up the song's minimalistic beat, which eventually gives way to a marching band- and military-inspired horn-infused stomp. This created an atmosphere of suspense for the audience. The vocalist used a variety of delivery techniques throughout the song; the introduction is spoken in a gruff, muttered voice that changes as the song goes on to a half-rapped, half-sung rhythm. This was done to grab the attention of the audience at particular wordings of the song. Similarly, the soundscapes in other songs of Black music will be analysed in this chapter.

Conclusion

Through the analysis of lyrics and soundscapes in select songs of Black music, Black culture and the racial discrimination faced by the Black community will be studied. A better understanding of Black culture will be made possible by the use of a cultural studies method that considers important concepts like culture, power, ideology, dominant ideology, and hegemony into account. Due to the urgent need for

it created by the alarming levels of violence against Black people in the present, the researcher will be able to reexamine the concept of racism.

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Abstract

In India Banana is cultivated in an area of 830.5 thousand ha and total production is around 29,779.91 thousand tons. In the present study four pathogens were identified on the banana tree (*Musa acuminata* L.). Collected diseased parts of the banana plants in Rajahmundry and then samples of infected tissue such as corm, root, leaf, pseudostem, flower and fruit were collected and cultured. In the present study four pathogens such as *Fusarium* sps, *Alternaria* sps, *Gloeosporium* sps and *Erwinia* sps were isolated from banana Leaf, Leaf spot, fruit and Rhizome respectively. These pathogens cause diseases in banana plant so it effects the yeilding of banana plants.

Keywords: Identification, rhizome, pathogen, disease, banana, India

Introduction :

Banana is a significant natural product harvest of numerous tropical and subtropical locals of India. It is developed in India about of 830.5 thousand ha and all out creation is around 29,779.91 thousand tons. In India mainly banana developing states are Tamil Nadu, Maharashtra, Gujarat, Andhra Pradesh and Karnataka. The worldwide creation of banana is around 102028.17 thousand tons of which India contributes 29.19%. Other than India, other significant banana delivering nations are China, Philippines, Ecuador, Brazil and Indonesia.

In India banana is developed under different circumstances and creation frameworks. Determination of assortments, hence depends on countless assortments taking care of different sorts of necessities and circumstances. However, around 20 cultivars viz. Bantam Cavendish, Robusta, Monthan, Poovan, Nendran, Red banana, Nyali, Safed Velchi, Basarai, Ardhapuri, Rasthali, Karpurvalli, Karthali and Grandnaine and so forth.

Grandnaine is acquiring prevalence and may before long be the most preferred variety because of its resistance to biotic burdens and great quality packs. Bundles have all around dispersed hands with straight direction of figures, greater in size. Organic product creates alluring uniform yellow tone with preferred self life and quality over different cultivars.

Plants are contaminated by various types of microbial microorganisms and the expected inoculum for disease is available in the dirt, water and air, not withstanding plant have. Phytofungus microbes present difficult issues overall in horticulture and food industry, particularly in the subtropical and tropical locals. Moreover, many likewise produce mycotoxins, which are harmful to



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Banana is a significant natural product harvest of numerous tropical and subtropical locals of India. It is developed in India about of 830.5 thousand ha and all out creation is around 29,779.91 thousand tons. In India mainly banana developing states are Tamil Nadu, Maharashtra, Gujarat, Andhra Pradesh and Karnataka. The worldwide creation of banana is around 102028.17 thousand tons of which India contributes 29.19%. Other than India, other significant banana delivering nations are China, Philippines, Ecuador, Brazil and Indonesia.

In India banana is developed under different circumstances and creation frameworks. Determination of assortments, hence depends on countless assortments taking care of different sorts of necessities and circumstances. However, around 20 cultivars viz. Bantam Cavendish, Robusta, Monthan, Poovan, Nendran, Red banana, Nyali, Safed Velchi, Basarai, Ardhapuri, Rasthali, Karpurvalli, Karthali and Grandnaine and so forth.

Grandnaine is acquiring prevalence and may before long be the most preferred variety because of its resistance to biotic burdens and great quality packs. Bundles have all around dispersed hands with straight direction of figures, greater in size. Organic product creates alluring uniform yellow tone with preferred self life and quality over different cultivars.

Plants are contaminated by various types of microbial microorganisms and the expected inoculum for disease is available in the dirt, water and air, not withstanding plant have. Phytofungus microbes present difficult issues overall in horticulture and food industry, particularly in the subtropical and tropical locals. Moreover, many likewise produce mycotoxins, which are harmful to



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**Isolation And Culturing Of Four Pathogens
Causing Diseases In Banana Crops At
Rajamahendravaram, East Godavari District, Ap,
India.**

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Abstract

In India Banana is cultivated in an area of 830.5 thousand ha and total production is around 29,779.91 thousand tons. In the present study four pathogens were identified on the banana tree (*Musa acuminata* L.). Collected diseased parts of the banana plants in Rajahmundry and then samples of infected tissue such as corm, root, leaf, pseudostem, flower and fruit were collected and cultured. In the present study four pathogens such as *Fusarium* sps, *Alternaria* sps, *Gloeosporium* sps and *Erwinia* sps were isolated from banana Leaf, Leaf spot, fruit and Rhizome respectively. These pathogens cause diseases in banana plant so it effects the yeilding of banana plants.

Keywords: Identification, rhizome, pathogen, disease, banana, India

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Table 1: Characteristics of isolates from banana plantations

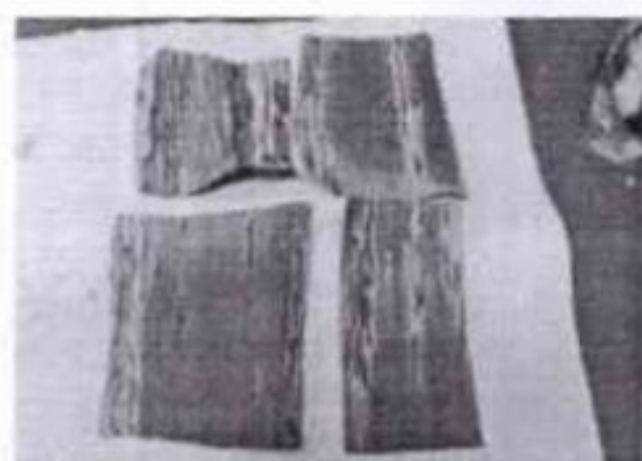
Leaf spots may be rounded or angular, and have smooth or fringed edges.

Name of the disease	Causative organism	Infected tissue	Symptoms
Wilt	<i>Fusarium</i>	Leaf	Yellowing & drying of leaves
Rhizome rot	<i>Erwinia</i>	Rhizome	Rotting of crown region is a characteristic symptom which is followed by epinasty of leaves, which dry out suddenly.
Leaf spot	<i>Alternaria</i>	Leaf	Leaf spots may be rounded or angular, and have smooth or fringed edges.
Anthraco nose	<i>Gloeosporium</i>	Fruit	Premature ripening and shriveling of the fruits are covered with pink spore masses.

Different diseases symptoms in Banana crop



Anthraco nose disease



Leaf spot in Banana

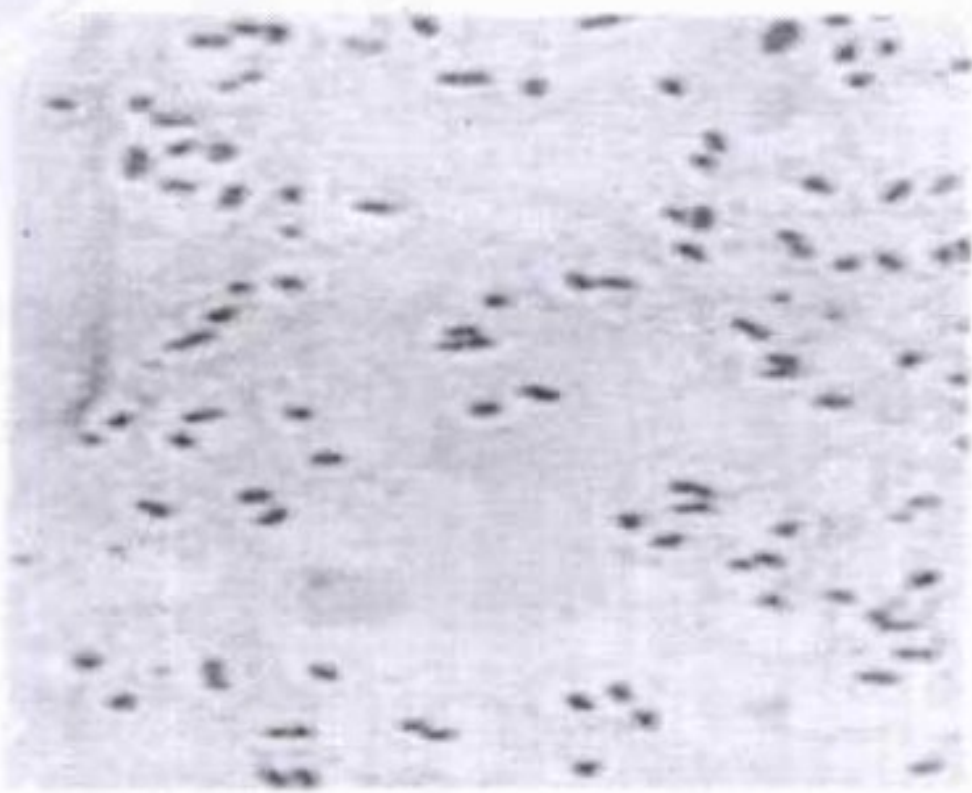


Rhizome rot in Banana



Culturing of Pathogens



*Erwinia**Gloeosporium*

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Authored by

B.ASHA LATHA

From

SKR Government Degree College (W) Rajahmundry, A.P, India

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Important Medicinal plants of Dhanvanthari medicinal garden at SKR government Degree College, Rajamahendravaram to maintain sustainable health and well being

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Abstract:

All plants synthesize a number of chemical compounds for different functions, plants have properties like defense and give protection against diseases produced by virus, bacteria and fungi, etc., The present study showed that the ratio of medicinal plants that are maintained in my Dhanvanthari medicinal garden. These plants were used as home remedies to cure diseases. There are 723 plants in total included in 65 species. These 65 plants are included in 34 families. Out of 723 plants, herbs are 455, shrubs are 152, trees are 32, creepers are 65 and climbers are 19 in number. Herbs are more in number and climbers are least in number. In Prehistoric period tribal and rural area people living in forest areas still depends on indigenous system of medicine. Now a days most of the people were depending on homeopathy and Ayurveda traditional system.

Keywords: Herbal Therapy, medicinal plants, Dhanvanthari medicinal garden, diseases, Medicinal values, traditional medicine.

Introduction:

Medicinal plants are also known as medicinal herbs. Since long time plants were used for treatment to cure diseases. 70 % of Indian forest surrounding people use different plant parts as food, medicine and also for many other purposes. In India, people generally depend on herbal plants for unhealthiness and skin disorders. Now a days there is a highly demand for medicinal plants. These herbal plants are mainly used in Ayurveda. All plants contain medicinal values. In some plants roots are used in herbal therapy, in some plants leaves, stems, fruits, flowers etc., Wild species are very rich in vitamins, minerals, medicinal values. All the plants are source of shelter, timber, food and clothing. These medicinal plants are rich in bio-active compounds that serve different pharmacological activities. Tribal people mostly depend on the plants around

Important Medicinal plants of Dhanvanthari medicinal garden at SKR government Degree College, Rajamahendravaram to maintain sustainable health and well being

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them to earn money, along with to essential medical care benefits which depends on need, perception, experience of more seasoned ethnic individuals, and experimentation. Due to low cost and good results these medicinal practices are extended to generation to generation. Mostly 65 % of the population in India depends on medicinal plants. Some respiratory diseases, pains, wounds cured by medicinal plants. Medicinal plants are mainly used in Ayurveda, Unani and chinese medicine herbal therapies. Present study was carried out to provide a detailed information of the knowledge on some medicinal plants.

Review Of Literature:

Fajemiroye, J. O., da Silva, D. M., de Oliveira, D. R., & Costa, E. A. (2016). their article states that the uses of medicinal plants for the treatment of anxiety and depression.

Singh, N., Tailang, M., & Mehta, S. C. (2016) study revealed that the connection between connection between plant drugs and man in nature from the far past.

Van Wyk, B. E., & Wink, M. (2018). *Medicinal plants of the world*. CABI, study states that medicine systems of the the world, medicinal plants and plant derived medicines are widely used in traditional cultures.

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Süntar, I. (2020). His study revealed that role of medicinal plants in curing the diseases and role of herbal plants in therapeutic system.

Methodology:

My college campus is wealthy and rich in full of plants. We are maintaining a medicinal garden, named Dhanvanthari medicinal garden present in front of Saraswathi Pramadavanam. In my medicinal garden there are absolutely 65 medicinal plants that have rich medicinal values and these medicinal plants are using for home remedies and also used in the preparation of herbal powders. The plants are including herbs, shrubs, climbers and trees. We observed each plant and noted details like the botanical name, family name, habit of the plant, part used, uses of that medicinal plant and total number of plants.

Every day we went to the Dhanvanthari medicinal garden and observed the plants and studied each medicinal plant from its habitat to seed of the plant and entered the details of the plant into field note book. All plants in garden are using for health remedy. Mostly Tulasi, Aloe vera, Curcuma longa, Eclipta alba, Annona squamosa, etc., for home remedies. There are totally 723 number of plants are included in 65 species. Some plants are more in number some species are

less in number. Out of 723 plants Herbs are 455, shrubs are 152, trees are 32, creepers are 65 and climbers are 19 in number. 65 plants are included in 34 families. Herbs are more in number and climbers are least in number.

Results And Discussion:

The given table states the information of medicinal plants which are growing in Dhanvanthari medicinal garden at SKR Government Degree College (W) Rajamahendravaram.

The given table states the details of medicinal plants like botanical name, family, habit, useful part and medicinal uses and number of plants available.

S.No	Name of the plant	Family	Type of Plant	Part used	Medicinal uses	Number of Plants
1	Achyranthes aspera	Amaranthaceae	Herb	Whole plant.	Asthama, Leprosy, Skin diseases, Anaemia.	8
2	Acorus calamus	Acoraceae	Herb	Rhizome	Epilepsy, Mental disorders, Skin diseases, Improves speaking ability.	5
3	Adhatoda zeylanica	Acanthaceae	Shrub	Leaves, Roots, Stem bark	Asthma, Menorrhagia, Psoriasis, Cough, Body inflammation	7
4	Aegle marmelos	Rutaceae	Tree	Root, Bark, Leaf, Seed.	Diarrhoea, Constipation, Cardiac diseases, High Blood Pressure, Jaundice,	4

					Joint Pains, Leprosy, Piles.	
5	Aloe vera	Liliaceae	Herb	Leaf juice, Roots.	Leprosy, Piles, Mental disorders, Skin diseases, Jaundice, Menstrual problems, Dysentery, Joint pains.	5
6	Alpinia calcarata	Zingiberaceae	perennial Herb	Rhizomes	Diabetes, Arthritis, Obesity, Nervine tonic.	24
7	Annona squamosa	Annonaceae	Small Tree	Roots, Leaves, Fruits, Seeds.	Anaemia, Mental depression, Maligant Tumours, Hysteria, Antiulcerate, Tooth ache.	2
8	Aristolochia bracteolata	Aristolochiaceae	Creeper	Roots, Leaves	Anti- inflammatory Vulnerary Antiperiodic Eczema.	4
9	Artemisia vulgaris	Asteraceae	Herb	Leaves	Antihelmintic, Asthma, Antiseptic Nervous & Spanmodic affections Antilithic	34
10	Artemisia absinthium	Asteraceae	Herb	Flower heads	Chronic fevers, Swelling, Inflammation of liver, Rheumatism.	58

11	Bacopa monnieri	Plantaginaceae	Herb	Whole plant.	Cooling, Laxative, Inflammations, Epilepsy, Tumours, Ulcers, Leprosy, Leucoderma	67
12	Basella alba	Basellaceae	Creeper	Stems, Leaves.	Laxative, Haemostatic, Appetiser, Sedative, Diuretic, Demulcent, Maturate, Haemorrhages, Haemoptysis, Gonorrhoea.	4
13	Barleria Prionitis	Acanthaceae	Shrub	Leaves, Roots	Catarrhal affections, Glandular swelling, Tooth ache, Asthma, Skin diseases	2
14	Brassica juncea	Brassicaceae	annual herb	Seeds, Oil.	Dengue fever, Anorexia, Dyspepsia, Inflammation, Skin diseases, Splenomegaly, Persistant vomiting, Burning sensation, Colic, Hyperdipsia	6
15	Calotropis Procera	Asclepiadaceae	evergreen shrub	Root-Bark, Leaves, Flowers.	Leprosy	3
16	Capsicum	Solanaceae	annual shrub	Fruits	Dyspepsia, Flatulence, Cardiac	12

	annum				debility, Dropsy, Cholera, Ulcers, Phlegm	
17	Cascabela thevetia	Apocynaceae	Small tree	Bark, Seeds.	PurgativeSeeds used for suicidal and homicidal purpose.	2
18	Catharanthus roseus	Apocynaceae	Shrub	whole plant.	Blood cancer, Sedative, Hypotensive, Diabetes, Stomachic tonic, Wasp stungs, Menorrhagia	6
19	Centella asiatica	Apiaceae	Perennial herb	whole plant.	Anxiety,Neurosis,Minor memory disturbances, As a Psychotropic agent, Memory enhancer, General debility, Jaundice, Leprosy.	45
20	Cinnamomum verum	Lauraceae	evergreen tree	Bark, Twigs, Leaves.	Diarrhoea, Gastric, Flatulence, Nausea, Vomiting	5
21	Cissus quadrangularis	Vitaceae	Creeper	Stems	Bone Fratures, Dyspepsia, General weakness.	29
22	Clitoria ternata	Fabaceae	Creeper	Roots, Leaves, Seeds.	Weakness of sight, Dropsy, Ascites, Bronchitis, Constipation.	8
23	Coffea arabica	Rubiaceae	perennial shrub	Seeds	Stimulant, Diuretic, Antipyretic,	1

					Woophing, Cough, Hysteria.	
24	Calophyllum inophyllum	Calophyllaceae	Tree	Bark, Leaves, Seeds.	Oil used in rheumatism, Scabies, Syphilis, Eczema, Insanity, Internal haemorrhages, Leprosy, Diuretic, Tooth ache.	1
25	Curcuma longa	Zingiberaceae	Herb	Rhizomes	Urticaria and skin allergy, Viral hepatitis, Inflammatory conditions of Joints, Sore throat, Wounds.	10
26	Cymbopogon flexuosus	Poaceae	perennial herb	Leaves	Source of vitamin-A Leprosy, Epilepsy, Mosquito repellent creams.	20
27	Datura fastuosa	Solanaceae	Shrub	Leaves, Seeds.	Narcotic, Antispasmodic, Mydriatic, Anodyne	6
28	Eclipta alba	Asteraceae	Herb	Seeds, Juice of leaves, Herb oil	Viral hepatitis, Hair hygiene, Memory disorders, Minor cuts and burns, Conjunctivitis.	33
29	Elephantopus scaber	Asteraceae	perennial herb	Roots, Leaves,	Bile, Phlegm, Urethral discharges, Dysuria, Heart	9

				Flowers.	diseases.	
30	<i>Euphorbia nivulia</i>	Euphorbiaceae	Shrub	Stems, Leaves.	Rheumatism, Hydrophobia	15
31	<i>Hemidesmus indicus</i>	Asclepiadaceae	semi- erect shrub	Roots	Diuretic, Stimulate Lactation, General weakness, Skin burning, Tooth ache	18
32	<i>Hibiscus rosa-sinensis</i>	Malvaceae	Small tree	Flowers, Roots.	Menorrhagia, Oral contraceptive, Hair tonic, Gonorrhoea, Jaundice	3
33	<i>Jasminum sambac</i>	Oleaceae	small shrub	Roots, Leaves, Flowers.	Insanity, Eye complaints, Pruritus, Leprosy, Ulcers, Hiccough, Galactorrhoea, Fever, Skin diseases	2
34	<i>Jatropha gossypifolia</i>	Euphorbiaceae	Shrub	Roots, Leaves, Seeds, oil.	Ophthalmia, Rheumatism, Paralysis, Enlargement of Spleen and Liver	2
35	<i>Manilkara hexandra</i>	Sapotaceae	Tree	Bark, Fruits.	Loss of Consciousness, Anorexia, Ulcers, Opacity of the Cornea, Odontopathy, Fever, Flatulence, ColicDyspensia	3
36	<i>Operculina turpethum</i>	Convolvulaceae	Climber	Roots, Stem Bark	Constipation, Flatulence, Fever, Obesity	3

37	Murraya koenigii	Rutaceae	Tree	Leaves, Roots, Bark.	Helminthiasis, Dyspepsia, Colic, Flatulence, Diarrhoea, Dysentery, Vomitings, Hair tonic, Stomach ache.	4
38	Musa paradisiaca	Musaceae	perennial herb	Leaves, Roots, Fruits, Stem.	Burns and Ulcers, Gonorrhoea, Menorrhagia, Anaemia, Aphrodisiac, Demulcent, Haemophysis	7
39	Nyctanthes arbor-tristis	Oleaceae	shrub	Leaves, Flowers, Seeds.	Sciatica, Eye diseases, Scurvy, Chronic fever, Bronchitis, Dyspepsia, Hepatopathy, Greyness of Hair and baldness	1
40	Ocimum tenuiflorum	Lamiaceae	Shrub	Leaves, Roots, Seeds.	Common cold and cough, Bronchospasm, General debility and Stress disorders, Skin infections, Wounds, Indigestion and Nausea	5
41	Ocimum basilicum	Lamiaceae	Shrub	Whole Plant.	Sprains, Asthma, Diarrhoea, Dysentery, Bronchitis, Gonorrhoea,	10

					Nephritis, Internal piles	
42	Pergularia daemia	Apocyanaceae	Creeper	Whole Plant	Pulmonary affections, Asthma, Biliousness, Insanity, Leprosy, Gonorrhoea, Tuberculosis, Prickings in the uterus, Piles, Nervous affections, Syphilis	5
43	Piper betle	Piperaceae	Creeper	Whole Plant	Antiseptic, Aphrodisiac, Expectorant, Bronchitis, Impotency, Rheumatism, Vitiating conditions of Kapah, Stimulant, Acts Synergistically upon central nervous system, Wounds, Diphtheria, Carminative	15
44	Piper longum	Piperaceae	Climbing shrub	Fruit, Root and Stem.	Bronchial asthma, Recurrent infection of Throat, Flatulence, Dyspepsia, Respiratory diseases, Analgesic, Carminative, Sedative, Insomnia, Epilepsy,	9

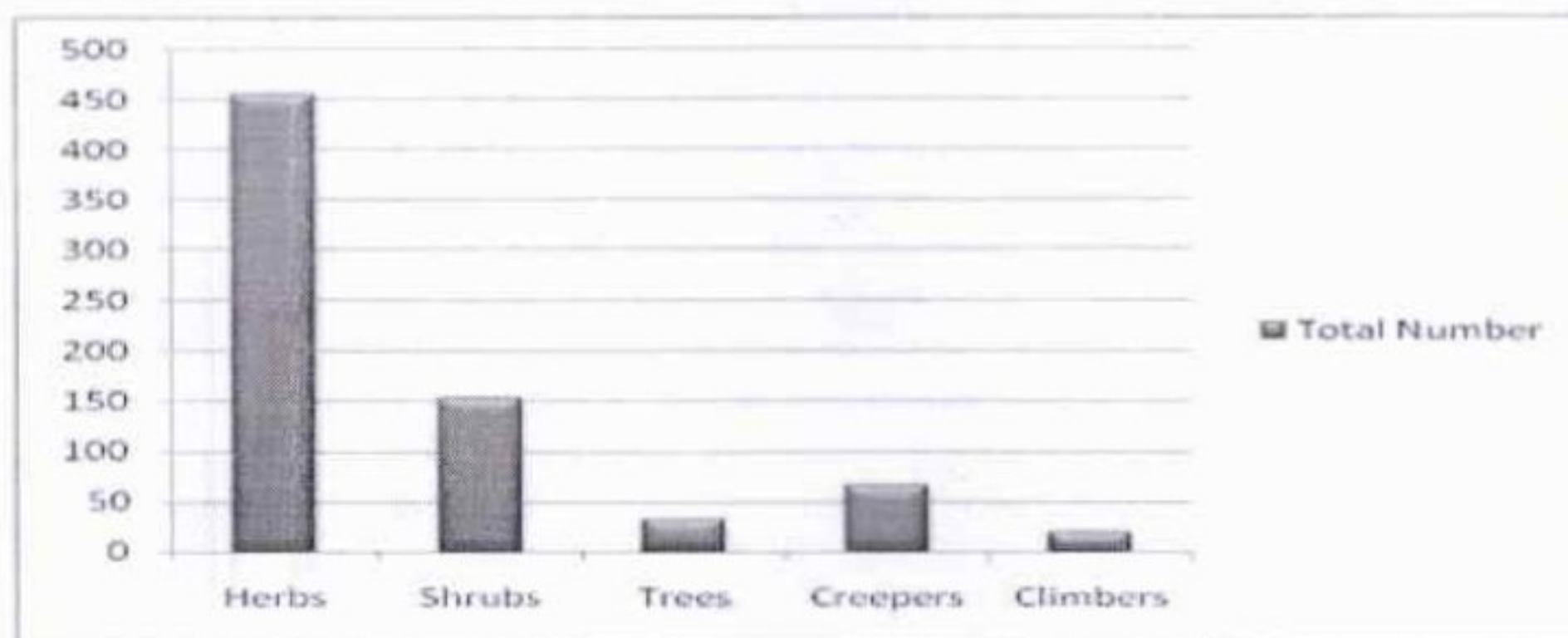
					Abortifacient	
45	Coleus amboinicus	Lamiaceae	Shrub	Leaves	Asthma, Cough, Epileps Leaf juice is antidote for centipede poision(external application)	6
46	Plumbago auriculata	Plumbaginaceae	shrub	Roots	Bronchitis, Cough, Leprosy Removes warts, As a styptic in scrofula , Powered root used like snuff.	2
47	Polygonum chinense	Polygonaceae	Shrub	Whole Plant	Tonic, Antiscorbutic, Vulnery.	4
48	Rauvolfia serpentina	Apocynaceae	Shrub	Roots, Leaves	Snake bite, Rheumatism, Hypertensive, Posion, Epilepsy, Eczema, Leaves used in removal of opacityies of the cornea	2
49	Rauvolfia tetraphylla	Apocynaceae	Small tree	Roots	Hypertension, Skin diseases.	1
50	Crataeva magna	Capparidaceae	Small tree	Roots, Stem bark, Leaves & Flowers	Urolithiasis, Crystalluria, Urinary tract infections, Internal Carcinoma, Anti-periodic.	1

51	Sesbania grandiflora	Fabaceae	Tree	Root bark,Leaves,Flowers,Fruits.	Tonic, Anthelmintic, Scabies, Dyspepsia, Diuretic, Nasal catarrh, Nyctalopia, Anaemia, Aperient, Scabies	1
52	Solanum nigrum	Solanaceae	Shrub	Whole Plant	Asthma, Bronchitis, Sedative, Rheumatism, Nephropathy, General debility, Anti-dysentery	2
53	Solanum xanthocarpum	Solanaceae	Shrub	Whole Plant	Anthelmintic, Carminative, Appetiser, Diuretic, Arthralgia, Hypertension, Pharyngitis, Cardiac disorders, Rhinopathy, Cough, Sore throat	1
54	Sauropus androgynus	Euphorbiaceae	Shrub	Leaves	Source of various vitamins except vitamin-D	1
55	Vitex negundo	Lamiaceae	Tree	Whole Plant	Rheumatic swellings, Increase hair growth, Bronchitis, Verminosis, Weakness of sight, Malarial fever, Cardiac disorders, Diarrhea	1
56	Withania somnifera	Solanaceae	Shrub	Roots & Leaves	Nervine sedative, Aphrodisiac, Emaciation, Improving vitality,	2

					To cure sterility of women, Sore eyes, Febrifuge ulcers	
57	Zingiber officinale	Zingiberaceae	Herb	Rhizomes	Asthma, Worms, Leprosy, Skin diseases, Pharyngopathy, Cholera, Carminative, Nausea	6
58	Costus igneus	Costaceae	Herb	Leaves	Antidiabetic, Male sterility, Antibacterial, Asthama, Bronchitis, Skin diseases	4
59	Aerva lanata	Amaranthaceae	Herb	Whole plant	Urinary calculi, Dysuria, Wounds, Polyurea, Piles, Uterine diseases, leucorrhoea	56
60	Euphorbia hirta	Euphorbiaceae	Herb	Whole Plant	Asthma, Cough, Dysentery, Latex applied to warts, Leprosy, Ulcers, Fissures in the mouth	48
61	Leucas aspera	Lamiaceae	Annual herb	Leaves, Flowers, Roots	Psora, Chronic eruptions, Epilepsy, Headche, Snake bite, Rheumatism, Swellings, Jaundice, Asthama, Bowel complaints, Conjunctivitis	10
62	Thunbergia	Acanthaceae	perennial	Root, stem,	Antibacterial, Skin	14

	fragrans		climbing twiner	Leaves	diseases, Rheumatic arthralgia.	
63	Gymnema sylvestre	Asclepiadaceae	Climber	Leaves	Snake Bite, Enlargement of Liver, Cardiac Stimulant, Diabetes, Diuretic, Malarial Fever, Eye Diseases	2
64	Andrographis paniculata	Acanthaceae	Shrub	Whole plant	Antipyretic, Antiperiodic, Anti-inflammatory, Ulcers, Chronic fevers, Bronchitis, Skin diseases, Leprosy, Jaundice, Haemorrhoids, Intestinal worms	33
65	Phyllanthus emblica	Euphorbiaceae	Tree	Fruits	diarrhea, jaundice, and inflammation, Hair tonics	4

Type of Plant	Total Number
Herbs	455
Shrubs	152
Trees	32
Creepers	65
Climbers	19



Conclusion:

There are totally 65 medicinal plants, including herbs, shrubs, climbers and trees which are having medicinal values. Each plant have curative values. Plants are generally having terpenoids, steroids, flavonoids, tannins , saponins, alkaloids and phenols etc., Because of these properties plants are widely used in every product. Every part of the plant is useful. In some plants root is usable, in some plants stem, for some plants leaves, fruits, seeds, flowers are usable. In some plants, all parts are usable.

Plants are gift of nature to humans. Depending on the present study, all plants are having therapeutic values. From past years tribal people used medicinal plants for curing their diseases. Now a days, all are depending on homeopathy and Ayurvedic medicine and also prepares hair tonics, herbal powders like bath powder, tooth powder and shampoos, etc., plants give peace of mind, Purified oxygen and gives eye feast. So there is a need to grow more plants to avoid pollution and healthy environment. Because of deforestation there is an increase of pollution and green house gases and cause diseases in living things. In order to reduce or cure diseases and maintain a healthy environment, people should be aware of medicinal plants.

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Authored by

M.SRIDEVI

From

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Important Medicinal plants of Dhanvanthari medicinal garden at SKR government Degree College, Rajamahendravaram to maintain sustainable health and well being

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Abstract:

All plants synthesize a number of chemical compounds for different functions, plants have properties like defense and give protection against diseases produced by virus, bacteria and fungi, etc., The present study showed that the ratio of medicinal plants that are maintained in my Dhanvanthari medicinal garden. These plants were used as home remedies to cure diseases. There are 723 plants in total included in 65 species. These 65 plants are included in 34 families. Out of 723 plants, herbs are 455, shrubs are 152, trees are 32, creepers are 65 and climbers are 19 in number. Herbs are more in number and climbers are least in number. In Prehistoric period tribal and rural area people living in forest areas still depends on indigenous system of medicine. Now a days most of the people were depending on homeopathy and Ayurveda traditional system.

Keywords: Herbal Therapy, medicinal plants, Dhanvanthari medicinal garden, diseases, Medicinal values, traditional medicine.

Introduction:

Medicinal plants are also known as medicinal herbs. Since long time plants were used for treatment to cure diseases. 70 % of Indian forest surrounding people use different plant parts as food, medicine and also for many other purposes. In India, people generally depend on herbal plants for unhealthiness and skin disorders. Now a days there is a highly demand for medicinal plants. These herbal plants are mainly used in Ayurveda. All plants contain medicinal values. In some plants roots are used in herbal therapy, in some plants leaves, stems, fruits, flowers etc., Wild species are very rich in vitamins, minerals, medicinal values. All the plants are source of shelter, timber, food and clothing. These medicinal plants are rich in bio-active compounds that serve different pharmacological activities. Tribal people mostly depend on the plants around

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Isolation and Categorization of Plant Growth Promoting Endophytic Bacteria Isolated from Halophytic *Suaeda nigra* at Salt Stress Area of Srikakulam, Andhra Pradesh

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Abstract

In search of novel endophytic bacteria capable of producing plant growth promoting phytohormones and providing tolerance against biotic and abiotic stress to the plant, present study was carried out during 2021-22. For this, endophytic bacteria were isolated from halophytic *Suaeda nigra* at salt stress areas of Srikakulam district, Andhra Pradesh. Total of sixteen endophytic bacteria were isolated from roots and aerial parts of *Suaeda nigra*. Isolates were enumerated, purified and preserved for subsequent studies. All isolates were analyzed for their phenotypic, biochemical, enzymatic assay and molecular characterization was carried out by 16S rRNA molecular method. Isolates were tested for their ability in producing plant growth promoting phytohormones, siderophores, exo enzymes and ability to solubilize the phosphate molecules. Among total isolates extracted, bacteria which was labeled as "SNA7" isolated from aerial parts of *Suaeda nigra* showed better characters in producing catalytic enzymes like catalase, amylase, protease, phosphate solubilization ability and Indole-3-acetic acid (IAA) production. Isolate SNA7 was gram negative, motile, aerobic, rod shaped, non-spore forming, and no pigmentation which grows best at 42°C, pH 8.3 with tolerance of 8% NaCl nutrient agar. Based on phenotypic, biochemical, nucleotide homology and phylogenetic analysis isolate SNA7 showed higher relationship with *Pseudomonas pseudoalcaligenes* *Pseudomonas* spp. was characterized as an effective organism to explore its ability in various research fields. In this current study, isolate SNA7 showed higher potential in producing wide range of enzymes and bioactive secondary metabolites and was first of its kind reported and isolated from halophytic *Suaeda nigra*.

Keywords: Catalytic Activity, Endophytic Bacteria, Halophytes, Plant Growth Promoters, *Pseudomonas*, Secondary Metabolites

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INTRODUCTION

Endophytic bacteria are the organisms that has the capacity to harbor inter and intra cellular spaces of the host plant and they can spread systemically.^{1,2} Their exact functions for the plants are still uncertain.² Endophytes encourages the growth of the plant and yields and also acts as antagonists bacteria.³

Halophytes are the plants which can tolerate salt and grows well in water with extreme salinity like mangrove forest, marsh lands, sea shores, saline deserts and coastal areas of arid and semi arid regions. Halophytes exists in no more than 2% of the entire kingdom of plants establish on earth. They can tolerate high salinity by adopting diverse techniques such as resistance, tolerance and avoidance, and also they had less opposition in halo environmental surroundings.

Halophytes grows in areas where there had regular floods. *Suaeda monica* grows more vigorously in degraded soils when compare to other halophytes. As salt extractors, they carry out major functions like decreasing the salinity of the soils creating conditions more suitable to growing mangrove plant species. During the course of ecological time halophytes are gradually replaced by mangrove ecosystem. In absence of halophytic plants the rejuvenation of mangrove ecosystem will be very difficult in sea shore areas.

Microorganism interacting in rhizosphere, phyllosphere and endosphere of the host plant are exceptionally diverse.⁴ Symbiotic relationship of microbes with host plant plays a important key role in maintaining plant health, plant growth promotion, resistant to diseases and survival of the host plant.^{5,6} In the midst of diverse microflora, endophytic bacteria shares same environment as that of plant pathogens and makes them as ideal models of antagonistic agents.⁷ There are several studies are made which illustrate that endophytes has the ability to resist plant pathogens, insects and nematodes in addition to promoting plant growth and establishment under stress environments.^{8,9}

Currently, researchers have recognized more than hundreds of endophytic bacteria from medicinal plants of South Indian which showed promising characters against anti-tumour and antimicrobial agents.¹⁰ *Suaeda nigra* formerly

called as *Suaeda amoquinii* is a species of flowering plant belonging to family Amaranthaceae. It grows well in saline and alkaline habitats regularly occurs in inland and occasionally in coastal ecosystems. *Suaeda nigra* grows as shrub from a woody base with several branches growing upto 5.0 feet in tall.

Pseudomonas sp. isolated from soils are of particular attention because of their root forming ability, catabolic adaptability and capability of producing vast ranges of proteins, enzymes and secondary metabolites which helps host plant to tolerate diverse biotic and abiotic stress environments.¹¹ *Pseudomonas pseudoalcaligenes* KF707 isolated at Biphenyl manufacturing industry in Japan¹² is a soil born bacteria. It is well known for its ability to aerobically degrade polychlorinated biphenyls¹³ using biphenyl as secondary metabolites.

In search of novel endophytic bacteria capable of producing promising bioactive molecules, current study was undertaken to screen and identify endophytic bacteria isolated from halophytic *Suaeda nigra*.

MATERIALS AND METHODS

This current investigation was carried out during 2020-21 and 2021-22 at Department of Botany, Andhra University, Visakhapatnam, Andhra Pradesh.

Endophytic salt tolerant bacteria isolation

Explants were collected from aerial and root parts of *Suaeda nigra* located at holophytic zone of Khaspanaupada of Srikakulam district within latitude of 18°34'25.6"N and longitude of 84°18'50.4"E (18.573986, 84.313925) (Figure 3). The explants were sealed in sterile container for further studies.

Surface sterilization of explants

The explants were first washed with sterile water, blotted dry with filter paper dipped in 70% ethanol and kept for about 1min. The sample was removed and again washed in sterile water. After washing the sample was then dipped in 4% Sodium hypochlorite solution and kept for about 5 minutes and again washed in sterile water. Followed by dipped in 70% ethanol and kept for

about 1min. The sample was removed and again washed in sterile water for final preparation of sample into paste.

To test the sterility of the procedure, the explants were kept and rolled on plates containing nutrient agar. 0.1 ml of the water from last wash was also inoculated to nutrient broth. After incubation period if any colonies developed, then all the samples were discarded and again surface sterilization of explants was carried out.

Endophytic bacteria isolated from explants of *Suaeda nigra*

After the surface sterilization of the explants, about 1g of each sample was weighed, cut into small pieces and well grounded into paste using sterile saline water in a mortar. Make the sample pastes into about 10ml using saline water. Each stock sample is further diluted 4 times, ten parts each time. The highest diluted solutions (10-4) were spread (50µl) on agar plates containing Zobell marine agar (ZM agar) (Composition - Zobell-Marine Broth 2216 Himedia @ 5.5 % + Agar agar @ 1.5 %) with the aid of 'L' shaped glass spreader, and the plates were incubated. Colonies with different morphology were isolated and streaked on ZM agar plates with assigned codes and kept for 24 hours at 32°C. In order to obtain pure culture the streaked cultures were again quaternary streaked on individual ZM agar plate and kept for 24 hours at 32°C for incubation.

After 24 hours, the cultures were obtained from individual colonies were subjected to further studies like biochemical, molecular, property and salt tests.

Preservation and Maintenance of endophytic bacterial isolates

All the test isolates were streaked on nutrient agar plates and stored with 20% glycerol at -20°C. Viability of the cultures was retrieved by periodic sub-culturing into new media at monthly intervals.

Morphological and Microscopic observations of endophytic isolates

The following morphological and microscopic examination which is cell shape, colony morphology, Gram's staining and motility were done to characterize the tentative identity of endophytic bacteria.

All sixteen isolates were inoculated on 3% NaCl Nutrient agar and the phenotypic, colony morphology was observed.¹⁴ According to Aneja, 2006¹⁵ the cells from purified cultures were observed for their morphological characters like cell shape, cell size, endospore forming ability, reaction to gram's stain, pigmentation and cell motility.

Growth at different NaCl concentration

The young cultures were streaked on

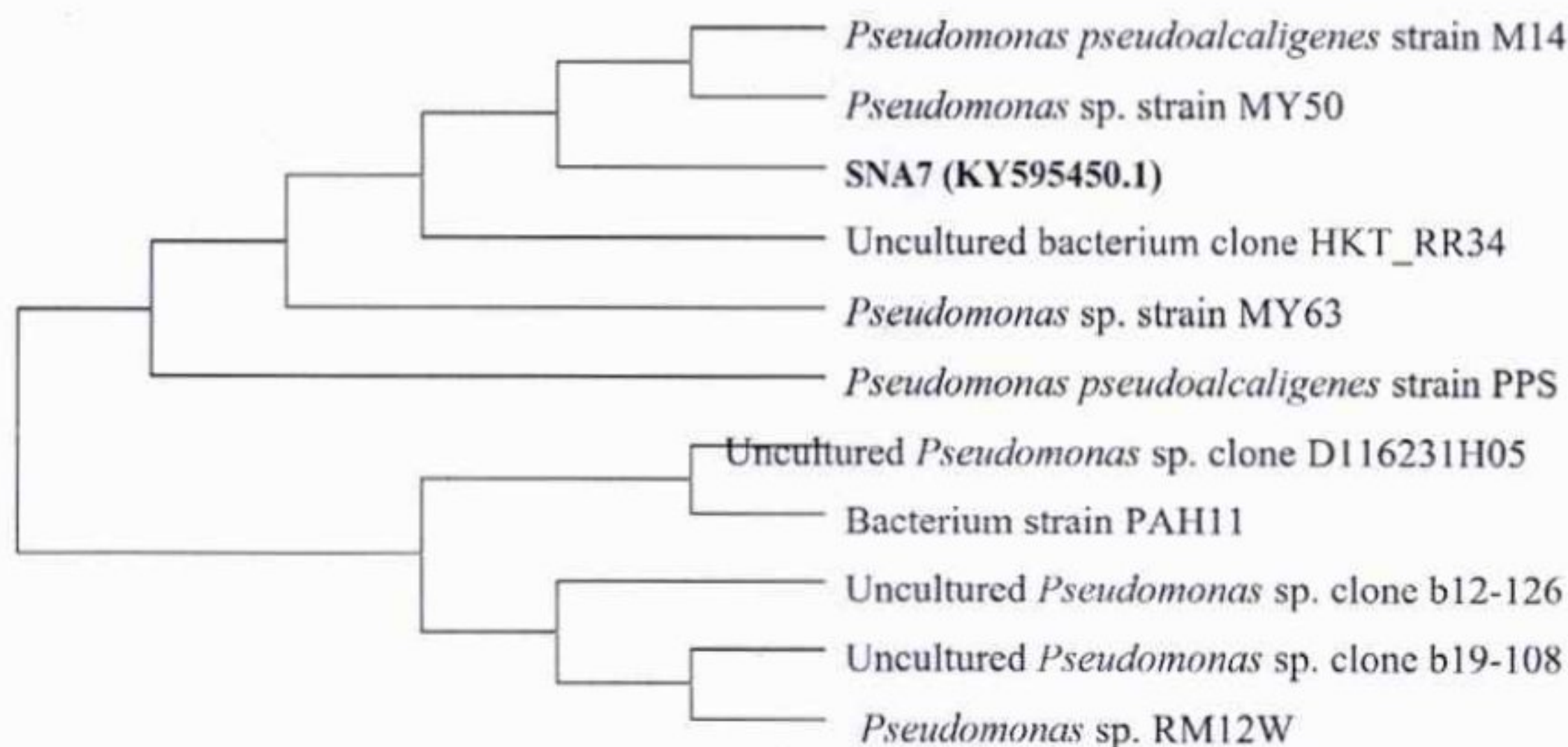


Figure 1. Phylogenetic Tree

Nutrient agar plates with different salt percentages i.e. 8% NaCl, 10% NaCl and 15% NaCl. The streaked plates were incubated at 32°C and observation of growth was made for 24hrs and 48hrs.

Oxygen requirement of endophytic bacterial isolates

Oxygen requirement was tested by growing bacteria in thioglycolate broth. The tubes

were inoculated and incubated at 32°C. Bacterial population concentrate in the test tube where the O₂ concentration is best suited for that particular microorganisms. Strict anaerobes concentrate at the bottom of the test tube, strict aerobes at the top to the test tube, aerotolerant organisms found evenly spread throughout the test tubes.

Biochemical enumeration of endophytic bacterial isolates

Catalase activity¹⁶

Loopfull of 24 hours old cultures of endophytic bacterial test isolates were transport to test tube containing 0.5 ml of sterile water. 3% solution of hydrogen peroxide (0.5ml) was added and thoroughly mixed. Observation was recorded for the production of effervescence give positive test for catalase production.

Oxidase test¹⁷

Trypticase Soy agar medium was used for this test. The test isolates were streaked on petri plates containing media and incubated for 48 hours at 32°C temperature in an upturn position. After incubation few drops of para amino dimethyl aniline oxalate were added. Observation was recorded for any colour changes from pink to maroon within few seconds indicates oxidase positive.

KOH test

Similar to Gram staining reaction, this test is also based on differences in the arrangement of the bacterial cell wall. Small amount of colony was mixed with little amount of 3% KOH. If the cell breaks, the cellular DNA makes the composition viscous or stringy in appearance. If KOH test is positive it indicates a gram negative microorganisms or If KOH test is negative then it indicates a gram positive microorganisms.

IndoleTest¹⁷

Glucose Tryptone broth was used to conduct Indole test. The test isolates was inoculated in sterile test tube containing sterile broth and kept for incubation for 48 hours at 32°C. After incubation time, 0.3 ml of Kovac's reagent was added and thoroughly mixed. Observation was recorded by the formation of red colour alcohol

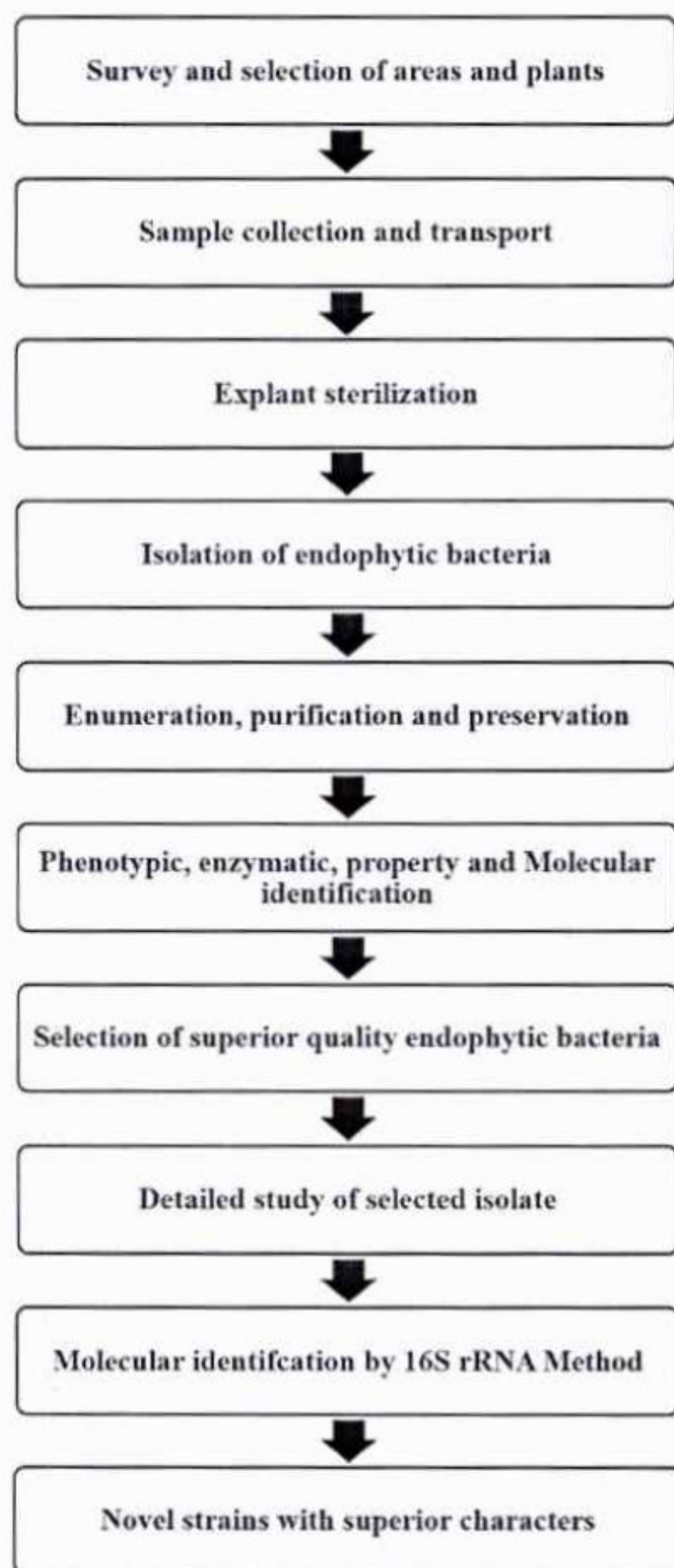


Figure. 2. Flowchart of the study undertaken

ring at the top of the test tube indicates positive test for indole production.

Methyl Red & Voges Proskauer Test¹⁷

Glucose phosphate broth (MR-VP medium) was used to test both Methyl red & Voges Proskauer. Two sets of sterilized broth was inoculated with test organisms and incubated at 32°C. After 48 hours of incubation period few drops of methyl red indicator were added, development of red colour indicates Methyl red test was positive. To another set of test tubes 5-6 drops of 5% α-naphthol and 2-3 drops of 40% potassium

hydroxide solution were added and mixed well. The positive reaction of acetylmethylcarbinol from glucose fermentation was converted into diacetyl in presence of α-naphthol and potassium hydroxide with the development of red colour at the surface within few minutes.

Citrate Test¹⁷

Simmon's Citrate Agar was used to test the consumption of Citrate as only carbon source and ammonium salts as only nitrogen source. All the isolates were inoculated in slants containing simmons citrate agar and incubated for 48 hours

Table 1. Coding of endophytic bacterial isolates

Plant	Plant part	Isolates
<i>Suaeda nigra</i>	Aerial parts (08 isolates)	SNA1, SNA2, SNA3, SNA4, SNA5, SNA6, SNA7, SNA8
	Root (08 isolates)	SNR1, SNR2, SNR3, SNR4, SNR5, SNR6, SNR7, SNR8

*S-Suaeda N-nigra A-aerial parts R-roots

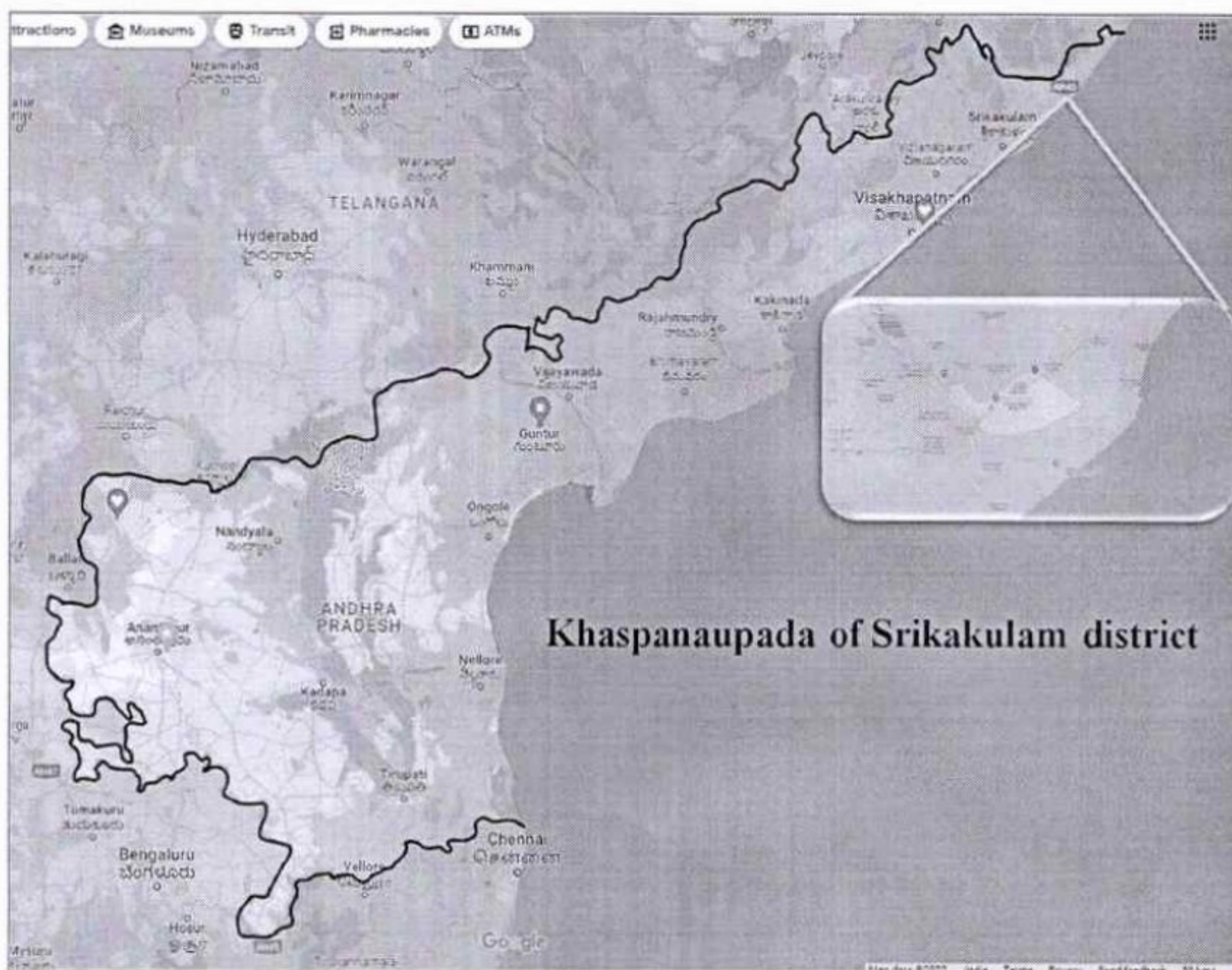


Figure 3. Sample Collection site at salt stress area of Khaspanaupada of Srikakulam district

Table 2. Comparative study of isolated SNA7 strain with other *pseudomonas* spp.

	SNA7 strain	<i>P. alcaligenes</i>	<i>P. pseudo alcaligenes</i>	<i>Pseudomonas alcaligenes</i> strain TPS8	<i>Pseudomonas putida</i> BP25
Morphological identification					
1) Cell shape	Bacillus	Bacillus	Bacillus	Bacillus	Bacillus
2) Gram's staining	-	-	-	-	-
3) Motility	+	+	+	-	+
4) NaCl concentration	8%	*	*	*	*
5) Oxygen requirement	Aerobic	Aerobic	Aerobic	Aerobic	Aerobic
6) Pigmentation	-	+	-	-	*
Biochemical Tests					
1) KOH	+	+	+	+	+
2) Oxidase	+	+	+	+	+
3) Catalase	+	*	*	+	+
4) Indole	+	-	-	-	+
5) Methyl Red	+	+	+	+	-
6) Voges-Proskauer	-	-	-	-	-
7) Citrate	+	+	+	+	+
Enzymatic activity					
1) Gelatin	+	+	+	-	-
2) Starch	+	-	-	*	-
3) IAA production	+	*	*	*	+
4) Phosphate solubilisation	+	*	*	*	+
5) Siderophore production	+	*	*	*	+

*Not reported.

at 32°C. The positive test was indicated by the change of its colour from green to blue because of the change in pH.

Property studies of endophytic isolates

The isolated bacteria were subjected to different property studies like Protease activity (Gelatin hydrolysis), Amylase Production (Starch hydrolysis), IAA production and Phosphate solubilizing ability.

Gelatin and Starch hydrolysis

Gelatin and Starch hydrolysis test was conducted by growing the organism on 1% Gelatin Nutrient Agar and 1% Starch Nutrient agar plates in that order. After 48 hours of incubation the plates were flooded with saturated solution of Ammonium Chloride (5g/10ml) and diluted Iodine solution for Gelatin and Starch utilization respectively.

IAA production and Phosphate solubilizing ability

Bacteria isolated from plant rhizosphere

produce various phytohormones in the form of secondary metabolites, the most common of which is Indole-3-acetic acid (IAA). IAA production was screened for the presence of Indole using Salkowski reagent and colour developed was measured spectrophotometrically at 536 nm using UV Spectrophotometer.

Phosphate solubilization ability was carried out by Pikovskaya's broth and the presence of Phosphate was tested by adding 750 µl of phosphate reagent (Molybdenum Blue) and colour development was measured spectrophotometrically at 680 nm by using UV Spectrophotometer.

Microbial Identification using 16S rRNA gene based molecular method

Nucleic acid was extracted from test isolates using Silica based membrane technology and its quality was detected on 1 per cent agarose gel, a high molecular weight containing single band of DNA was recorded. Fragments of 16 S rRNA gene was multiplied by using 16S rRNA-

Forward and 16S rRNA-Reverse primers. A distinct PCR amplicon (a piece of RNA or DNA which is the source for amplification or replication reaction) of 1500 base pairs band was observed which was determined on agarose gel and purified. Forward and Reverse DNA sequencing of PCR amplicon was determined by using Big Dye Terminator Version 3.1 cycle on Applied Bio systems 3730 X 1 genetic Analyzer. By using Aligner software tool complete consensus sequence of 16S ribosomal-RNA gene sequence was generated and BLAST was carried out with nucleotide collection database from NCBI GenBank. Primary 10 sequence were selected and aligned by using Clustal W alignment programme. By using Molecular Evolutionary Genetics Analysis (MEGA 10) phylogenetic tree and distance matrix was constructed.

RESULTS

Enumeration of endophytic bacterial isolates in aerial and roots of halophytic plant *Suaeda nigra*

The endophytic bacterial population in aerial parts and roots of halophytic plant *Suaeda nigra* are 3.7×10^5 cfu/g and 4.9×10^5 cfu/g respectively. Total sixteen isolates from both aerial and root parts of *Suaeda nigra* were isolated and purified by quaternary streak plate method and they were coded according to their host plant followed by part (aerial and root) they are collected and finally by numbering in Serial Number. Among 16 isolates, strain SNA-7 showed distinct morphology, phenotypic and biochemical characters which was selected for further studies. The results of cultural, biochemical and enzymatic characters are recorded in Table 2.

Colony and cell morphology

The colonies of SNA7 strain on agar medium were medium, round in shape, colourless, convex in elevation. The cells when viewed microscopically are single rods and motile. Gram's staining was carried out and the cells were gram negative in appearance. When grow in nutrient broth cells showed aerobic in nature. Grows well at temperature 25-30°C with 3% NaCl supplement, pH ranges 05-10 and salt tolerance upto 8% NaCl concentration.

Biochemical characteristic of endophytic bacterial isolates

Biochemical studies were carried out by the isolate SNA7 and compare with strain of other *Pseudomonas* species are presented in Table 2. The results showed that the SNA7 isolate were KOH positive with stringy appearance. Catalase positive when 3% H₂O₂ was added and oxidase positive when para aminodimethyl aniline oxalate solution were added. IMViC test showed Indole positive with red colour when Kovac's reagent was added, Methyl red positive with the production of red colour, Voges-Proskauer test negative with no colour and Citrate utilization positive with production of blue colour due to the change pH in the medium.

Hydrolysis of Gelatin (Protease production)

Agar plates inoculated with SNA7 was tested for gelatinase production. The plates were flooded with saturated solution of Ammonium sulphate (5g/10ml) and kept for 30 min. Gelatin hydrolysis was observed by clear zone around the culture inoculated showed positive result.

Hydrolysis of Starch (Amylase production)

48 hrs of SNA7 plates were flooded with diluted Iodine solution. The iodine reacts with the starch present in the agar plate and produces blue colour. Clear zone was observed around the inoculated culture showed positive reaction to starch hydrolysis.

Production of Indole-3-acetic acid (IAA)

IAA production was screened for the presence of Indole compounds by colorimetric assay using Salkowski reagent. Strain SNA7 was cultured and inoculated in 4ml of 3% Nutrient broth in ria vials as detailed in material and methods. After 48 hrs incubation the culture were subjected to centrifugation and the liquid from supernatant was pipetted and mixed with 1.5 ml of Salkowski's reagent. The colour intensities were measured by using UV Spectrophotometer at 536 nm. The OD values were compared with standard graph of IAA and 43µg/l of IAA production was recorded with strain SNA7.

Phosphate solubilizing ability

SNA7 culture were inoculated in 4ml of

3% pikovskaya's borth in ria vials and kept for 48 hrs incubation as mentioned in material and methods. After incubation 750 µl of phosphate reagent to the 4ml of the sample and blue colour intensities were measured by using UV Spectrophotometer at 680 nm wavelength. 2.3 µg/l was recorded with strain SNA7.

Production of Siderophore

To test the siderophore production, all the test isolates were inoculated on blue agar fo Chrome Azurol S and incubated for 72 hours at 30°C. After incubation period the plates inoculated with SNA7 shows colour change from blue to orange which indicates the positive for siderophore production.

Microbial Identification using 16S rRNA gene based molecular method

Nucleic acid from the isolate SNA7 (accession number KY595450.1) was isolated and evaluated on 1% agarose gel and obtained single band of DNA with high molecular weight. Fragments of 16S rRNA gene was multiplied by 16S rRNA-Forward-5'-GCCGTTGGGTTTCCTTGAGAAC-3' and 16S rRNA-Reverse-5'-CTTAATGCGTTAGCTGCGCC-3' primers using BDT version 3.1 Cycle sequencing kit on ABI 3730 X I Genetic Analyzer. A comparison using 16S ribosomal-RNA gene sequences from the databases revealed that the 16S rRNA gene sequence of the type strain of SNA7 displayed high levels of similarity to those of *Pseudomonas pseudoalcaligenes*. The percentage of 16S rRNA sequence similarity between strain SNA-7 and *Pseudomonas pseudoalcaligenes* was 100%. The phylogenetic tree reconstructed using the neighbour-joining algorithm also confirmed that the strain SNA7 and *Pseudomonas pseudoalcaligenes* clustered together and constituted a separate group from the other closely related species.

DISCUSSION

Similar studies were carried out by difference research workers on endophytic bacterial interaction with the host plant especially on endophytic bacteria belonging to the genus *Pseudomonas* and halophytic *Suaeda* family are discussed in this session.

Yachana Jha et al. in 2011¹⁹ studied on

genus *pseudomonas* and stated that combination of endophytic *Pseudomonas pseudoalcaligenes* and rhizospheric *Bacillus pumilus* in paddy has an ability to promote resistance to the host plant from biotic and abiotic stress condition by inducing osmoprotectant and antioxidant proteins rather than by endophytic or rhizospheric bacteria alone at the early stages of development.

Mieke Rochimi Setiawati et. al.,(2021)²⁰ in their study isolated strain *Pseudomonas stutzeri* K10P4 from Karawang increase Nitrogen uptake (3.5%), dry weight (20.93 mg) and chlorophyll (67.51 µmol) in rice crops under saline environments.

Daniela Soledad Riva et al.,(2020)²¹ in their study revealed that the *P. pseudoalcaligenes* activate changes in plant defense mechanism and sugar metabolism leading to better tolerance against *Sclerotium rolfsii*.

Morahem Ashengroph et al., in 2013²² isolated strain *P. pseudoalcaligenes* TPS8, was screened from tea plantation soil, which has high ability for caffeine tolerance (upto 15g/l) and caffeine degradation (80.2%) without any external carbon/nitrogen source addition.

Recent research findings was also correlated with present study, according to de Vilhena Araujo, E et. al., (2020)²³ Endophytes have been associated with the production of secondary metabolites that may confer environmental advantages to the host. Similar findings was also studied by Eid A.M. Fouda et. al. (2021)²⁴ that Endophytes promote plant growth and fitness through the production of phytohormones or biofertilizers or by alleviating abiotic and biotic stress tolerance and strengthening plant immune system.

Jaborova D. et. al., (2020)²⁵ isolated four endophytic bacterial isolates (GS2, GS5, GS8 and GS10) from Ginger (*Zingiber officinal* Rosc) showed positive for IAA production, siderophore production and phosphate solubilization activity and production of enzymes.

Similar results were obtained by Abdelshafy Mohamad et. al., (2020)²⁶ in their study showed that endophytic bacteria exhibited several plant growth-promoting activities in vitro, including auxin synthesis, diazotrophy, phosphate solubilization, siderophore production, and production of lytic enzymes (i.e., chitinase,

cellulase, protease, and lipase)

Papik J et.al., (2020)²⁷ finds that Endophytic bacteria promote plant growth and protect their host plant against pathogens, herbivores, and abiotic stresses including drought, increased salinity and pollution.

CONCLUSION

Pseudomonas spp. having vast potential in production of siderophores, ACC deaminase, variety of bioactive secondary metabolites, phosphate and potassium solubilization and are effective aerobic degraders of polychlorinated biphenyls (PCB) and also used as bio-inoculants in many biological applications such as bioremediation, biological nitrogen fixation, antagonism. Hence, *Pseudomonas* spp. was characterized as an effective organism to explore its ability in various research fields. In this present study, an attempt was made to study *Pseudomonas pseudoalcaligenes* isolated from *Suaeda nigra* which had higher potential in producing bioactive secondary metabolites and was first of its kind reported in halophytic *Suaeda nigra*.

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CONFLICT OF INTEREST

All authors declare that there is no conflict of interest in any manner.

AUTHORS' CONTRIBUTION

All authors listed have made a substantial direct, personal and intellectual contribution to this research work and all authors edited, proofread and approved for publication of this manuscript.

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DATA AVAILABILITY

All datasets generated or analyzed during this study are included in this manuscript.

ETHICS STATEMENT

This research work does not contain any study involving or experimenting on humans and animals performed by any of the authors.

INFORMED CONSENT

Not applicable

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Screening and Isolation of Plant Growth Promoting, Halotolerant Endophytic Bacteria from Mangrove Plant *Avicennia officinalis* L. at Coastal Region of Corangi Andhra Pradesh

J. Lavanya, D. Sandhya Deepika, M. Sridevi

10.18805/ag.D-5607

ABSTRACT

Background: Main objective of this study is to isolate and characterize halo tolerant plant growth promoting endophytic bacteria from leaves and pneumatophores of mangrove plant *Avicennia officinalis* L. Isolates were also screened for their ability to provide resistance to extreme salt tolerance and temperatures and to produce exo enzymatic activity like catalase, amylase, protease, phosphate solubilization and plant growth promoting hormone (Indole 3-acetic acid).

Methods: The present study was carried out during 2020-21 to 2021-22 at field and laboratory level. Eleven endophytic bacterial isolates were obtained from mangrove *Avicennia officinalis* L. grown at coastal region of Corangi Wildlife Sanctuary, East Godavari. All Isolates were enumerated, purified and preserved for further studies.

Result: Out of eleven isolates obtained bacteria "AOL2" isolated from leaves of *Avicennia officinalis* L. was found promising in production of exo enzymes, Indole 3-acetic acid (IAA) and phosphate solubilization parameters. Isolate AOL2 was a Gram's negative, motile, moderately halophilic, rod shaped diplobacilli which grows optimally at 32°C, pH 8.3 and had a salt tolerance of 10% NaCl. Microbial identification was carried out by morphological, biochemical and by 16S rRNA sequence. Based on nucleotide homology and phylogenetic analysis isolate AOL2 showed high degree of resemblance with *Salinicola salarius*. On the basis of the experimental findings, strain *Salinicola salarius* AOL2 had a capability in producing plant growth promoting substances, exo enzymes, phosphate solubilization ability and was first reported in endophytic bacteria isolated from *Avicennia officinalis* L. that can be studied further.

Key words: Catalytic activity, Endophytic bacteria, Mangrove, Plant growth promoters, *Salinicola*.

INTRODUCTION

Direct extraction of secondary metabolites from mangrove plants that have superior in antibacterial activity requires a large amount of biomass and this is potentially damage the mangrove community and their ecosystem. Endophytic bacteria that live in plant tissues can be used to obtain the bioactive compounds efficiently. Endophytic microbes are groups of organisms associated with various tissues and organs of several terrestrial and aquatic plants (Stone *et al.*, 2000). Some endophytic bacteria are known to produce secondary metabolites that are useful in pharmaceutical industry (Gouda, *et al.*, 2016). Endophytic organisms are those that live internally in apparently healthy and asymptomatic hosts. Endophytes appear to be ubiquitous; indeed, no study has yet shown the existence of a plant species without endophytes (Nisa *et al.*, 2015). Microorganisms from marine ecosystems contain useful enzymes, proteins, antibiotics and salt tolerant genes that have pharmacological significance (Thatoi *et al.*, 2013). Endophytic bacteria had several potential applications in medicine and in other various sectors of biotechnology including agriculture. One of the potential applications of bacterial endophytes in agricultural is to enhance the growth of the agricultural crops.

Mangrove belong primarily to the families *Rhizophoraceae*, *Acanthaceae*, *Lythraceae*, *Combretaceae* and *Arecaceae*; that grow in dense thickets along tidal

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estuaries, in salt marshes and on muddy coasts. Mangrove ecosystem is a bridge between terrestrial and marine environment and harbors unique microbial diversity. Recently, among the marine microorganisms, marine derived bacteria have been recognized as good resources for new biologically active secondary metabolites including antitumor, antibacterial, antiviral, antifungal and enzyme inhibitor compounds. Bacterial diversity from these ecosystems has been studied worldwide for their unique biochemical processes. Various groups of bacteria are typically present in the mangrove ecosystem (Holguin *et al.*, 2001) where they perform diverse activities including photosynthesis, nitrogen fixation and methanogenesis

(Das *et al.*, 2007). Bacterial communities can be found living freely in mangrove sediments (Roy *et al.*, 2002) or as endophytes associated with the native flora (Garcias-Bonet *et al.*, 2012). Microorganisms from mangrove ecosystems contain useful enzymes, proteins, antibiotics and salt tolerant genes, all of which have biotechnological significance.

Avicennia officinalis L. found sporadically on the banks of rivers and rarely found near the sea. It prefers clay soil and usually found inland. *Avicennia officinalis* L. is a species of mangrove also known as Indian mangrove.

One of the bacterial isolates in this study belongs to genus *Salinicola*, a member of the family Halomonadaceae, was originally described with *Salinicola salarius* as the type species. The genus comprises six recognized species with validly published names: *S. socius*, *S. halophilus*, *S. salarius*, *S. rhizosphaerae*, *S. peritrichatus* and *S. acroporae*. *Salinicola* strains have been isolated from different environments including seawater, salt mines, a solar saltern, the rhizosphere of mangrove and deep-sea sediment. *Salinicola* strains are described as Gram-stain-negative, aerobic, rod-shaped, motile and moderately halophilic. *Salinicola* strain isolated from the leaves of mangroves, *Avicennia officinalis* L. was studied in this experiment.

MATERIALS AND METHODS

This present study was conducted during 2020-21 and 2021-22 at Department of Botany andhra University, Visakhapatnam, Andhra Pradesh (Fig 1).

Sample collection

Samples were collected from leaves and pneumatophores of mangrove plant *Avicennia officinalis* located at mangrove zone of Corangi Wildlife Sanctuary, East Godavari district within latitude of 16°49'53.0"N and longitude of 82°20'12.0"E

(16.831389, 82.336667). The collected samples were sealed in sterile container before sending to the Research Laboratory (Fig 5).

Surface sterilization and Sterility check

The sample was first washed with sterile water, blotted dry with filter paper dipped in 70% ethanol and kept for about 1 min. The sample was again washed in sterile water dipped in 4% Sodium hypochlorite solution and kept for about 5 minutes. The whole process was repeated twice.

For sterility check, the shoots were rolled on nutrient agar plates as well as 0.1 ml aliquot from the final wash was inoculated to 10 ml nutrient broth (NB) (Gyaneshwar *et al.*, 2001). Samples were discarded if any growth was detected in the sterility check.

Isolation of endophytic bacteria from leaves and pneumatophores of mangrove plant *Avicennia officinalis* L.

After surface sterilization of the explants, 1g of each sample was grounded into paste and diluted by serial dilution technique. The highest diluted solution (4th) were spread (100 µl) on Zobell Marine Agar plates (Composition-Zobell-Marine Broth 2216 Himedia @ 5.5% + Agar agar @ 1.5%) and incubated. After incubation individual colony of a different type were observed isolated and purified by quaternary streaking method on Zobell Marine Agar plates with a code assigned. Pure cultures obtained were subjected to further studies. They were also named according to their host plant followed by part (leaf or pneumatophore) they are collected and finally by numbering in serial number (Table 2).

Preservation of endophytic bacterial isolates

All the isolates were streak on 3% sodium chloride (NaCl) nutrient agar plates and stored with 20% (w/v) glycerol and

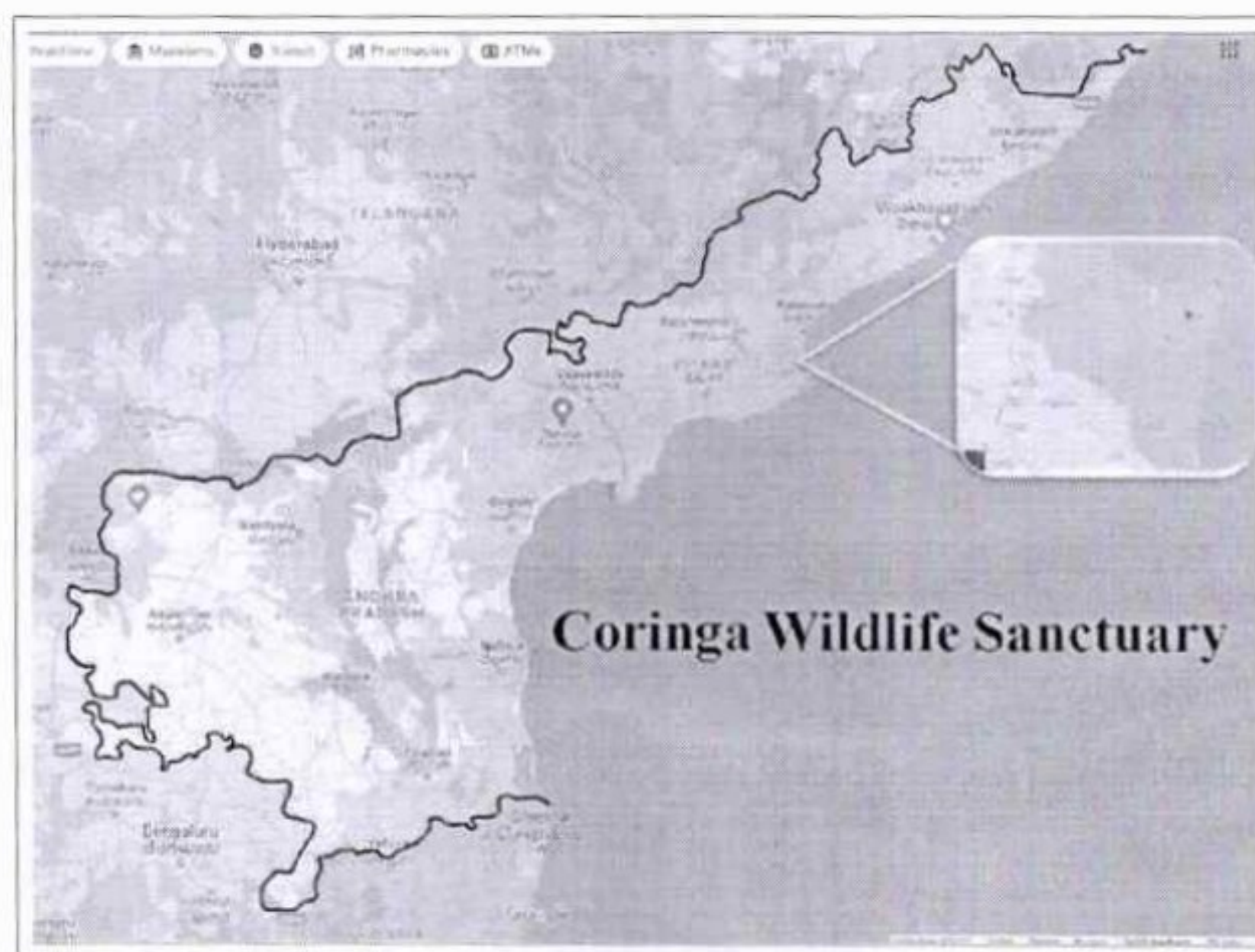


Fig 1: Sample collection site (Coringa Wildlife Sanctuary, East Godavari).

stored at -20°C. Viability of the cultures was retrieved by periodic sub-culturing into new media at monthly intervals (Fig 2).

Phenotypic characterization of the endophytic isolates

Eleven isolates were inoculated on 3% NaCl Nutrient agar and the colony morphology was observed as per guidelines given by Hawksworth *et al.* (1983). The purified cultures, at log phase were observed microscopically for the cell morphological characters as per the method outlined by Aneja, (2006).

Growth at different NaCl concentration

The young cultures were streaked on Nutrient agar plates with different salt percentages *i.e.* 8% NaCl, 10% NaCl and 15% NaCl. The streaked plates were incubated at 32°C and observations on growth was made for 24hrs and 48 hrs (Fig 4).

Biochemical characterization of endophytic bacterial isolates

12 hours old cultures were subjected to catalase test, oxidase and KOH string test as per the methods outlined by Aneja (2006). Indole, Methyl Red, Voges Proskauer and

Citrate Utilization Tests was conducted as per the method summarized by Seeley (1962).

Property studies of endophytic isolates

The isolated bacteria were subjected to different property studies like Protease activity (Gelatin hydrolysis), Amylase Production (Starch hydrolysis), IAA production, Phosphate solubilizing and Sideophore production ability (Fig 3).

Gelatin and starch hydrolysis

Gelatin and Starch hydrolysis test was conducted by growing the organism on 1% Gelatin Nutrient Agar and 1% Starch Nutrient agar plates in that order. After 48 hours of incubation the plates were flooded with saturated solution of Ammonium

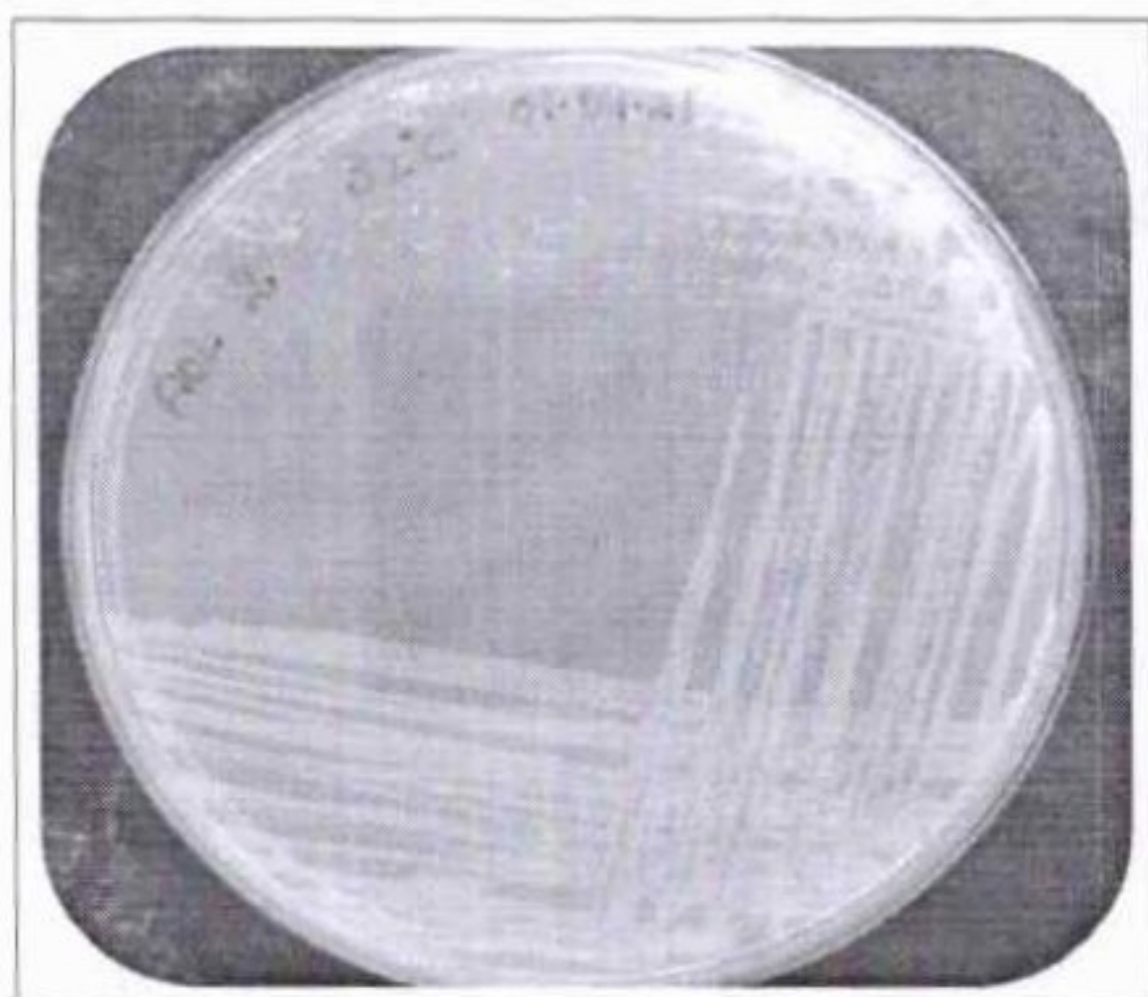


Fig 2: AOL2 Colonies isolated from *Avicennia officinalis* L.

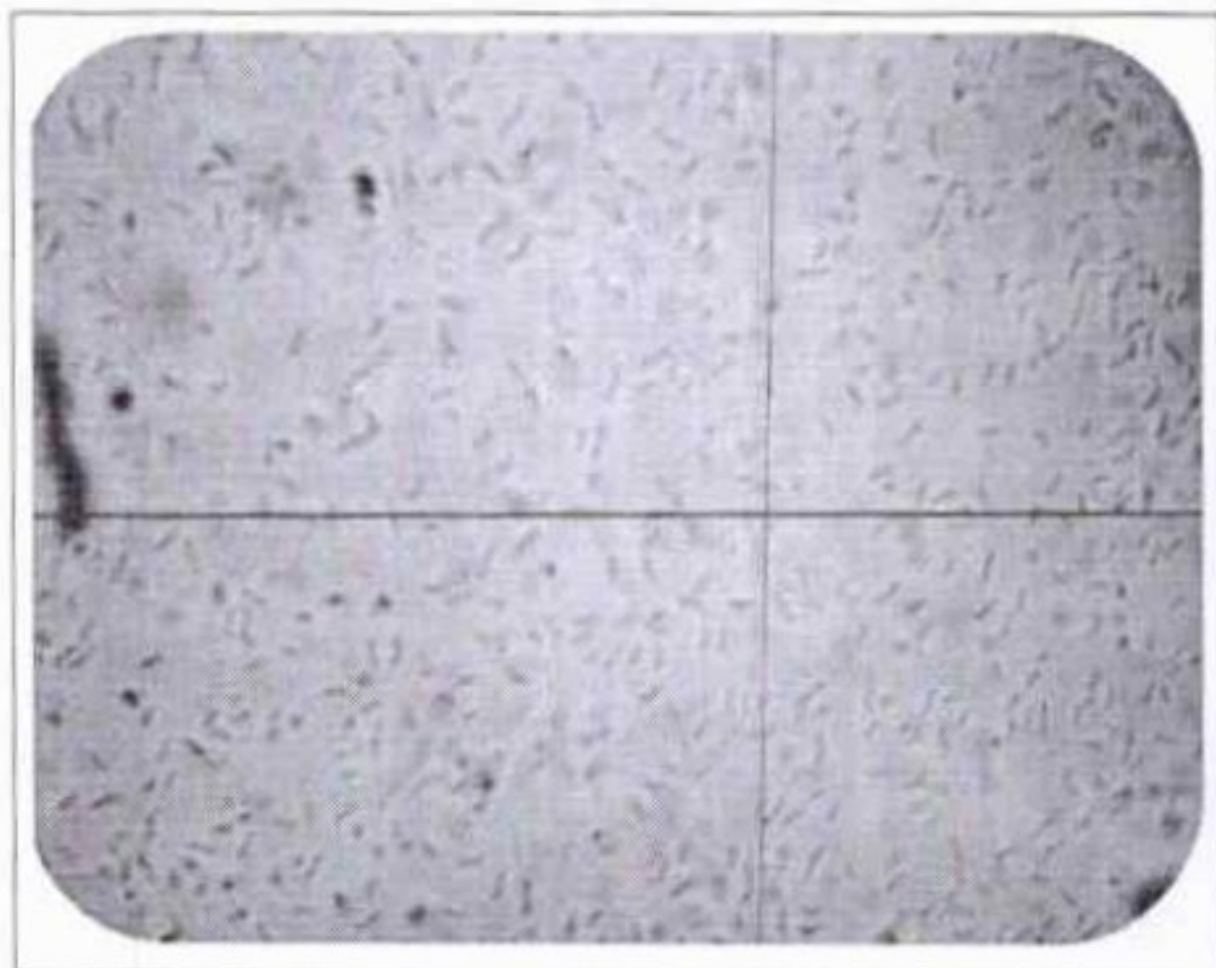


Fig 3: Endophytic bacteria under 100X.

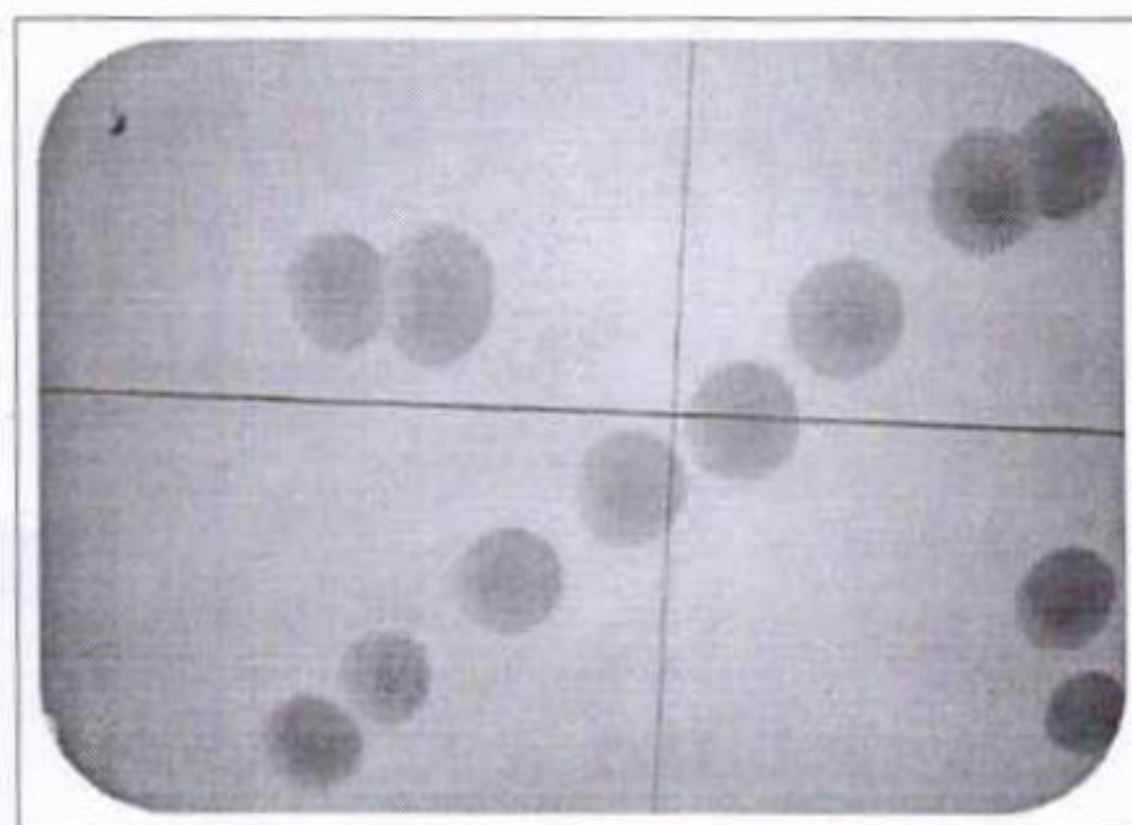


Fig 4: Colony morphology of strain AOL2.



Fig 5: *Avicennia officinalis* L. leaves and pneumatophores.

Chloride (5 g/10 ml) and diluted Iodine solution for Gelatin and Starch utilization respectively.

IAA production and phosphate solubilizing ability

Bacteria isolated from plant rhizosphere produce various phytohormones in the form of secondary metabolites, the most common of which is Indole-3-acetic acid (IAA). IAA production was screened for the presence of Indole using Salkowski reagent and colour developed was measured spectrophotometrically at 536 nm using UV Spectrophotometer.

Phosphate solubilization ability was carried out by Pikovskaya's broth and the presence of Phosphate was tested by adding 750 µl of phosphate reagent and colour development was measured spectrophotometrically at 680nm by using UV Spectrophotometer (Fig 5).

Microbial identification using 16S rRNA gene based molecular method

DNA was isolated from the culture. Its quality was evaluated on 1.0% agarose gel, a single band of high-molecular weight DNA has been observed. Fragment of 16S rRNA gene was amplified by 16S rRNA-F and 16S rRNA-R primers. A single discrete PCR amplicon band of 1500 bp was observed when resolved on agarose gel. The PCR amplicon was purified to remove contaminants. Forward and reverse DNA sequencing reaction of PCR amplicon was carried out with 16S rRNA-F and 16S rRNA-R primers using BDT v3.1 Cycle sequencing kit on ABI 3730xl Genetic Analyzer. Consensus sequence of 16S rRNA gene was generated from forward and reverse sequence data using aligner software. The 16S rRNA gene sequence was used to carry out BLAST with the 'nr' database of NCBI GenBank database. Based on maximum identity score first ten sequences were selected and aligned using multiple alignment software program Clustal W. Distance matrix and phylogenetic tree was constructed using MEGA 10. 7.

RESULTS AND DISCUSSION

Enumeration of endophytic bacterial population in leaves and pneumatophores of mangrove plant *Avicennia officinalis* L.

The endophytic bacterial population in leaves (3.5×10^5 cfu/g) and pneumatophores (4.2×10^5 cfu/g) of mangrove plant *Avicennia officinalis* were isolated. Three isolates from leaves and eight isolates from pneumatophores of *Avicennia officinalis* were obtained and purified by Streak plate technique.

Among 11 isolates, which belongs to the genus *Bacillus*, *Exiguobacterium*, *Salinicola*, *Pseudomonas*, *Enterobacter* and *Vibrio*, Strain AOL2 (*Avicennia Officinalis* Leaf strain-2) is of particular interest due to its salt tolerance at 10-15% NaCl and also showed distinct morphology and phenotypic characters and was selected for further studies (Fig 2 to 5) (Table 1).

Colony and cell morphology

The colonies of AOL2 strain on agar medium were medium, round in shape, yellow in colour, convex in elevation. The cells when viewed microscopically are single rods and motile.

Gram's staining was carried out and the cells were gram negative in appearance. When grow in nutrient broth cells showed aerobic in nature and are non-endospore forming.

Growth at saline conditions

AOL2 grows well at temperature 25-30°C with 3% NaCl nutrient agar, pH ranges 05-10 and salt tolerance up to 15% NaCl nutrient agar. Similar findings were presented by Ali *et al.* (2017) in their study with *Bacillus pumilus* AM11 and *Exiguobacterium* sp. AM25 showed significantly higher growth in saline media.

Biochemical characteristic of endophytic bacterial isolates

Biochemical studies were carried out by the isolate AOL2 and presented in Table 2. The results showed that the AOL2 isolate were KOH positive with stringy appearance. Catalase positive when 3% H₂O₂ was added and oxidase negative when para-aminodimethyl aniline oxalate solution were added. IMViC test showed Indole positive with red colour when Kovac's reagent was added, Methyl red positive with the production of red colour, Voges-Proskauer test negative with no colour and Citrate utilization positive with production of blue colour due to pH change in the medium. AOL2 showed positive result with Gelatin (0.5 cm) and Starch (0.8 cm) hydrolysis (Table 2).

Indole-3-acetic acid (IAA) production

IAA production was screened for the presence of Indole compounds by colorimetric assay using Salkowski reagent. Strain AOL2 was cultured and inoculated in 3% Nutrient broth with 0.5% Tryptophan. After 48 hrs incubation the culture were subjected to centrifugation and the supernatant was mixed with 1.5 ml of Salkowski's reagent. The colour intensities were measured by using UV Spectrophotometer at 536 nm. The OD values were compared with standard graph of IAA and 7.5 µg/ml of IAA production was recorded with strain AOL2 (Table 2). Similar results were obtained by Haridom *et al.* (2015).

Phosphate solubilizing ability

AOL2 culture were inoculated in 4 ml of 3% pikovskaya's broth in ria vials and kept for 48 hrs incubation as mentioned in material and methods. After incubation 750 µl of phosphate reagent to the 4ml of the sample and blue colour intensities were measured by using UV Spectrophotometer at 680 nm wavelength. 3.5 ppm was recorded with strain AOL2. Similar results were also reported Rylo Sona Janarthine *et al.* (2011) in their study isolated Endophytic bacteria from the surface sterilized pneumatophores of

Table 1: Coding of endophytic bacterial isolates.

Plant	Plant part	Isolates*
<i>Avicennia officinalis</i> L.	Leaf (03 isolates)	AOL1, AOL2, AOL3
	Pneumatophore (08 isolates)	AOP1, AOP2, AOP3, AOP4, AOP5, AOP6, AOP7, AOP8

*A- *Avicennia*, O- *Officinalis*, L- Leaf, P- Pneumatophores.

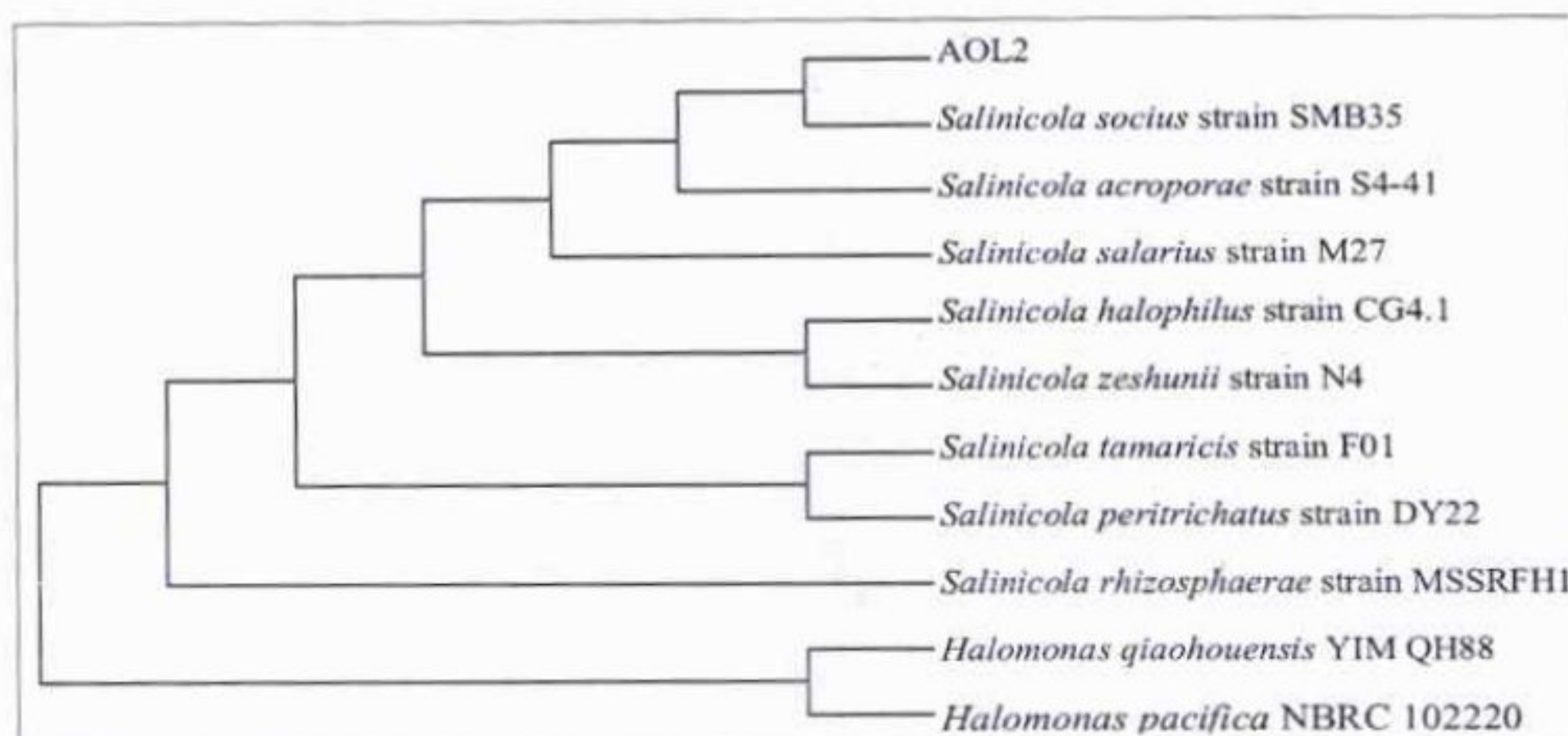


Fig 6: Phylogenetic tree based on nucleotide sequence of the 16S rRNA sequence of AOL2 and other related type strains.

Table 2: Phenotypic studies of endophytic bacteria isolates strain AOL2.

Parameter	Results
Morphological observation	
Gram's reaction	-ve
Cell shape	Rod
Endospore forming ability	-
Motility	+
Biochemical studies	
KOH	+
Catalase	+
Oxidase	-
Indole production	+
Methyl red	+
Voges-proskauer test	-
Citrate utilization	+
Enzymatic assay	
Starch hydrolysis (Amylase production)	0.5 cm
Gelatin hydrolysis (protease production)	0.8 cm
Phosphate solubilization	3.5 ppm
IAA production	7.5 µg/ml

Avicennia marina. They identified isolates as GU930357 (*Bacillus* sp.), GU930358 (*Enterobacter* sp.) and GU930359 (*S. aquimarina*). *Bacillus* sp., fixed nitrogen, *S. aquimarina* produced siderophore and all the three strains solubilized phosphate molecule. Same findings were also obtained by El-Tarabily and Youssef, (2010) conducted a study on mangrove *Avicennia marina* rhizosphere identified 129 bacterial strains with the ability to solubilize rock phosphate, with *Oceanobacillus picturae* able to mobilize 97% of this mineral. Richardson (2009) in their study stated that Phosphate solubilization by microorganisms has an important function in supplying phosphorus (P) to plants with the potential to be used as inoculants. Kim *et al.* (1997) also reported that the ability of microorganisms to solubilize phosphate correlates with the ability to produce organic acids and/or extracellular polysaccharide.

Microbial identification using 16S rRNA gene based molecular method

Isolated DNA from the culture was evaluated on 1.0% agarose gel and single band of high molecular weight DNA was observed. Fragment of 16S rRNA gene was amplified by 16SrRNA-F-5'-TCTTCGGACTTCGCGCTATC-3' and 16SrRNA-F-5'-CAGACCAGCTACGGATCGTC-3' primers using BDT v3.1 Cycle sequencing kit on ABI 3730xl Genetic Analyzer. A comparison using 16S rRNA gene sequences from the databases revealed that the 16S rRNA gene sequence of the type strain of AOL2 displayed high levels of similarity to those of *Salinicola salarius*. The percentage of 16SrRNA sequence similarity between strain AOL2 and *Salinicola salarius* was 99.19%. The phylogenetic tree reconstructed using the neighbour-joining algorithm showed that the strain AOL2 and *Salinicola salarius* clustered together and constituted a separate group from the other closely related species (Fig 6).

CONCLUSION

Interaction between plants and endophytic bacteria is very crucial in the development and evolution of both organisms. Endophytes contributes nutrients, resistance to the plants from extreme biotic and abiotic stress. Endophytes produce several active secondary metabolites that are useful in many applications. Much research is still needed to understand their relationship. Present study revealed the interaction between endophytic bacteria and mangrove plants. Isolated strain *Salinicola salarius* AOL2 has an ability in producing plant growth promoting phytohormones, bioenzymes, phosphate solubilization and was first reported endophytic bacteria isolated from *Avicennia officinalis* and had importance in further research studies.

Conflict of interest: None.

Authors' contribution

All authors listed have made a substantial direct, personal and intellectual contribution to this research work and all

authors edited, proofread and approved for publication of this manuscript.

Data availability

All datasets generated or analyzed during this study are included in this manuscript.

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HETEROSTRUCTURE COMPOSITE OF FeWO_4 /CHITOSAN via HYDROTHERMAL FOR DEGRADATION OF BRILLIANT GREEN DYE AND INACTIVATION OF PATHOGENS

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ABSTRACT

*In this paper, we have reported the fabrication of chitosan based iron tungstate (FeWO_4) heterostructure composite via hydrothermal route. The prepared composite was compared with its bare sample FeWO_4 in their structural, electronic and optical properties. In this connection, the analytical instruments like XRD, FTIR, TEM, SEM EDX, XPS, TGA and UV-DRS were employed in this study. Brilliant green is a model dye pollutant was used in this study to determine the photocatalytic performance of prepared composite and bare FeWO_4 . As a result, the findings show that 20 mg/L of FeWO_4 /Chitosan at pH-10 is an effective photocatalyst for degradation 10 mg/L BG dye solution. In addition the antimicrobial activity of prepared samples also measured over the pathogens of *E.coli* and *S.aureus*. The analysis results drew that prepared FeWO_4 /chitosan composite showed promising applications in degradation of BG dye and inactivation of pathogens effectively.*

Keywords FeWO_4 /chitosan; heterostructure composite; Brilliant green; dye degradation; antimicrobial activity.

Introduction

A known soluble natural product chitin derived from deacetylated chitin, being constructed by repeating units of 1,4 linked 2-deoxy-2-aminoglucose is a chitosan [1-2]. Chitosan has peculiar properties of structural, biological, physical and chemical characteristics which extend to biocompatibility, biodegradability and antimicrobial properties [3]. Chitosan renders a new generation of bio-polymer nanocomposites with semiconductor metal oxides [4]. Due to chitosan can act as free radical scavengers with the presence of hydroxyl groups which can donate hydrogen atom or electron to free radical [5]. In addition, chitosan has the power to chelate metal ions which involved in organic reaction transformations [6]. Chitosan based composites showed a great

photocatalytic activity significantly TiO_2 /chitosan porous materials for methylene blue (MB) and methyl orange (MO) degradation [7-8], ZnO /chitosan for direct blue 78 [9], CdS /chitosan for congo red and CI acid red 66 [10-11], Cu_2O /chitosan composite for degradation of Brilliant green dye efficiently [12] and niobium (V) based chitosan composite was effective catalyst for indigo carmine [13]. Therefore, more probabilities for preparing chitosan based semiconductor composites for photocatalytic applications and antimicrobial activity. Semiconductor metal oxide nanoparticles are cost-effective, non-toxic, eco-friendly and energy-efficient. Tungstates (MWO_4) are widely used in microwave ceramics, luminescence, catalytic fields and optical properties [14]. Tungsten oxide and iron oxide nanoparticles have gained much attention over other metal oxides for their significant surface and optical



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संत कवियों की सामाजिक समरसता - रज्जब वाणी के सन्दर्भ में

लेखिका : डॉ के नीरजा

असोसिएट प्रोफेसर इन हिन्दी

एस के आर महिला महा विद्यालय

राजमहेंद्रवरम ।

सामाजिक समरसता का अर्थ है सामाजिक समानता अर्थात् जातिगत एवं धर्मगत भेदभाव का जड़ से उन्मूल कर लोगों में परस्पर प्रेम एवं सौहार्द बढ़ाना तथा समाज में सभी वर्गों के मध्य एकता स्थापित करना । समरसता का अर्थ है सभी को अपने सामान समझना । सृष्टि में सभी मनुष्य एक ही ईश्वर की संतान हैं और उनमें एक ही चैतन्य विद्यमान है ,इस बात को हृदय से स्वीकार करना ।

यदि देखा जाय तो पुरातन भारतीय संस्कृति में कभी भी किसी के साथ किसी भी तरह भेदभाव स्वीकार नहीं किया गया है । काल प्रवाह में हमारी एकात्म भावना ,सामाजिक समरसता पर आततायियों के प्रहारों की धूल जम गई । तब भारतीय संत परम्परा ने पुनः इसे जीवंत करने का कार्य किया । काल के प्रवाह में उत्पन्न मनुष्य -मनुष्य के मध्य भेदभाव को मिटाकर समरस समाज स्थापना का प्रयास किया । संत कवियों के जीवन ,दर्शन और साहित्य का मूलाधार सामाजिक समरसता ही रही है । संत कवियों के विचारों में व्यापकता एवं मानव मात्र के कल्याण का भाव समाहित है । समाज में घर कर बैठी अनेकानेक जड़ताओं ने मनुष्य को बांधा है । ये जड़ बंधन ही समाज -समाज के बीच ,मनुष्य -मनुष्य के बीच समरसता स्थापित होने में बाधक बनते हैं । संतों ने इस विषय को पहचाना । वे इन जड़ताओं से मानव मुक्ति की कामना की है । अपनी वाणी के माध्यम से वे जन जन के बीच प्रेम ,विश्वास ,मानवता सहयोग एवं अपनत्व के बीज बोने का प्रयास की है ।

भारतीय संत परंपरा में सामाजिक ,प्राकृतिक ,सांस्कृतिक, आर्थिक सभी वर्तमान व्याधियों का सटीक उपचार विद्यमान है । इन व्याधियों से -सामाजिक न्याय ,मानवीय समानता ,संवेदनशीलता अदि के उपायों को अपनी वाणीयों में कबीर ,रैदास ,नानक ,मीरा, दादू ,मलूकदास ,रज्जब ने मुखर स्वर दिए हैं । इन संतों की माला में प्रथम वैष्णव मुस्लिम संत हुए हैं रज्जब अली खां । यहाँ पर मैं अपनी बात संत दादूदयाल के प्रिय शिष्य तथा संत कवि रज्जब के माध्यम से कहना चाहती हूँ ।

मध्ययुगीन ज्ञानमार्गी निर्गुण भक्तिधारा के महान संत दादूजी के 152 शिष्य हुए हैं । उनमें रज्जब गुरु के प्रिय शिष्यों में एक है । इनका जीवनकाल सं.1624 से सं.1746 तक माना गया है । इनका जन्म स्थान सांगनेर था । दादूदयाल के शिष्य बनकर आमेर में स्थित दादूद्वारा में रहने लगे। रज्जब जी ने दादूवाणी का संग्रह तथा विभिन्न अंगों में बांधने का कार्य भी किया। यही नहीं संत रज्जब ने देश के हर संप्रदाय ,धर्म ,जाति के संतों की वाणी का संकलन 'सर्वांगी 'में किया है। संत रज्जब विद्वान और आध्यात्मिक महापुरुष थे। जिनके रज्जब वाणी में पांच हजार से अधिक स्वरचित कविताएँ संग्रहीत हैं।

संत कवियों ने जन -जन में छुपे एकात्म भाव को जगाने का प्रयास किया। लोक साहित्य की रचना की। संत साहित्य का उद्देश्य 'लोक ' में फैले अविश्वास ,अनास्था एवं कुरीतियों को दूर करना था। संत रज्जब ने जीवन की सार्थकता के लिए दया ,ममता और करुणा से जुड़ने की आवश्यकता पर बल दिया है। निर्वैरता को दया का प्रथम एवं मुख्य लक्षण माना है।

मुख्य दया निर्वर है ,सब जीवहुँ प्रतिपाल।

तो रज्जब तिस प्राणी ने ,भेल्या मंगल माल।। [1]

रज्जब का कहना है कि सारी सृष्टि को ब्रह्मकृत मानकर सब में ब्रम्ह को देखने की आत्मदृष्टि रखने पर कोई भी प्राणी पराया या वैरी नहीं रह जाता। तभी मन में दया का भाव एवं जीवदया का भाव विकसित होती है। सब ही सब के रक्षक होते हैं।

मनुष्य ने सभ्यता के विकास के साथ ही स्वार्थी की अंधी सोच ,छोटी और खोटी समझ के वश में दूसरों का अहित सोचने-चाहने की आदत भी विकसित कर ली है। इसे अब छोड़ देना चाहिए -

राग द्वेष कासों करहिं ,सब में साहिब जान।

रज्जब बुरा न बाँछिये ,छाड़ देहगत बाण ॥ [2]

रज्जब चाहता है कि सब जीवों में परमात्मा ,अल्लाह को उपस्थित जानकर सबके प्रति राग -द्वेषरहित हो ,प्रेम के भाव रखने चाहिए। किसी का भी बुरा नहीं चाहना और अपने मन के अहितकारी भावों का त्याग कर देना चाहिए।

जंतु हिंसा का खण्डन करते हुए एक साखी में रज्जब जी कहते हैं कि -

गोस्फुन्द गो मेष मजूर ,हमशीर सब भाई।

रज्जब ऐन अजीज बोलिये ,गाफिल गोशत खाई ॥ [3]

ये मनुष्य जीवों को ही नहीं मनुष्य ही मनुष्य की भी हत्या कर रहे हैं। वैसे तो किसी भी प्राणी की हत्या नहीं करनी चाहिए। किन्तु मनुष्य की हत्या तो सर्वथा गहित कार्य है। नीच कर्म है ,पाप है। जिसका फल भी अवश्य ही भुगतना पड़ता है -

हंस हते हत्या सही ,परि आदम अघ अधिकाय।

रज्जब निरखहु नर उसि ,पन्नग पूँछ गरि जाय ॥ [4]

साँप के उदाहरण से रज्जब कहते हैं कि साँप जैसे मनुष्य को काटता है तब उसकी पूँछ गल जाती है ,अन्ध को डसने से नहीं गलती है। अतः मनुष्यों की हत्या से लगा पाप जघन्य है। सबसे बुरा है। इसका प्रयत्न नहीं।

रज्जब ने संत परंपरा का निर्याह करते हुए कई सटीक दृष्टान्त और तर्क देकर 'विवेक समता और ' में मानवीय ,भौतिक ,आत्मिक समता की स्थापना की है -

चार वर्ण षट दार्श मधि ,एक रूप एक ही मिले।

रज्जब इमि समता सुलभ ,समझ साधु सो मिल चले ॥ [5]

चार वर्णों के लोग -ब्राह्मण ,क्षत्रिय ,वैश्य,शूद्र भी विचारपूर्वक देखा जाय तो एक ही ब्रह्मा द्वारा उत्पन्न हैं तथा अध्यात्म -धर्म -दर्शन -कनफटे नाथ ,जैन ,बौद्ध सन्यासी ,सूफी फकीर ,शेख आदि परस्पर भिन्न होने पर भी एक ही आत्मा को धारण किये हैं तथा गहराई से देखें तो जान रूप में एक ही ईश्वर ,अल्लाह ,ब्रह्मा में पुनः विलीन हो जाते हैं। रज्जब का कहना है कि किसी भी धर्म सम्प्रदाय के अनुयायियों के विवेकपूर्ण समता -एकता के दृष्टि धारण करनी चाहिए।

रज्जब ने भारत समाज में वैमन्यस्य के स्थान पर सौहार्द कटुता के स्थान पर मृदुता और घृणा के स्थान पर सहिष्णुता की भावना जागृत करने में अपनी महत्वपूर्ण भूमिका निभाई। यह वह समय था जब विदेशों से विजेता के रूप में मुस्लिमान यहाँ आए थे। दो पृथक सभ्यताएँ और संस्कृतियाँ आमने सामने खड़ी थी। टकराव के स्थान पर सौहार्द और सहिष्णुता ही केवल एक मार्ग था जिस पर चलकर सामाजिक समरसता और मेल जोल का वातावरण बनाया जा सकता था। रज्जब में उस मिलान सेतु की दूरदृष्टि मौजूद थी।

यह सारी पृथ्वी ही एक पुस्तक के सामान है। वेद और कुरान --

रज्जब यसुधा वेद सब , कुल आलम सु कुरान।

पंडित खाजी वै बडे ,दफ्तर दुनिया जान ॥ [6]

अर्थात् यह सारी पृथ्वी वेद सामान है और सारा विश्व कुरान है। बड़ा जान रखनेवाले पंडित और काजी लोग इन ग्रंथों में संकलित जान बेचनेवाले हैं। यह संसार उनका दफ्तर है।

रज्जब मानवतावादी थे और मानवता से प्रेम करते थे उनके सामने हिन्दू -मुस्लिमान की कोई अंतर नहीं था। इसका प्रमाण उनका यह कथन है।

पाने पुस्तक एक के हिन्दू मुसलमान।

सबमें विद्या एक ही ,पढ़ें सु पंडित प्रान ॥ [7]

उनके लिए धर्म ,संप्रदायगत विभेद नितांत व्यर्थ के जाल -जन्जाल हैं। भारतीय समाज में हिन्दू मुसलमान को एक ही राष्ट्रदेव के अंग बताया --

दोनों भाई हाथ पग ,दोनों भाई कान।

दोनों भाई नैन हैं ,हिन्दू मुसलमान ॥ [8]

रज्जब की सोच और चिंतन से आज और आनेवाले काल को पुनः शिक्षा लेनी होगी। यसुदेव कुटुम्बकम की अवधारणा को अखंड और संवेदित मान्यता के निर्माण में लगाया जा सकता है।

सच्चे भक्त के बारे में बताते हुए रज्जब कहते हैं कि

येते दोष रहित भज राम।

जन रज्जब केवल निष्काम ॥ [9]

और राम को भजना -उसकी बनायी सृष्टि को भजना ,इसकी संरक्षा ,सुरक्षा और विकास में स्वयं को तन,मन,आत्मा से लगाना है यही एक मुक्ति मार्ग है। और अन्तः यही पहुंचकर विराम लेते दिखते हैं रज्जब की जो दूसरों के दर्द को ,पीडा को ,वेदना को अपना दर्द,पीडा तथा वेदना मानकर उसे राहत देता है यही संत कहलाता है -

दर्द बिना दरवेश क्या पीर बिना क्या पीर।

धरम बिना धर भी नहीं ,अपढ न बावन बीर ॥ [10]

अतः दरवेश ,संत ,साधु तथा पीर की पहचान वस्तुतः दूसरों की पीडा से जुडना और उसे हटाना है। संसार के पीडाओं का अंत कर सुखों का विस्तार करना ही सच्चा धर्म है।

अंत में मैं यह कहना चाहती हूँ कि इक्कसवी सदी के हिंसक ,बर्बर वैश्विक बर्तावों में धर्म और धार्मिक होना अति कठिन है ,जहाँ अनेक प्रकार की हिंसाओं से पीडाएँ बोई -बिछाई जा रही हों ,ऐसे में सच्चा धार्मिक होने के लिए संसार से पीडाओं को समाप्त करने की दिशा में लगना होगा। रज्जब की वाणी हमें इस दिशा में जाग्रत करती ,प्रेरित करती है। अतः हमारे आधुनिक ,उत्तर आधुनिक संसार में रज्जब की वाणी अपनी प्रासंगिकता सिद्ध करती है।

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हमारी प्राचीन संस्कृति में बुजुर्गों को भगवान के सामान माना जाता है। अभिवादनशीलम्य नित्य वृद्धोपसंविनः चत्वारि तस्य कर्णने आयुर्विधा यशा बलम अर्थात् प्रतिदिन बुजुर्गों को प्रणाम करने और उनकी सेवा करनेवाले व्यक्ति की आयु,विद्या, शक्ति और यश में वृद्धि होती है। हमारे देश में मातृदेवो भवः पितृदेवो भवः जैमी अवधारणा सर्वोपगी रही है। जैसे जैसे समय परिवर्तित होता गया जैसे जैसे वृद्धों की दशा भी परिवर्तित होती गयी। आज हमारे देश में बुजुर्गों की दयनीय एवं असम्माननीय स्थिति हो गयी है। यह एक चिन्तनीय एवं विचारणीय विषय है। युग का साहित्य युगीन परिस्थितियों से अवश्य प्रभावित होता है। इसी कारण से २१ वीं सदी में खास तौर पर हिन्दी साहित्य में वृद्धों की दशा और परिस्थिति को लेकर विचार वृद्ध विमर्श कर रहा है। पारिवारिक मर्यादा और रिश्तों में आरही गिरावट व विनयन एवं वृद्धों की तमाम समस्याओं को साहित्य की लोकप्रिय किथा कहानी साहित्य के माध्यम से देख सकते हैं। समकालीन हिन्दी कहानियों के अध्ययन से यह स्पष्ट होता है कि कई दर्जन कहानियाँ वृद्ध विमर्श करती हुई नजर आ रही हैं।

संयुक्त परिवारों की परंपरा अब भारतीय समाज से गायब हो रही है। पिता—पुत्र के सम्बन्ध में जमीन आसमान का अंतर आ चुका है। पुत्र के रिश्ते में मिले

दर्द को आगामी पितावाँ को सदियों तक सहना होगा। तमाम हिन्दी साहित्यकारों ने उम्र परिवर्तन को महत्त्व दिया कि जो बुजुर्ग कल तक घर के नीति निर्माता थे उन्हें बिल्कुल स्वाभाविक रूप से आज उनके पद से मुक्त किया जा रहा है। इतना ही नहीं हाशिये पर भी ढकेला जा रहा है। हिन्दी के कई कहानीकारों ने भिन्न भिन्न दृष्टी से बुजुर्गों के जीवन के अंतर्विरोधों,समस्याओं और चुनौतियों को अपनी कहानियों के माध्यम से समाज तक पहुँचाने की कोशिश की है।

भौतिकवादी संस्कृति के फलस्वरूप आज की युवापीढ़ी का रहन —रहन एवं जीवन शैली में बदलाव तेजी से आ रहा है। पीले पईत्र कहानी के उत्पल दीपा के साथ लिख इन रिश्ता में रहता है। उसके पिता प्रताप नागयण जी उम्रमें कहता है कि बेटे अब अकेलेपन बर्दाश नहीं होता। मैं तुम्हारे पास आना चाहता हूँ। मुझे अपने पास ले जाओ या, बेटा कहता है पापा आप समझने की कोशिश क्यों नहीं करते? दीपा भी नहीं चाहती कि,

चाहे वे शहर के माँ —बाप हो या गांव के अपने अग्रमानों का,अपनी मुख —मुखियाओं का खयाल न कर बच्चों की जरूरतों को पूरा करते रहते हैं,उम्रकी जिंदगी संभालने में अपने जीवन होम करते रहते हैं। बन्द पडी कहानी की अम्मा, चलो एक बृद्ध की कथा सुनते हैं कहानी के पिता, कुल्ता कहानी का फातंगी बाबू भूप में झरता अकेला मन कहानी के श्रीपति काका, भविष्य कहानी का शिव भई, पीले पईत्र कहानी का प्रतापनागयण आदि अपने बच्चों के प्रति दायित्व समझकर अपने जीवन का होम कर चाले। उसके बदले इन पत्रों ने अपने बच्चों से अनादर व तिरस्कार को सहना पड़ा।

वर्तमान युवा पीढ़ी द्राग वृद्धों के प्रति उदासी व्यवहार, उनके प्रति असंवेदनशीलता आदि के कारण वृद्ध स्वयं को परिवार व समाज की मुख्यभाग से अलग—थगल पाते हैं। पार्क कहानी के जगदीश बाबू अपने परिवारवालों की उपेक्षा को सहन नहीं कर पते, ...घर? कौन सा घर? अब वह नहीं। घर तो उम्र कहते हैं जहाँ परिवार हो। मैंने शौक से बनवाया था घर। पत्नी,बेटे सबकी मुखिया। किसको क्या पसंद है। उसके

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डॉ. के. नीरजा

असोसिएट प्रोफेसर इन हिन्दी,

एन के आर महिला महाविद्यालय, राजमहेंद्रवर्म,
अछ प्रदेश

हिन्दी के आंचलिक उपन्यासों में आदिवासी संस्कृति और जन-जीवन का यथार्थ चित्रण पाया जाता है। अर्थात् आदिवासियों का जीवन माथी है। अशिक्षा, शोषण, रहन-सहन में पिछड़ापन, सामाजिक प्रथाओं का दबाव धार्मिक अंधविश्वास, नेतृत्व की कमी आदि के कारण आदिवासी कई सदियों से बदतर जितंगी जी रहे हैं। आदिवासी केंद्रित उपन्यासों का सृजन आदिवासी जड़ के आदिवासी उपन्यासकारों द्वारा हुआ है। हिन्दी के कई नए आदिवासी उपन्यासकारों ने आदिवासी समाज को बहुत निकट से देखा और स्वानुभूति के आधार पर उनकी समस्याओं एवं जीवन-संघर्ष का यथार्थ अंकन किया है। आदिवासी उपन्यास का उद्भव जगन्नाथ प्रसाद अक्षुक्ती के सन् १९१९ में प्रकाशित उपन्यास अन्त माखती से माना जाता है। वह प्रथम अद्यतन रचना हुई है।

आदिवासी विमर्श से तात्पर्य है - उनके अस्मित्य एवं अस्मिता का विमर्श। इस विमर्श के अंतर्गत उनके सामाजिक, आर्थिक, राजनैतिक, सांस्कृतिक एवं धार्मिक जीवन संघर्षों का अध्ययन किया जाता है। प्रथम अन्त माखती युग के लोकप्रिय उपन्यासकार हैं। इनके प्रसिद्ध उपन्यास जंगल के आसपास १९८२ में प्रकाशित हुआ।

प्रस्तुत उपन्यास में सोन नदी के किनारे फैले जंगल और पहाड़ियों में बसे टमकड़ी, पहलुआ, डबरा और मुंठ जैसे जंगल के पिछड़े और शोषित आदिवासियों

का अभिशाप जीवन चित्रित है। उपन्यास के आरंभ में टमकड़ी गांव की चंदी की बेटी महुआ को नरमशी बंदुआ उठाकर ले जाता है गांववाले इस दुर्घटना को नरमशी प्रेत का संकट मानकर नृप रहते हैं। दूसरे दिन ओझा बागपत महागज उनके सहयोगियों द्वारा महुआ के शव को ढूंढ लिया जाता है और राह संस्कार के समय महुआ के गरीब पिता के जेब में सारे रुपये लेकर उनका धार्मिक शोषण किया जाता है। आदिवासी नागियों का धार्मिक व्यवस्था द्वारा अमानुष शोषण किया जाता है। यहाँ नागियों का अकसर बलात्कार होने है। जिस लड़की या औरत की हज्जत लूट जाती है अगर वह शिकायत ओझा या गयमाहब के पास पहुंचाए तो पहले उस औरत या लड़की को अग्निपरीक्षा देनी पड़ती है। अपनी शिकायत की सच्चाई को साबित करने के लिए। यही इस हत्याके के ओझा का बनाया हुआ धार्मिक ट्यूट है। कमजोर मनोवृत्ति और परंपरागत संस्कारों के कारण आदिवासी लोग ओझा के पीछे पड़े रहते हैं। भूत-प्रेत के भय के कारण गंडा-तावीज, झाड़ू-फूंक का प्रचलन पाया जाता है।

मुंठ गांव के आसपास गयमाहब फतेसिंह का साम्राज्य है। उनकी आदिवासी हत्याके में आतंक, भ्रम, राजनीति, एंयारा और क्रूर सामंत-शक्ति के रूप में पहचान है। कृषि के साथ ही उनके शगब, फलों का रस, लकड़ी चिर्छे, मांस तथा खुंभी को डिब्बों में बंद करना जैसे अनेक कारखाने भी हैं। पुरे आदिवासी हत्याके को उन्होंने बंदुआ मजदूर बनाया है। कोई आदिवासी बंदुआ मजदूर गयमाहब का विरोध करता है तो गयमाहब का गुंडे उसे सोन नदी के तट पर लेजाकर पैर से गिर तक थोड़ी-थोड़ी फरके काटते रहते हैं। कटनेवाला चीखता-चिल्लाता है तो खुद नशे में धुत होकर उसके मजा लेते हैं। बाट में सारे टुकड़ों को पत्थरों के साथ बोरी में डालकर सोन नदी में डुबो देते हैं। यदि कोई बंधुआ मजदूर भागता है तो उसे पकड़ कर लाया जाता है और सभी मजदूरों के सामने उस पर अमानुष अत्याचार किये जाते हैं, जिससे बाकी मजदूर आतंकित और विवश होकर इस बोझ को खोना ही अपनी नियती मानते हैं। काम के बदले में बंदुआ मजदूरों को मात्र पहनने के लिए मटमैला खहर और

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राकेश वत्स के उपन्यास : दलित —चेतना की अभिव्यक्ति और शोषण का खंडन

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भारतीय समाज में दलित वर्ग के लोग सामाजिक वर्ण व्यवस्था और जातिवाद से अभिरक्षित होकर दुर्भर जीवन बिताने लगे। हिंदी के प्रगतिशील साहित्यकारों ने दलितों के साथ किये जानेवाले सामाजिक दुर्व्यवहारों, उत्पीड़न आदि अस्मानताओं का विरोध किया है। साठोत्तर युग के लोकप्रिय उपन्यासकार राकेश वत्स के पुनीता, जंगल के आसपास, सपनरंग और नारदश उपन्यासों में दलित चेतना का मशक्त अभिव्यक्ति मिलती है। इन उपन्यासों में लेखक के द्वारा दलितों के जीवन का पथार्थ चित्रण कर उन पर होनेवाले अत्याचार, दमन और शोषण का फटाफट किया गया है। राकेश वत्स ने दलित वर्ग की समस्याओं का तीन रूपों में अंकन किया है। शोषित व्यक्ति के स्वाभाव के अनुरूप उनकी समस्याओं की तीव्रता का उद्घाटन किया गया है। प्रथम वर्ग के अंतर्गत वे दलित आते हैं जो जड़ता के प्रतीक होते हैं। उन्हें अपनी समस्याओं का बोध नहीं होता है। दूसरे वर्ग के अंतर्गत वे आते हैं — जो अपनी समस्याओं की जटिलता को पहचानते हैं, किन्तु उनका विरोध करने की शक्ति वे नहीं रखते हैं। तीसरे वर्ग के अंतर्गत वे आते हैं, जो शोषण के विरुद्ध विद्रोह करने में सफल होते हैं।

पुनीता उपन्यास में चमार जाति की पागे के रजि ने जमींदार गयमाहब से कर्ज लिया था। पति के मर जाने के कारण अकेली, अमहाय पागे गयमाहब का कर्ज चुकाने में असमर्थ है। इसका फायदा गयमाहब

उठाने है। गयमाहब एक गत पागे को हवेली पर बुलाकर उस पर बलात्कार करते हैं। पति के कर्ज से दबी पागे गयमाहब का अत्याचार सह लेती है। विधवा पागे कुछ दिनों बाद पुनीता को जन्म देती है। गाँववाले उसका घर तथा जमीन छीन लेते हैं। पागे दर-दर की टोकें खाने के लिए विवश हो जाती है। एक दिन गयमाहब के हवेली में आकर पागे आश्रय मांगती है। गयमाहब उस पर पिस्तौल तानकर धमकियाँ देते हैं। गयमाहब का अत्याचारों रूप देखकर पागे में भी संवर्ष —चेतना जागृत होती है। वह अपनी दयनीय दशा के बारे में गयमाहब से कहती है मुझे अपनी जान की चिंता नहीं है। अभी किन्ही नदी में कूटकर मर सकती हूँ। आपके इस खून की रक्षा करने के लिए मुझे क्या क्या नहीं करना पड़ा, कितनी मुसीबतें मिर पर नहीं उठाईं। लोगों के बर्तन साफ किये। पीकदानों को पीक धोया। लोगों ने मेरी जवानी को कलरी की तरह ममल देना चाहा। मेरे तक उनकी पहुँच न हुई तो जबरदस्ती पर उतर आये। दुनिया ने मुझे रनी भर महाराग नहीं दिया। हर जगह मेरे नागत्य को खरीदने की कोशिश की गई। वह भी गेटी के दो टुकड़ों के बदले।¹³ , इस प्रकार दलित वर्ग की नागी पागे गयमाहब तथा पुरुष समाज के वामना के शिकार बनती है। येमहाग विधवा पागे में इस शोषण का विरोध करने की शक्ति नहीं है।

पुनीता उपन्यास के चमार जाति के चंदू के पास जमींदार को लगान चुकाने के लिए रुपये नहीं हैं। घर में बच्चे के पेट भरणे की सामग्री कुछ भी नहीं है। चंदू गयमाहब से लगान माफ करने की विनती करने पर भी वह चंदू को फटकारते हैं , तुम कितने ही तमारे दिव्वाओ, लगान तो तुम्हें देना ही पड़ेगा। यदि लगान भरणे की कोशिश की तो झोपड़ा नीलाम करवा दूंगा, झोपड़ा।¹⁴ , झोपड़े की नीलामी का परिणाम चंदू ने अपनी आँखों से देखा था। वह पुनः गयमाहब के पैरे पर गिड़गिड़ाना है। गयमाहब नीकर श्यामू को आदेश देते हैं , इस चमार के बच्चे को धक्के देकर बाहर निकाल दो।¹⁵ , गयमाहब का निर्णय सुनकर चंदू के मुँह में ज्वाला के समान शब्द बाहर निकलते हैं, मुझे पहले ही पता था कि जो गधम गाँव की विधवा



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ABSTRACT

This paper explores the formation of heterostructure composite of chitosan based cobalt tungstate (CoWO₄) through hydrothermal approach. The desirable samples were further carried out by using sophisticated analytical instruments such as XRD, FTIR, TEM, SEM EDX, XPS, TGA and UV-DRS were employed in this study to get information about their structural, electronic and optical properties. Xylenol orange (XO) is a model dye pollutant was used in this study to determine the photocatalytic performance of prepared composite and pure CoWO₄. The obtained analysis results were stated that prepared composite is effective photocatalyst for the complete degradation of XO dye aqueous solution under visible light irradiations in 1h. As a result, the data reveal that CoWO₄/Chitosan at 10 mg/L at pH 3 is an excellent photocatalyst for the degradation of 10 mg/L XO dye solution. In addition the antimicrobial activity of prepared samples also measured over the pathogens of E.coli and S.aureus.

Keywords: CoWO₄-Chitosan Composite; Xylenol orange dye; Photocatalytic degradation; Antimicrobial activity.

1. Introduction

A severe threat to water is due to rapid industrialization, urbanization and population. Copious industries such as petrochemical, textile, printing, pharmaceutical, and chemical industries require great quantity of water and also discharge large amount of wastewater. Dye waste is an important toxic pollutant which is a non-biodegradable nature and destructs the whole ecosystem [1]. Researchers among the world have been done fabulous work to explore more convenient, economical and ecological process. The conventional methods including chlorination, adsorption, reverse osmosis, ion exchange and filtration have been reported for organic compounds from one phase to another [2]. However, owing to the great amount of aromatic compounds and stability of dye molecules, the conventional approaches are ineffective for the removal of dye pollutant. Yet, heterogeneous photocatalysis has proven to be an effective advanced oxidation process (AOP) technique for the complete decolourisation of dye pollutant owing to the active formation of hydroxyl free radical (OH) is a main product via light irradiating with

semiconductors metal oxides. Photocatalytic mechanism is mainly based on the formation of electron and hole pairs are capable of removing organic dyes upon light illumination. Efforts have been made by many researchers to introduce metal [3-4], non-metal [5] or metal oxide [6-7] into the semiconductor materials to effectively increase the catalytic activities of semiconductors [8]. The literature survey has shown that the semiconductor supported materials widely enhance the photocatalytic activity because of their controllable pore space and surface chemistry as well as photostable. Various support have been investigated such as alumina, zeolite, silica gel, fiber optic cable, glass beads, quartz, stainless steels, clays, cellulose, activated carbon and polymers [9-11].

The binary metal oxide CoWO₄, one of the tungstates, has been receiving more and more attentions for its multitude of applications, including oxygen evolution catalyst [12] and production of hydrogen [13]. However, no literatures reported the application of CoWO₄ as the electrode material in supercapacitors until

now, to our best knowledge. Based on the high super capacitive performances of the metal oxide, CoWO_4 with a $\text{Co}^{3+}/\text{Co}^{2+}$ redox couple should be a promising electrode material for supercapacitors. Besides, as reported in some literatures, the binary metal oxides of tungstate present the conductivity on the order of $10^{-7} - 10^{-3} \text{ S cm}^{-1}$, because the incorporation of W atoms can greatly enhance their conductivity in comparison with pure metal oxide [14]. In this work, CoWO_4 has been prepared by the wet-chemical and hydrothermal approaches starting from solutions of Co^{2+} and $[\text{WO}_4]^{2-}$. In general, such a quick precipitation reaction usually forms amorphous compounds in wet-chemical method, while the hydrothermal reaction often obtains compounds with crystal structure. These CoWO_4 nanoparticles were used in electrode materials for supercapacitors and their electrochemical performances were investigated by cyclic voltammetry (CV), galvanostatic charge/discharge (GV) and electrochemical impedance spectroscopy (EIS) studies [15].

Natural biopolymer chitosan has wide range of applications in pharmaceutical, biomedical and environmental activities. Chitosan is an interesting biopolymer for immobilization due to its excellent film-forming ability, high permeability, good mechanical strength, nontoxicity, biocompatibility, low cost and easy availability [16-17]. The binding ability of chitosan was attributed to the chelating groups such as $-\text{NH}_2$ and $-\text{OH}$ with metal. The different chitosan composite materials such as chitosan/ TiO_2 [18-19], chitosan/cuprous oxide [20], chitosan/ CdS [21] and chitosan/ ZnO [22-23] were prepared for the application of antibacterial agent, biosensor and photocatalyst to remove organic pollutants. The present investigation deals with the synthesis of Cobalt tungstate nanoparticles using a Chitosan biopolymer, characterisation and its application on photocatalysis and antibacterial activity. The photocatalytic experiment on the degradation of xylenol orange (XO) were carried out under irradiation of visible light. Antibacterial activity for the nanoparticles was performed for Gram-negative *Escherichia coli* (*E. coli*) bacteria and gram-positive *Staphylococcus aureus*.

2. Materials and methodology

2.1 Materials:

The chemicals including Sodium tungstate ($\text{Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$), Cobalt nitrate ($\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$), Glutamic acid ($\text{C}_5\text{H}_9\text{NO}_4$) and Chitosan polymer were purchased from Merck Co., India and used as such. Double distilled water was used for preparing aqueous solutions. All the chemicals used in these studies were of Analytical grade without any further purification. All the reagents and dye solutions of desired concentrations were prepared with double distilled water.

2.2 Methodology:

Preparation of CoWO_4 via hydrothermal route: The CoWO_4 nanoparticles were prepared by the

hydrothermal method from Sodium tungstate and Cobalt nitrate. For preparing CoWO_4 via hydrothermal, 0.05 M of Na_2WO_4 was prepared in 100 mL of distilled water. 0.05 M of $\text{Co}(\text{NO}_3)_2$ was prepared in 100 mL of distilled water and was added to the above solution under magnetic stirring, followed by add 1 M NaOH solution to maintain pH-7 for 30 min. The obtained mixture solution was transfer to autoclave, which was maintained at 100°C for 1 h. After reaction completion, autoclave was allowed to cool at room temperature. The obtained reddish-brown precipitation was washed several times with deionized water and ethanol and dried at 70°C . Finally obtained product was calcined at 220°C for 12 h in furnace and then cooled it to room temperature.

2.3 Instrumentation:

The optical properties were investigated using a UV-VisDRS in the air at room temperature in the wavelength range of 200-800 nm using Shimadzu UV-2600R spectrophotometer. Functional groups of the nanocomposites were analyzed by using the Fourier-Transform Infrared (FT-IR) spectrophotometer (JASCO-FTIR-460 plus). The crystalline structure of the nanoparticles was identified by an X-ray diffractometer (XRD; XPERT PRO X-RAY) with the Cu-K α radiation at 25°C and the structural assignments were made regarding the JCPDS powder diffraction files. The surface morphology was examined using a Scanning Electron Microscope (SEM) (JSM 6701F-6701) in both secondary and backscattered electron modes and the elemental analysis was also done with EDAX. The surface area was measured on approximately 250 mg of the samples using Kr at the liquid nitrogen temperature by a Micromeritics ASAP 2020 apparatus. Before the measurements, the samples were degassed at 350°C for 18 h. The pH was monitored using EUTECH instrument pH meter.

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The photocatalytic experiments were carried out in a 250 mL beaker and the whole setup along with magnetic stirrer was kept under the visible light. 100 mL of Xylenol orange (XO) with an initial concentration of 20-30 mM were used. 25 mg-100 mg of the nanocomposite was taken for degradation. Before the light irradiation, the reaction mixture was stirred in the darkness for 30 min to achieve the adsorption-desorption equilibrium between the catalyst and the dye molecules. During the exposure to visible light, 5 mL of aliquot was collected at regular time intervals. Then the samples were centrifuged to remove the photocatalyst and the filtrate was evaluated for the absorbance by UV-Visible spectrometry at $\lambda_{\text{max}} = 583 \text{ nm}$. The photodegradation of XO dye was calculated by the Equation (2).

$$\text{Photodegradation (\%)} = [C_0 - C/C_0] \times 100 \quad (2)$$

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Keywords: CoWO₄-Chitosan Composite; Xylenol orange dye; Photocatalytic degradation; Antimicrobial activity.

1. Introduction

A severe threat to water is due to rapid industrialization, urbanization and population. Copious industries such as petrochemical, textile, printing, pharmaceutical, and chemical industries require great quantity of water and also discharge large amount of wastewater. Dye waste is an important toxic pollutant which is a non-biodegradable nature and destructs the whole ecosystem [1]. Researchers among the world have been done fabulous work to explore more convenient, economical and ecological process. The conventional methods including chlorination, adsorption, reverse osmosis, ion exchange and filtration have been reported for organic compounds from one phase to another [2]. However, owing to the great amount of aromatic compounds and stability of dye molecules, the conventional approached are ineffective for the removal of dye pollutant. Yet, heterogeneous photocatalysis has proven to be an effective advanced oxidation process (AOP) technique for the complete decolourisation of dye pollutant owing to the active formation of hydroxyl free radical (OH) is a main product via light irradiating with

semiconductors metal oxides. Photocatalytic mechanism is mainly based on the formation of electron and hole pairs are capable of removing organic dyes upon light illumination. Efforts have been made by many researchers to introduce metal [3-4], non-metal [5] or metal oxide [6-7] into the semiconductor materials to effectively increase the catalytic activities of semiconductors [8]. The literature survey has shown that the semiconductor supported materials widely enhance the photocatalytic activity because of their controllable pore space and surface chemistry as well as photostable. Various support have been investigated such as alumina, zeolite, silica gel, fiber optic cable, glass beads, quartz, stainless steels, clays, cellulose, activated carbon and polymers [9-11].

The binary metal oxide CoWO₄, one of the tungstates, has been receiving more and more attentions for its multitude of applications, including oxygen evolution catalyst [12] and production of hydrogen [13]. However, no literatures reported the application of CoWO₄ as the electrode material in supercapacitors until

now, to our best knowledge. Based on the high super capacitive performances of the metal oxide, CoWO_4 with a $\text{Co}^{3+}/\text{Co}^{2+}$ redox couple should be a promising electrode material for supercapacitors. Besides, as reported in some literatures, the binary metal oxides of tungstate present the conductivity on the order of $10^{-7} - 10^{-3} \text{ S cm}^{-1}$, because the incorporation of W atoms can greatly enhance their conductivity in comparison with pure metal oxide [14]. In this work, CoWO_4 has been prepared by the wet-chemical and hydrothermal approaches starting from solutions of Co^{2+} and $[\text{WO}_4]^{2-}$. In general, such a quick precipitation reaction usually forms amorphous compounds in wet-chemical method, while the hydrothermal reaction often obtains compounds with crystal structure. These CoWO_4 nanoparticles were used in electrode materials for supercapacitors and their electrochemical performances were investigated by cyclic voltammetry (CV), galvanostatic charge/discharge (GV) and electrochemical impedance spectroscopy (EIS) studies [15].

Natural biopolymer chitosan has wide range of applications in pharmaceutical, biomedical and environmental activities. Chitosan is an interesting biopolymer for immobilization due to its excellent film-forming ability, high permeability, good mechanical strength, nontoxicity, biocompatibility, low cost and easy availability [16-17]. The binding ability of chitosan was attributed to the chelating groups such as $-\text{NH}_2$ and $-\text{OH}$ with metal. The different chitosan composite materials such as chitosan/ TiO_2 [18-19], chitosan/cuprous oxide [20], chitosan/ CdS [21] and chitosan/ ZnO [22-23] were prepared for the application of antibacterial agent, biosensor and photocatalyst to remove organic pollutants. The present investigation deals with the synthesis of Cobalt tungstate nanoparticles using a Chitosan biopolymer, characterisation and its application on photocatalysis and antibacterial activity. The photocatalytic experiment on the degradation of xylene orange (XO) were carried out under irradiation of visible light. Antibacterial activity for the nanoparticles was performed for Gram-negative *Escherichia coli* (*E. coli*) bacteria and gram-positive *Staphylococcus aureus*.

2. Materials and methodology

2.1 Materials:

The chemicals including Sodium tungstate ($\text{Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$), Cobalt nitrate ($\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$), Glutamic acid ($\text{C}_5\text{H}_9\text{NO}_4$) and Chitosan polymer were purchased from Merck Co., India and used as such. Double distilled water was used for preparing aqueous solutions. All the chemicals used in these studies were of Analytical grade without any further purification. All the reagents and dye solutions of desired concentrations were prepared with double distilled water.

2.2 Methodology:

Preparation of CoWO_4 via hydrothermal route: The CoWO_4 nanoparticles were prepared by the

hydrothermal method from Sodium tungstate and Cobalt nitrate. For preparing CoWO_4 via hydrothermal, 0.05 M of Na_2WO_4 was prepared in 100 mL of distilled water. 0.05 M of $\text{Co}(\text{NO}_3)_2$ was prepared in 100 mL of distilled water and was added to the above solution under magnetic stirring, followed by add 1 M NaOH solution to maintain pH-7 for 30 min. The obtained mixture solution was transfer to autoclave, which was maintained at 100°C for 1 h. After reaction completion, autoclave was allowed to cool at room temperature. The obtained reddish-brown precipitation was washed several times with deionized water and ethanol and dried at 70°C . Finally obtained product was calcined at 220°C for 12 h in furnace and then cooled it to room temperature.

2.3 Instrumentation:

The optical properties were investigated using a UV-VisDRS in the air at room temperature in the wavelength range of 200-800 nm using Shimadzu UV-2600R spectrophotometer. Functional groups of the nanocomposites were analyzed by using the Fourier-Transform Infrared (FT-IR) spectrophotometer (JASCO-FTIR-460 plus). The crystalline structure of the nanoparticles was identified by an X-ray diffractometer (XRD; XPERT PRO X-RAY) with the Cu-K α radiation at 25°C and the structural assignments were made regarding the JCPDS powder diffraction files. The surface morphology was examined using a Scanning Electron Microscope (SEM) (JSM 6701F-6701) in both secondary and backscattered electron modes and the elemental analysis was also done with EDAX. The surface area was measured on approximately 250 mg of the samples using Kr at the liquid nitrogen temperature by a Micromeritics ASAP 2020 apparatus. Before the measurements, the samples were degassed at 350°C for 18 h. The pH was monitored using EUTECH instrument pH meter.

2.4 Photocatalytic degradation of Xylene orange dye:

The photocatalytic experiments were carried out in a 250 mL beaker and the whole setup along with magnetic stirrer was kept under the visible light. 100 mL of Xylene orange (XO) with an initial concentration of 20-30 mM were used. 25 mg-100 mg of the nanocomposite was taken for degradation. Before the light irradiation, the reaction mixture was stirred in the darkness for 30 min to achieve the adsorption-desorption equilibrium between the catalyst and the dye molecules. During the exposure to visible light, 5 mL of aliquot was collected at regular time intervals. Then the samples were centrifuged to remove the photocatalyst and the filtrate was evaluated for the absorbance by UV-Visible spectrometry at $\lambda_{\text{max}} = 583 \text{ nm}$. The photodegradation of XO dye was calculated by the Equation (2).

$$\text{Photodegradation (\%)} = \frac{[C_0 - C]/C_0}{100} \quad (2)$$

Where, C_0 is the concentration of MB before the irradiation and C is the concentration of MB after a certain irradiation time.



PROFESSIONAL DEVELOPMENT OF TEACHERS AND THEIR ACADEMIC ACHIEVEMENTS – A PERSPECTIVE

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ABSTRACT

Teacher empowerment in education has drawn considerable attention over the past decade. This means decentralization of all the aspects related to educational management and administration at the lowest levels because teachers are the ones in the classroom, closest to the students. Short and Greer identified six dimensions of empowerment: decision-making, teacher impact, teacher's status, autonomy, self-efficacy and opportunities for professional development. Professional growth refers to develop professionally, to learn continuously and to expand one's own skills through the work life of the school by the teacher. This leads to developing knowledge, skills, and competencies required in a profession so as to meet the contemporary and future demands of that particular profession. Empowerment of Teachers necessitates collaboration between management and teachers to solve problems, make decisions, create innovative solutions, and decide on the mission and vision of the school. This research paper to be discussed "Empowerment of teachers and their Academic professional development".

Key Words: Teacher empowerment, Professional development, Immoral Practices, Skill of creativity, Innovative Methods, Quality Concern.

Statement of the Problem

*"It is supreme art of the Teacher to awaken
in joy in creative expression and knowledge".*

-Albert Einstein

Teacher empowerment in education has drawn considerable attention over the past decade. Empowerment means different things to different people. Empowerment means bringing the responsibility for decision making to the lowest possible level, which specifies that the administrator does not make all the decisions. Leadership, where teacher empowerment exists, looks quite different from traditional bureaucratic, hierarchical

conceptions that slot individuals into different, limited functions and that place them in subordinate relationships to one another. Empowerment creates ownership for those responsible for carrying out decisions by involving them directly in the decision-making process. Therefore empowerment can be defined as a form of decentralization that places decision making and accountability at the lowest level; thus, teachers are involved in decisions about instruction, curriculum because they are the ones in the classroom, closest to the students. Teacher empowerment can bring the job efficacy, competency, professional skills, etc for the professional development.

Professional development is a process of developing one's knowledge, skills, and competencies required in a profession so as to meet the contemporary and future demands of that particular profession. Empowerment has been defined as a process whereby school participants develop the competence to take charge of their own growth, resolve their own problems, and fulfill their needs to effectively participate in the workplace. According to Teacher Empowerment defined teacher empowerment as 'investing teachers with the right to participate in the determination of school goals and policies and to exercise professional judgment about what and how to teach.' According to the Educational Resources Information Center (ERIC), professional development refers to "activities to enhance professional career growth." Such activities may include individual development, continuing education, and in-service education, as well as curriculum writing, peer collaboration, study groups, and peer coaching or mentoring. Teacher empowerment can bring the various empowerments in professional development of teachers by developing the professional efficacy, accountability, professional ethics and making the teachers as a resourceful. Also it creates the cooperative, adjustable environment, sportive mind, interest, etc in the teachers and its main advantage is professional development of teachers.

The present context

In the present status the teacher empowerment and professional development is in dilemma because a common mistake is not adequately addressing the role changes of teachers and administrators. Liberty of thought, innovation of teachers in an institution is curtailed due to rigid patterns of curricular structure and existing frame of routine work and The lack of preparation for the realities of change. Professional competencies-i.e. the ability to perform the activities within an occupation or function to

the standards expected in employment is not fully experienced due to inappropriate placement, under-placement of the teachers, lack of opportunities and appropriate learning environment. The socio-economic status of teachers from primary to tertiary level is looked down upon as the salary, service conditions and emoluments have been widely despised because of the fact that their designation and the nature, structure of salary are below the dignified level- even less than sweepers and wages earners in any corporation / public establishment. Status and social recognition go hand in hand. The ignominious status of teachers have left them, de-recognized en masse in the eyes of the public and also partly by the immoral and unethical acts committed by the teachers themselves. The process of selection to colleges of education and the duration of training, the obsolete content, and out dated methodology of training; such professionals are responsible for not earning due recognition for teachers in the society at present.

The most important criteria that are professional ethics (principal of code of conduct followed by the professional members) are not adhered to by most of the members of the teaching community. No incentives and reinforcement is accorded to the teachers: in reality most of them are not getting their genuine dues as per the provision of the service conditions; as a result, a large number of the teachers take shelters under the law for retrieval service conditions. Unwarranted political interference- involuntary, unethical and unusual transfers put the teachers into embarrassment, which in turn affects the quality of dispensation and discharge of their normal duties.

Teacher leaders assume a wide range of roles to support school and student success. Whether these roles are assigned formally or shared informally, they build the entire school's capacity to improve. Because teachers can lead in a variety of ways, many

teachers can serve as leaders among their peers. Teaching skills would include providing training and practice in the different techniques, approaches and strategies that would help the 3 teachers to plan and impart instruction, provide appropriate reinforcement and conduct effective assessment. It includes effective classroom management skills, preparation and use of instructional materials and communication skills.

Pedagogical theory includes the philosophical, sociological and psychological considerations that would enable the teachers to have a sound basis for practicing the teaching skills in the classroom. The theory is stage specific and is based on the needs and requirements that are characteristic of that stage. Professional skills include the techniques, strategies and approaches that would help teachers to grow in the profession and also work towards the growth of the profession. It includes soft skills, counseling skills, interpersonal skills, computer skills, information retrieving and management skills and above all life long learning skills.

An amalgamation of teaching skills, pedagogical theory and professional skills would serve to create the right knowledge, attitude and skills in teachers, thus promoting holistic development.

Nature of Teacher Education

- 1) Teacher education is a continuous process and its pre-service and in-service components are complimentary to each other. According to the International Encyclopedia of Teaching and Teacher education (1987), —Teacher education can be considered in three phases : Pre-service, Induction and In-service. The three phases are considered as parts of a continuous process.
- 2) Teacher education is based on the theory that —Teachers are made, not born in contrary to the assumption, —Teachers are

born, not made. Since teaching is considered an art and a science, the teacher has to acquire not only knowledge, but also skills that are called —tricks of the trade.

- 3) Teacher education is broad and comprehensive. Besides preservice and in-service programmes for teachers, it is meant to be involved in various community programmes and extension activities, viz adult education and non-formal education programmes, literacy and development activities of the society.
- 4) It is ever-evolving and dynamic. In order to prepare teachers who are competent to face the challenges of the dynamic society, Teacher education has to keep abreast of recent developments and trends.
- 5) The crux of the entire process of teacher education lies in its curriculum, design, structure, organization and transaction modes, as well as the extent of its appropriateness.
- 6) As in other professional education programmes the teacher education curriculum has a knowledge base which is sensitive to the needs of field applications and comprises meaningful, conceptual blending of theoretical understanding available in several cognate disciplines. However the knowledge base in teacher education does not comprise only an admixture of concepts and principles from other disciplines, but a distinct gestalt' emerging from the conceptual blending', making it sufficiently specified.
- 7) Teacher education has become differentiated into stage-specific programmes. This suggests that the knowledge base is adequately specialized and diversified across stages, which should be utilized for developing effective processes of preparing entrant teachers for the functions which a teacher is expected

to perform at each stage. 8) It is a system that involves an interdependence of its Inputs, Processes and Outputs.

So what are some of the leadership options available to teachers? The following 10 roles are a sampling of the many ways teachers can contribute to their schools' success.

1. Resource Provider

Teachers help their colleagues by sharing instructional resources. These might include websites, instructional materials, readings, or other resources to use with students. They might also share such professional resources as articles, books, lesson or unit plans, and assessment tools.

2. Instructional Specialist

An instructional specialist helps colleagues implement effective teaching strategies. This help might include ideas for differentiating instruction or planning lessons in partnership with fellow teachers. Instructional specialists might study research-based classroom strategies explore which instructional methodologies are appropriate for the school; and share findings with colleagues. When his fellow science teachers share their frustration with students' poorly written lab reports, Jamal suggests that they invite several English teachers to recommend strategies for writing instruction. With two English teachers serving as instructional specialists, the science teachers examine a number of lab reports together and identify strengths and weaknesses. The English teachers share strategies they use in their classes to improve students' writing.

3. Curriculum Specialist

Understanding content standards, how various components of the curriculum link together, and how to use the curriculum in planning instruction and assessment is essential to ensuring consistent curriculum implementation throughout a school.

Curriculum specialists lead teachers to agree on standards, follow the adopted curriculum, use common pacing charts, and develop shared assessments. Tracy, the world studies team leader, works with the five language arts and five social studies teachers in her school. Using standards in English and social studies as their guides, the team members agree to increase the consistency in their classroom curriculums and administer common assessments. Tracy suggests that the team develop a common understanding of the standards and agrees to facilitate the development and analysis of common quarterly assessments.

4. Classroom Supporter

Classroom supporters work inside classrooms to help teachers implement new ideas, often by demonstrating a lesson, co-teaching, or observing and giving feedback. It is found that consultation with peers enhanced teachers' self-efficacy (teachers' belief in their own abilities and capacity to successfully solve teaching and learning problems) as they reflected on practice and grew together, and it also encouraged a bias for action (improvement through collaboration) on the part of teachers. They ask the principal for two half-days of professional release time, one for learning more about the strategy and planning a lesson together, and the other for coteaching the lesson to Marcia's students and discussing it afterward.

5. Learning Facilitator

Facilitating professional learning opportunities among staff members is another role for teacher leaders. When teachers learn with and from one another, they can focus on what most directly improves student learning. Their professional learning becomes more relevant, focused on teachers' classroom work, and aligned to fill gaps in student learning. Such communities of learning can break the norms of isolation present in many schools. Frank facilitates the

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school's professional development committee and serves as the committee's language arts representative. Together, teachers plan the year's professional development program using a backmapping model. This model begins with identifying student learning needs, teachers' current level of knowledge and skills in the target areas, and types of learning opportunities that different groups of teachers need. The committee can then develop and implement a professional development plan on the basis of their findings.

6. Mentor

Serving as a mentor for novice teachers is a common role for teacher leaders. Mentors serve as role models; acclimate new teachers to a new school; and advise new teachers about instruction, curriculum, procedure, practices, and politics. Being a mentor takes a great deal of time and expertise and makes a significant contribution to the development of a new professional. Ming is a successful teacher in her own 1st grade classroom, but she has not assumed a leadership role in the school. The principal asks her to mentor her new teammate, a brand-new teacher and a recent immigrant from the Philippines. Ming prepares by participating in the district's three-day training on mentoring. Her role as a mentor will not only include helping her teammate negotiate the district, school, and classroom, but will also include acclimating her colleague to the community. Ming feels proud as she watches her teammate develop into an accomplished teacher.

7. School Leader

Being a school leader means serving on a committee, such as a school improvement team; acting as a grade-level or department chair; supporting school initiatives; or representing the school on community or district task forces or committees. A school leader shares the vision of the school, aligns his or her

professional goals with those of the school and district, and shares responsibility for the success of the school as a whole.

8. Data Coach

Although teachers have access to a great deal of data, they do not often use that data to drive classroom instruction. Teacher leaders can lead conversations that engage their peers in analyzing and using this information to strengthen instruction. They then plan instruction on the basis of this data.

9. Catalyst for Change

Teacher leaders can also be catalysts for change, visionaries who are "never content with the status quo but rather always looking for a better way" Teachers who take on the catalyst role feel secure in their own work and have a strong commitment to continual improvement. They pose questions to generate analysis of student learning.

10. Learner

Among the most important roles teacher leaders assume is that of learner. Learners model continual improvement, demonstrate lifelong learning, and use what they learn to help all students achieve.

Roles for All

Teachers exhibit leadership in multiple, sometimes overlapping, ways. Some leadership roles are formal with designated responsibilities. Other more informal roles emerge as teachers interact with their peers. The variety of roles ensures that teachers can find ways to lead that fit their talents and interests. Regardless of the roles they assume, teacher leaders shape the culture of their schools, improve student learning, and influence practice among their peers.

- Empowerment creates a sense of ownership in teachers' work environments and provides teachers with the opportunities to perform to their fullest capabilities

- A teacher to be empowered is the inspiration to grow as professionals.
- Empowerment inspires collaboration among educators.
- To make teachers as lifelong learners
- Give recognition to teaching as a reflective practice &
- teacher as the reflective practitioner
- To make teacher the first and foremost active agent in every aspect of the educational system
- To ensure natural development of teachers in their teaching efficacy
- To give concrete shape to code of ethic to make the teachers effective, resourceful, competent and role model for the students and contributing agent without burden to society.

Measures to be taken for teachers empowerment & professional development

- For empowerment of teachers to be successful, declared that four conditions must be in place; both teachers and administrators must:
- know what roles both will play;
- understand and theoretically accept the benefits of empowerment and shared decision-making;
- recognize the existence of a discrepancy gap between what currently is and what could be; and finally must
- take the risk of commitment to change. Teachers believe that they are more empowered when the school in which they work provides them with opportunities to grow and develop professionally

The principals should avoid the tendency to focus on the "here & now" rather than on the future. Therefore, a clearly stated end result must be communicated so that all parties understand the vision and mission of the school

SELF LEARNING: A teacher can never really teach unless he learns himself. "A lamp can

never light unless it burns its own flames" (R.N. Tagore). A Teacher should keep learning always.

IN-SERVICE PROGRAMME AND REFRESHER COURSES: A teacher requires refreshing and updates his knowledge by attending such courses.

SEMINARS, SYMPOSIUMS AND WORKSHOPS: A teacher needs to participate in the above activities with significant contribution in terms of contributing papers, delivering talks and organizing and chairing the sessions.

INNOVATION AND EXPERIMENTATION: A teacher needs to innovate and experiment upon new methods, techniques and practices.

WRITING BOOKS, ARTICLES AND RESEARCH PAPERS: A teacher should contribute originally in this endeavor for his professional growth.

FIELDTRIP, OUTING AND EXCHANGE PROGRAMME: Professional growth occurs through gaining personal experience, contact and communication and knowledge gathered through the above means.

Summing up:

In the light of the above-cited logical reasons and illustrations, it can be strongly visualized that teacher empowerment and professional development is a must for every teacher in enabling teaching-learning context. Any individual who enters the teaching profession should know and understand the expectations, challenges and issues of the teaching profession in relation to the needs and demands of time and society. For this proper knowledge and understanding of the presented reasons in relation to teaching as a profession. The Teacher empowerment and professional development of teachers is highly essential through the organization of

educational activities and programmes in teaching, training, research and extension perspectives.

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తెలుగు సాహిత్యం - సమకాలీనత



ప్రధాన సంపాదకులు :

కె. వి. పద్మావతి

వైస్ చైర్మన్ & శాఖాధిపతి, తెలుగు విభాగం, వి.ఎస్.ఆర్ & ఎస్.వి.ఆర్ కళాశాల, తెనాలి.

తెలుగు సాహిత్యం - సమకాలీనత
అంతర్జాతీయ అంతర్జాల సదస్సు (వెబినార్)

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డా॥ ఎల్. రాజీవ్ బాబు
డా॥ సి.హెచ్. బాలకృష్ణ

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తెలుగు కథా కావ్యాలు : సమకాలీన పరిస్థితులు

- కె.ఎస్. అన్నపూర్ణదేవి, తెలుగు అధ్యాపకురాలు, శ్రీమతి కందుకూరి రాజ్యలక్ష్మి మహిళా కళాశాల, రాజమహేంద్రవరం.

చిత్రరచనకు కుడ్యం ఎంత అవసరమో, కావ్య రచనకు కథ అంత అవసరం. కథా కావ్యాలు అన్నంతనే బాణుని కాదంబరి, దండి దశకుమార చరిత్ర, శుకసప్తతి మొదలైనవి మన దృష్టికి కనిపించేవి. కాని రామాయణ భారతాదులు కావు. ఇందు కథలు ప్రసిద్ధం. అంతేకాక పురాణవ్యక్తులకు సంబంధించినవి. కథాకావ్యాల్లో కథలు అలాంటివి కావు. అన్ని కథలూ కల్పితాలు. నమ్మరాని అద్భుత సంఘటనలతో, అమానుష కృత్యాలతో ఉంటాయి. పౌరాణికత్వం కంటే లౌకికత్వం ఎక్కువగా కనిపిస్తుంది. ప్రాచీన పామర కథా సమూహమంతా (Folk Lore) నిక్షిప్తమౌతుంది. కథాకావ్యాల్లో కథ ప్రధానంగా ఉత్పాద్యంగా ఉంటుంది. ఈ గుణాలున్నవి కథా కావ్యాలు.

కేతన దశకుమార చరిత్రలో పదిమంది రాజకుమారులు దిగ్విజయాలను, పది కథలలో వర్ణిస్తాడు. పాత్రల మనసులలోని భావాలను ఎక్కువగా విశదీకరించక, వాళ్ళ రూపాన్నీ, కట్టు, బొట్టు, అలంకారాలను విపులంగా వర్ణించాడు.

ఆభరణాలు :

మట్టియలు, ఉజ్వల మణి నూవురాలు, మెలనూలు, కమ్మపూవు, కట్టువడములు (కట్టిన పూలదండలు), గట్టి నూళ్ళు, సుద్ద సరితీగ (బంగారు తీగ), మినుకులు (తాళిబొట్టు), సంది దండలు (హస్తాభరణాలు), అంగుళీయకములు, హారికంకణాలు, చేకట్టు పాలెలు, మెరుగుటాకులు, సరిపెణలు (బంగారు గొలుసు), ఆలక్తక పూత (పారాణి), కాటుక, తిలకం మొదలైనవి ఆనాటి ఆభరణాలు, అలంకారాలుగా కేతన వర్ణించాడు. ఈనాడు ఆ ఆభరణాలు ఎన్ని ఉన్నాయో పరిశీలించవచ్చు.

వి.ఎస్.ఆర్ & ఎన్.వి.ఆర్ కళాశాల (స్వయంప్రతిపత్తి), తెనాలి. 67

దురలవాట్లు :

అపహరవర్మ కథలో జూదవర్ణన, ప్రతిమ కథలో కోడి పందాల వర్ణన, మద్యపాన వర్ణన ఇలాంటి అలవాట్లు ఆనాటి ప్రజల్లో ప్రబలంగా వ్యాపించి ఉన్నాయని తెలుస్తున్నది.

జక్కన, విక్రమార్క చరిత్రలో :

విక్రమార్కుడు పుట్టిన సందర్భంలో 'జ్యోతిశ్శాస్త్ర' ఫలితాలను కవి పేర్కొనడం ద్వారా ఆ కాలం నాటి నమ్మకాలెలాంటివో తెలుస్తున్నాయి. అంతేకాక, తీర్థయాత్రల ప్రసక్తి, పుణ్యక్షేత్రాల ప్రశంస, కోడికూత, యోగినీ రూపం, వృద్ధ విప్రులు, కస్తూరి వాసన, తమ్ములతావి మొదలైన వాని గురించి వివరించాడు. ఆనాటి భోజన పదార్థాలేమిటో వివరిస్తాడు.

"మించు కన్నులగోరగించు రాజాన్నంబు

నుపమింపరాని సద్యోఘృతంబు

నమృతోపమానంబులగు పిండివంటలు

నుజ్వలంబై యొప్పునొలుపుబప్పు

మదికింపుబెంచు కమ్మని పదార్థంబులు

బహుపాక రుచులైన పచ్చళ్ళు

వడియగట్టిన యానవాల పెరుగు

సరస మధురరసావళి సముదయములు

పంచదార సమంచిత పానకములు

గమ్మకస్తూరి నెత్తావిగైపు చేసి

యూరుఁగాయలుఁజల్లని యుదకములను

వివాహ భోజనానంతరం, విదర్భేశ్వరుడు అతిథులందరికీ తాంబూల, మణి భూషణాది సత్కారాలు చేసి పంపాడు.

పరిమళద్రవ్యాలు, పునుగు, తిలకం, కస్తూరి, పచ్చకర్పూరంతో కూడిన తమ్ములములతావి, కుంకుమ

తెలుగు సాహిత్యం సమకాలీనతీ - అంతర్జాతీయ అంతర్జాల సందేశ్సు (డిజిటల్)

పంకము మొదలైన సుగంధ ద్రవ్యాలను ఆనాటి విలాసినులు ఉపయోగించినట్లు తెలుస్తున్నది.

అనంతమాత్యుడు - భోజరాజీయము లో సాంస్కృతిక విజ్ఞానాన్ని రెండు విధాలుగా విభజించాడు. రాజకీయ విజ్ఞానం, సాంఘిక విజ్ఞానం.

రాజకీయ విజ్ఞానంలో ఆకాలంలో ప్రజలను అన్యాయంగా హింసించే రాజుల ప్రసక్తే కనిపించదు. నేరస్తులకు అనేక రకాలైన శిక్షలుండేవి. అపరాధం చేసినవాణ్ణి గడ్డి పరకలతో చుట్టి, పురం చుట్టూ తిప్పేవారు. తెకతెక ఉడికే ఉక్కు కంచాలతో నెత్తిపట్టి, ఇనుప రాగోలతో ఇరికించేవారు. ప్రత్యక్ష సాక్ష్యం లేనప్పుడు ఆ నేర నిరూపణానికి ప్రమాణాలు చేయించేవారు. యుద్ధంలో పరాక్రమం చూపిన సైనికులకు రాజులు కొన్ని గ్రామాల్నిగాని, భూమినిగాని గౌరవ సూచకంగా ఇచ్చేవారు.

సాంఘిక విజ్ఞానంలో 'స్త్రీలు': స్త్రీలకు విశిష్ట స్థానముండేది. స్త్రీవిద్య ఉండనడానికి సాక్ష్యాలున్నాయి. స్త్రీలు పురుషులతో స్వేచ్ఛగా మాట్లాడేవారని, ధైర్య సాహసాలు మెండుగా ఉండేవని తెలుస్తుంది. అంతే కాకుండా న్యాయాన్యాయ పరిగ్రహణశక్తి కూడా వీరి కున్నట్లు తెలుస్తున్నది. తనను నిరాకరించిన పరపురుషుని రాకుమార్తె 'కటకట మగతనము లేదుగా నీయందున్' అని హేళన చేయడం ఆనాటి స్త్రీల స్వేచ్ఛకు నిదర్శనం. భర్త తప్పచేస్తే దానిన సవరించి భర్తకు ధర్మాధర్మాలను నిర్భయంగా ఉపదేశించే సాహసమానాటికి స్త్రీలలో విశేషంగా కన్పిస్తుంది.

వేశ్యలు :

భోజరాజీయంలో కన్పించే వేశ్యలకు భోగలాలసత కంటే అధికంగా వారికి విద్యపై ఆసక్తి ఉన్నట్లు కన్పిస్తుంది. యోగులను సైతం విటులనుగా మార్చగలిగిన వేశ్యలూ ఉన్నారు. సంగీతసాహిత్యవిద్యా ప్రవీణులున్నారు.

యోగులు - యోగినులు, ఆ కాలంలో యోగులను దైవాంశ సంభూతులుగా మన్నించేవారు. కేవలం పురుషులే కాక సామాన్య గృహిణులు, రాకుమార్తెలు, వేశ్యలు కూడా

ఆనాడు యోగులను సేవించేవారు. యోగులే కాక యోగ కాంతలు కూడా ఆనాడు విశిష్టస్థానాన్ని ఆక్రమించారు. వాళ్ళవద్ద అనేకమైన సిద్ధులుంటాయని ప్రజలు, ప్రభువుల గాఢ విశ్వాసం.

వేషధారణం :

మణిమాణిక్యాదులు పొదిగిన కంకణాలతోనూ, దక్షిణమువైపు ధరించే అంగద హారాలతోనూ, కర్ణావతం సాదిక కవితాభూషణాలతోనూ, అలంకృతులైన పురుషులు నారీలోకానికే ఆకర్షణ గావించేవారు. వీరు స్త్రీలవలె శిరోజాలను ముడివైచి పూలమాలను చుట్టేవారు.

ప్రాతఃకాలములో మేల్కొగానే భగవంతుణ్ణి స్మరిస్తూ, తన అరచేతుల్ని చూచుకొనే ఆచారం అనంతమడు చెప్పాడు.

“అతడట్లు మేలకనియ,
చ్యుతు సంస్కృతియందు దగిలి శుభలక్షణల
క్షీతములగు నిజకరాంభో
జ తలంబుల చూచుచుండ సమయమునందున్”

నేటికీ ఈ సంప్రదాయం ఆచరణలో ఉంది.

ఆటలు :

అంజి సొగటాలు, అచ్చనగండ్లు, ఓమన గుంటలు మొదలైన ఆటలు స్త్రీలు విశేషంగా ఆడే ఆటలు. భోజ రాజీయంలో వివిధ సంస్కృతులను, ఆచారాలను తెలుసుకోవచ్చు. నీతికథలను తెల్పేదే కాదు, సాంస్కృతిక పునర్నిర్మాణానికి ఉపయోక్తమైన గ్రంథంగా దీన్ని చెప్పవచ్చు.

'పాలవేకదిరీపతి - శుకసప్తతి' లోని సంప్రదాయాలు - విశ్వాసాలు లో ఏ జాతికైనా ఆ జాతి విశిష్టతను వ్యక్తం చేసే కొన్ని సంప్రదాయాలు, విశ్వాసాలు ఉంటాయి. ఇవి ఎప్పటినుంచి ప్రారంభమయ్యాయో చెప్పటం కష్టం.

ఆనాటి పల్లెలు 'నిత్యకళ్యాణం పచ్చతోరణం' లాగా ఉత్సవాలతో, ఊరేగింపులతో కళకళలాడుతుండేవి.



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वर्तमान भारत में उच्चतर शिक्षा की चुनौतियाँ

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प्राचीन काल से ही हमारा देश उन्कृत शिक्षा का केंद्र रहा है। नालंदा व विक्रमशिला विश्वविद्यालयों की प्रसिद्धि विश्वभर में फैली थी। विश्व के कई देशों के लोग यहाँ विद्या ग्रहण करने के लिए आते थे। लेकिन भारत सदियों तक विदेशों के अधीन रहा, परंपरता के इस दौर में भारतीय शिक्षण संस्थान लगभग पवन की करार पर थे। ऐसे समय में कुछ विदेशी लोगों के प्रयत्न से विदेशी काल में उच्च शिक्षा की वर्तमान प्रणाली की शुरुआत उद्योगवी शताब्दी में प्रारंभ हुई। स्वतंत्रता प्राप्ति के बाद भारत ने प्राथमिक, माध्यमिक, कालेज, उच्चशिक्षा, तकनीकी एवं व्यावसायिक शिक्षा के क्षेत्र में महत्वपूर्ण प्रगति की है। फिर भी देश में उच्च शिक्षा की कई चुनौतियाँ हैं। इनके अनेक कारण भी हैं। मैं उन कारणों का परदाफाँद यहाँ करना चाहती हूँ।

सरकार ने उच्चशिक्षा की वर्तमान के लिए कई राज्य विश्वविद्यालयों की स्थापना की है। लेकिन उनमें से कुछ संस्थाओं की विश्वविद्यालय अनुदान आयोगों की पर्य्याय (UFA & UGC) तक नहीं है। सरकार 15-20 सालों से कोई नियमित नियुक्ति प्राध्यापकों या प्रवक्तृओं के स्तर पर नहीं कर पा रही है। भारी संख्या में प्रति लोकचर या नाममात्र मानदेय पर गैर लोकचर नियुक्ति होने लगा। स्तर घटा, प्रतिबद्धता घटी और विद्यार्थी भी मजदूरी में इस निराशाजनक स्थिति में उपाधियों प्राप्त कर रहे हैं। जो युवा शोध में रुचि लेते थे, वे शोध उपाधि प्राप्त कर विश्वविद्यालयों में पद प्राप्त करने के लक्ष्य रखते थे अब वे निराश होकर किसी अन्य पेशे की ओर मुड़ने लगे। नियमित नियुक्तियों वहीँ पमाने पर करने के बजाय सेवानिवृत्ति की आयु केंद्रीय संस्थाओं में 60 से 62 और 62 से 65 साल कर दी गई। यह निर्णय पहले से निराश युवा वर्ग को शोध तथा अध्यापन से दूर कर दिया गया। यदि शिक्षा में गुणवत्ता लाना है और इसका विस्तार करना है तो अधिकारिक स्तर पर समस्याओं के समाधान के प्रयास अनेक पक्षों में आवश्यक है। अध्यापक के रिक्त स्थानों को भरा जाना, उन्हें प्रारंभिक प्रशिक्षण देना इसमें सर्वप्रथम है। हर पाँच वर्ष बाद प्रत्येक अध्यापक के पुनर्प्रशिक्षण का प्रबंधन होना चाहिए। पी.हैच.डी शोध के स्तर को चिंताजनक है। सालभर में अमेरिका में 20 हजार, चीन में 16 हजार के मुकाबले भारत में 5 हजार या 6 हजार शोध प्रबंध ही बनते हैं। राज्य

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विश्वविद्यालय और उनके संबद्ध कालेज जिनमें 90 प्रतिशत से अधिक नामांकित हैं, निधियों की कमी और खराब गुणवत्ता के परिणाम स्वरूप खराब अभिजासन संबंधी गंभीर समस्याओं से जूझ रहे हैं।

भारत में उच्चतर शिक्षा के लिए बढ़ती हुई माँग के कारण उच्चतर शिक्षा का विस्तार हो रहा है। लेकिन इस विस्तार में ज्यादातर अंतर निजी संस्थाओं का है। इन संस्थाओं में सुविधाओं और शिक्षण अधिगम प्रक्रिया की गुणवत्ता बहुत असंतोषजनक है। उच्चतर शिक्षा में गुणवत्ता सुनिश्चित करने के लिए नती से वृद्धि होगी निजी संस्थाओं का भी आकलन होना चाहिए। देश के सभी उच्च शिक्षा संस्थाओं चाहे संस्था सार्वजनिक रूप से चित्त - पोषित हो या नहीं के लिए प्रत्यावर्तन की अनिवार्य चर्चा जाना चाहिए।

विश्वविद्यालयों की विश्व रैंकिंग में औप 2000 प्रतिशत में भारत में औप रैंकिंग प्राप्त संस्थाएँ भी निचले स्थान पर हैं। इसलिए भारत की भारतीय परिस्थिति के अनुकूल संकेतकों के आधार पर स्वयं अपनी रैंकिंग पदानि तैयार करना चाहिए चूंकि अन्य रैंकिंग प्रणालियों में परिकल्पना/विषयगत कारकों के लिए काफी महत्त्व दिया जाता है जिसमें भारतीय विश्वविद्यालय हानि उठाने हैं।

केंद्रीय विश्वविद्यालयों के सामने उच्च कौशल प्राप्त छात्रों को तैयार करने की चुनौती है ताकी उत्पादन क्षेत्र की आवश्यकताओं को पूरा किया जा सके। केंद्रीय विश्वविद्यालय स्थायी और सनन संस्थाएँ हैं। इन्हें वृद्धिमत्ता पूर्वक विज्ञान, अभिजासन और चित्त - पोषित किया जाना अपेक्षित होना है ताकि हमारे वैश्विक छवि और प्रतिस्पर्धात्मकता को बनाये रखना आवश्यक है। इन संस्थाओं की वैश्विक सम्मिश्रण के अनुसरण में, परंपरागत विषयक बाधाओं से आगे निकलकर आक्षेप उपक्रम उद्यम और ज्ञान उद्यमशीलता की संस्कृति को अपनाता होगा।

देश में सार्वजनिक राज्य विश्वविद्यालयों में अकादमिक सुधार की सख्त जरूरत है। गुणवत्ता में सुधार के लिए विश्वविद्यालयों और कालेजों के प्रत्यावर्तन की प्रणाली है। इसके बावजूद भी सार्वजनिक उच्चतर शिक्षा पर इसका कोई खास प्रभाव नजर नहीं आता। इसका प्रमुख कारण यह है कि शिक्षकों की कमी। ज्यादातर इन्हें नदर्थ रूप से नियुक्त किया जाता है। ऐसे शिक्षक इन्हें किए जानेवाले वृष्ट भुगतान से शिक्षण और अनुसंधान करने में असमर्थ हैं। कारपोरेट में कार्य करने की इच्छा रखनेवालों के लिए यह अनाकर्षक गंतव्य भी बन गया है। राज्य सार्वजनिक विश्वविद्यालयों और कालेजों में सुधार लाने के लिए राज्य सार्वजनिक विश्वविद्यालयों और कालेजों का चित्तपोषण करना, शिक्षण और अनुसंधान के मानकों का प्रत्यावर्तन देना, शिक्षकों की भर्ति आदि मुद्दों पर ध्यान देना चाहिए। हाल ही के वर्षों में राज्य में निजी विश्वविद्यालयों का



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पर्यावरण संरक्षण में महिलाओं की भागीदारी

डॉ. के. नीरजा

सह आचार्य

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मोबाइल नं : 9948045356

अंतर्राष्ट्रीय शासन के सहस्राब्दी विकास लक्ष्यों में लिंग समानता और पर्यावरण स्थिरता 21 वीं शताब्दी के बहुत ही महत्वपूर्ण एवं अंतःसम्बन्धित लक्ष्य हैं। इसी दौरान हमारे देश में हुई बहुत से पर्यावरण - आंदोलनों को देखा जाय तो हमें पता चलता है कि महिलाओं ने अहिंसात्मक ढंग से इन आंदोलनों में भागीदार बनकर अपने प्राणों की बलि देने के लिए तैयार होगये तथा पर्यावरण को क्षतिग्रस्त होने से बचाया, क्यों कि महिलाओं का शुरु से ही प्रकृति से निकटतम संबंध रहा है। हमारी संस्कृति में भूमि तथा नदियों को माता के रूप में पूजा की जाती है। पीपल, आँवला, तुलसी, बेल, शमी, नीम आदि पेड़-पौधों तथा गाय, बैल, साँप, चूहा, उल्लू, बंदर, कौआ आदि पशु - पक्षियों की पूजा - अर्चना के माध्यम से संरक्षण प्रदान करना देखने को मिलता है। हमारी महिलाओं द्वारा यह संरक्षण भावना पीढ़ी - दर पीढ़ी चली है एवं आज भी देखने को मिलती है। प्राकृतिक संसाधनों यथा वन, मिट्टी, जल से महिलाओं का सीधा गहरा संबंध है। एक तरफ वो प्रकृति की उत्पादनकर्ता, संग्रहकर्ता तो दूसरी तरफ प्रबंधक और संरक्षक की भूमिका निभा रही है।

देश में हुई कई पर्यावरण आंदोलनों में शिक्षित तथा अशिक्षित महिलाओं की भागीदारी अविस्मरणीय है। इन आंदोलनों पर नजर डाले तो 1739 में राजस्थान के खेजडी गाँव में अमृता देवी के नेतृत्व में किये गये आंदोलन की तस्वीर सबसे पहले आती है, वृक्षों को काटने से बचाने हेतु अमृता देवी सहित गाँव के 363 लोग प्राण त्याग दिये। इस घटना को रिचर्ड बरवे द्वारा संपूर्ण विश्व में पर्यावरण संरक्षण का उदाहरण देते हुए प्रचारित किया गया। इसी आंदोलन आजादी के बाद हुए चिपको आंदोलन को प्रेरित किया और दिशा दिखाई। 1974 में चमोली गाँव की महिलाएँ गौरा देवी के नेतृत्व में वृक्ष काटने आये लोगों को भगा दिया लगभग एक दशक तक ये आंदोलन (चिपको आंदोलन) चले। इसे ईको फेमिनिस्ट आंदोलन भी कहा जाता है क्योंकि इसकी

कार्यकर्ता अधिकांश महिलाएँ थीं। दक्षिण भारत में भी चिपको आंदोलन की तर्ज पर 1983 में अप्पिको आंदोलन उत्तर कन्नड क्षेत्र में शुरू हुआ। महिलाओं के आंदोलन से मजबूर होकर सरकार ने पेड़ों की कटाई रुकवाने का आदेश दिया। उत्तराखंड में महिलाओं ने 'रक्षासूत्र' आंदोलन की शुरुआत की। जिसमें उन्होंने पेड़ों पर रक्षाधागा बांधते हुए उनकी रक्षा का संकल्प लिया, इन आंदोलनों के दबाव के कारण 1988 में जो राष्ट्रीय वननीति बनी उसमें महिलाओं की सहभागिता को महत्व दिया गया। 1988 के पूर्व बने वननीतियों में महिलाओं का कहीं जिक्र नहीं था। संयुक्त वन प्रबंधन प्रोग्राम के अंतर्गत वन समिति में 33 प्रतिशत महिलाओं को आरक्षण दिया गया। इस प्रकार भारतीय महिलाओं ने बार बार साबित किया कि बड़े बदलाव लाने में वे पुरुषों के पीछे नहीं आगे हैं।

नर्मदा बचाओ आंदोलन के प्रणेता मेधा पाटकर ने बांध द्वारा पर्यावरण पर होनेवाली हानि तथा दूसरी ओर विस्थापित हुए लोगों के दर्द को आम आदमी तथा सरकार को सुनाने की सफल कोशिश की है। उच्चतम न्यायालय ने विस्थापित लोगों को उचित पुनरावास की स्पष्टनीति लागू करने के आदेश दिये। 'बुकर प्रैज' विजेता साहित्यकार अरुंधतीराय पर्यावरणविद भी है। 'बुकर प्रैज' से मिला हुआ धन राशी को उन्होंने 'नर्मदा बचाओ' आंदोलन की सहायता के लिए दे दिया। वे लेखिका के रूप में इस दुनिया को बेहतर और जीने योग्य बनाने के लिए अपने लेखन के द्वारा पर्यावरण संरक्षण में लगी हुई हैं।

प्लाजीमाडा आंदोलन नदी - संरक्षण और प्रदूषण के विरुद्ध महिलाओं द्वारा उठाया गया एक महत्वपूर्ण कदम था। अधिक लाभ आर्जन करने के लिए कोका कोला कंपनी ने भूजल में छोड़े गये प्रदूषण की ओर ध्यान नहीं दिया। जल-संसाधनों पर आश्रित स्थानीय महिलाओं की आजीविका पर इसका बड़ा असर पड़ा। अशिक्षित महिला मायालम्मा ने अन्य महिलाओं के साथ कोका कोला के विरुद्ध 'समर समिति' बनाई जो कि दक्षिण भारत में एक सफल आंदोलन के रूप में उभरी।

शुद्धतम नदी गंगा मैदानी भाग में चीनी रिफाइनरियों, डिस्टिलरियों, चमड़ा परिशोधन के कारखानों और कागज उद्योगों से प्रदूषित हो रही है। इसी कारण से गंगा अब दुनिया की दस सबसे प्रदूषित नदियों में से एक बन गई है। 'गंगा और हमारा दायित्व' पर कानपुर में आयोजित संगोष्ठी के माध्यम से श्रीमती रामराउता ने इसे राष्ट्रव्यापी सामूहिक आंदोलन में बदल दिया।

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हिन्दी तथा तेलुगु पहेलियों का विवेचन

डॉ. नीरजा

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कारण पहेलियाँ लोक साहित्य का एक प्रमुख एवं महत्वपूर्ण अंग हैं। पहेली लोक मानस की एक प्रकृत रूपरेखा है। हर संस्कृत, प्राचीन पुरातन पहेली है जिसकी कि लोक कथा और लोकगीत क्योंकि दुर्गम मानव बुद्धि का उपयोग करते हैं। लोक साहित्य में पहेलियाँ अत्यंत लोकप्रिय हैं। इनमें कर्तुल का रूप प्रकृत नहीं होता है। दो पहेलियों-एक पहेली-एक प्रमुख सामान्य है अतः प्रकृत लोकप्रिय है। ये अत्यंत पुरातन हैं क्योंकि इनका उल्लेख वेदों में महाभारत में भी मिलता है। महाभारत में युधिष्ठिर और गण के संवाद के रूप में पहेलियों के महत्त्व की जानकारी मिलती है।

पहेलियाँ, लोक साहित्य, लोक-मानस, पुरातन, अभिव्यक्ति, लोक कथा, लोकगीत, मानवबुद्धि, मनोविनोद।

पुरातन साहित्य में पहेली का अर्थ अत्यंत ही प्राचीन है। यह लोक साहित्य का एक अत्यंत महत्वपूर्ण अंग है। पहेलियों का नाम से इनका उद्भव हुआ है। प्राचीन भाषाओं में बुद्धिबल, उलट-धरियाँ, कर्मकर्मनी, गूढ़ा, पारसी आड़ी, दकोसला आदि प्राचीन नाम हैं।

तेलुगु में पालुपु कथलु या मारु कथलु कहते हैं। लोक विद्वानों ने यह स्पष्ट होता है कि ये प्रधानतया अभिव्यक्ति रूप में प्रचलित हैं।

पहेलियों मनोरंजन एवं बुद्धि परीक्षा तथा मनोविकास का साधन हैं। इसमें लोक जीवन का प्रतिबिम्ब दिखाई देता है। हिन्दी और तेलुगु पहेलियों के रहस्य-सहन, आचार-विचार, धर्म धर्म आदि कुछ भिन्नताएँ होने पर भी उनमें बहुत बड़ा समानता भी दिखाई देती है। हिन्दी पहेलियों का विस्तार हज़ारों काजी विस्तृत है। जबकि तेलुगु पहेलियों का हज़ार सीमित है। फिर भी हिन्दी और तेलुगु की अनेक पहेलियों में हमें समानताएँ और कुछ पहेलियों में विषमताएँ दिखाई देती हैं। इस आलेख का विस्तार बढ़ न जाय इसका दृष्टि में रखकर हिन्दी और तेलुगु की सिर्फ कुछ पहेलियों का यहाँ उद्धृत करके उनका विवेचन किया जायेगा।

प्रकृति संबंधी पहेलियों में—

- एक डिब्बा न बारह खाना।
- हर खाना में तीस-तीस दाना।। (साल, महीना, दिन)
- इसमें एक वर्ष में बारह महीने और हर महीने में तीस-तीस दिन सूचित है।
- हर एक पल में तीस बीज।
- 16 बीज काल।
- 15 बीज सकल।। (बादनी, अधरा)

तेलुगु में महीना और हर महीने में पंद्रह दिन प्रभावस्था क और पंद्रह दिन पूर्णिमा के होते हैं। इसलिए

इसमें अघरे और लजाल का उल्लेख है। तीस व दस महीना सूचित है। इस प्रकार दोनों पहेलियों में समानता है। जीव संबंधी पहेलियों में— मृगवदन-ख्याल-वीन-दाना खाती हाथ से वीन।। (गिलहरी)

इसमें गिलहरी का रंग और उसके शरीर पर धारियाँ होना सूचित है। वह दाना खाते समय हाथ से वीन-वीन कर खाती है।

पतले-पतले दांत हैं मगर वूहा नहीं गुच्छे वाली पूँछ है मगर लोमड़ी नहीं।

लम्बी धारियाँ हैं लेकिन सर्प नहीं। श्रीराम की सहायता की लेकिन बंदर नहीं। (गिलहरी)

तेलुगु पहेली में गिलहरी की पीठ पर धारियाँ और श्रीराम की सहायिका कहा गया है। क्योंकि कहा जाता है कि श्रीराम लंका जाते समय समुद्र में मार्ग बनाने के कार्य में गिलहरी ने भी सहायता की थी और रामचंद्र जी प्रसन्न होकर उसके पीठ में हाथ फेरने के कारण धारियाँ बन गई हैं। दोनों पहेलियों में गिलहरी की शारीरिक रचना के कार्य में समानता है।

शरीर संबंधी पहेलियों में— लग-लग कहे तो न लगे बेलग कहे तो लग जाय।। (होंठ)

हिन्दी पहेली में लग-लग शब्द कहने पर दोनों होंठ आपस में नहीं मिलते हैं लेकिन बेलग शब्द कहने पर होंठ आपस में मिलते हैं 'बे' ओष्ठ्य है।

इसी प्रकार तेलुगु में भी एक पहेली है: अम्मा कहने पर लगता है नाना (पिता) कहने पर दूर रहते हैं। इसमें 'अम्मा' शब्द कहने पर होंठ मिलते हैं और 'नाना' शब्द कहने पर नहीं मिलते हैं।

वस्त्र— आभूषण व श्रृंगार संबंधी पहेलियों में— घर है पर दरवाजा नहीं। गर्दन है पर सिर नहीं। हाथ है पर पैर नहीं। (कमीज)

अनुरूपी लेखक

जो भी पकड़ता है इसलिए उसे पीतल बना दिया गया है। जन्म म
म भी इसी से साम्य रखती हुई एक प्रकार से हम पकड़ते हैं।
प्यार प्यार से पला नाक पर खड़ा होकर कानों दोनों
खींचकर माल देवाता है।

महान पंडितों को सस्ता दिखाना काम है। (चश्मा)
महान पंडित, विद्वान लोग ही प्रायः चश्मे धारण करते हैं।
प्यार से पला क द्वारा चश्मे की नाक का सुविधा
है। यौक्त शाखाओं का नाम वृत्त कृदा विद्या पर नहीं रखा
है।

विभिन्न डिजाइनों में रंगाली भूमि पर बनाई जाती
है उसे उठाना कठिन होता है। हिन्दी में रंगाली पर पहेंली
हमें दिखाई नहीं देती। क्योंकि उन प्रदेशों में रंगाली का
प्रचलन बहुत कम है। लेकिन दक्षिण भारत में हर दिन
प्रत्येक घरों में सुबह और शाम रंगालियां बनाई जाती हैं।
इस प्रकार पहेंलियों लोक जीवन के अनुकूल,
विभिन्न प्रकार की रची गई हैं चाहे वे हिन्दी की हों या
तेलुगु की, उनमें केवल भाषा का ही अंतर होता है। जिससे
यह साबित होता है कि हिन्दी और तेलुगु की अनेक
पहेंलियों में साम्य अधिक दिखाई देता है। कुछ ही पहेंलियों
में अंतर दिखाई देता है। यों लोक मानस की प्रवृत्ति में अंतर
नहीं होता। भारतीय चिंतन पद्धति एक ही है तथा भारतीय
हृदय एक है।

पतंग कागज का बना होता है उसे धागा बांधकर
रस्मान में उड़ाना जाता है। वह बच्चों का एक मनोरंजक
काम है इसमें भी प्रतियोगिता होती है।
पहेंली में लोहा अंतर है।
पहेंली में लोहा अंतर है। (पतंग)

पहेंली में लोहा अंतर है।
पहेंली में लोहा अंतर है। (पतंग)

पहेंली में लोहा अंतर है।
पहेंली में लोहा अंतर है। (पतंग)

घरेलु वस्तु संबंधी पहेंलियों में— एक दोस्त, बड़ा
दोस्त, बड़े नाक पर पकड़े कान।। (चश्मा)

चश्मे को पहनते समय वह नाक पर आधारित
रखा है और कानों पर उसकी डंडियों को रखा जाता है
जिससे वह हिलता नहीं है और स्थिर रहता है। चश्मा कान

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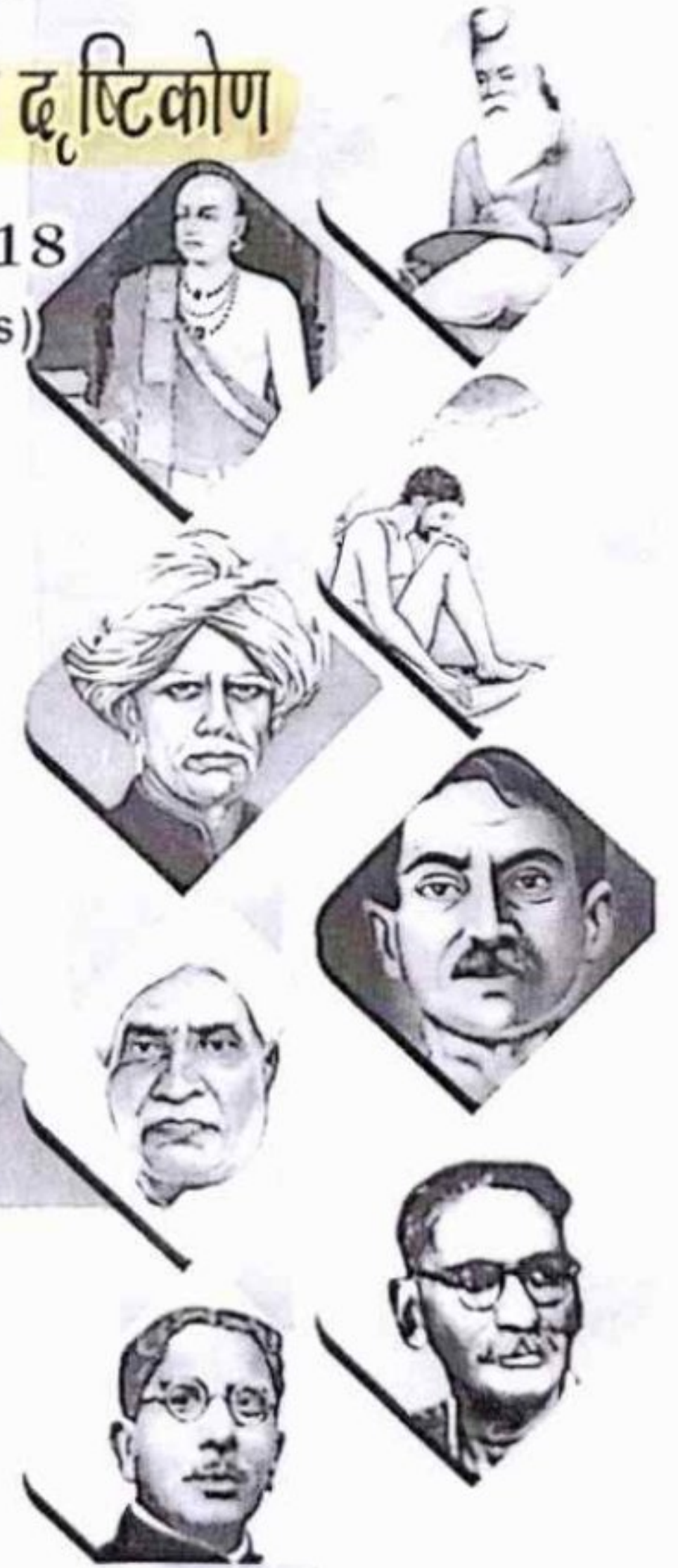
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డా. ఆర్.యస్.వి.యస్. రాజారావు



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डॉ. क. नीरजा, प्राध्यापिका.

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हिन्दी वाङ्मय के इतिहास में संत - साहित्य का अपना एक विशिष्ट स्थान एवं महत्त्व है। यह इस्फूर्त सान्ता का वह प्रमुख मूलस्रोत है जो उसके आदिकालीन अपभ्रंश रूप से ही निरंतर प्रवाहित होना आया है। यह संत साहित्य न केवल समय की दृष्टि से दीर्घकालीन है, अपितु वह अपने प्रचार-क्षेत्र के अनुसार बहुत व्यापक भी है। इसके रचयिताओं में, यदि दक्षिण के महाराष्ट्रीय संत नामदेव का लिया जाना है तो दूरगो और उत्तर के गुम्नामक देव तथा लल्लदेव तक को गणना की जाती है। इसी प्रकार इसमें पश्चिम के प्राणनाथ एवं पूर्व के जयदेव की भी गचनाएँ सम्मिलित हैं। तदनुसार पंढरपुर से लेकर पूरी तक तथा कश्मीर से कटियावाड तक की विस्तृत सीमा के निवासियों ने इसके निर्माण में न्यूनाधिक हाथ बँटाया है। इस विस्तार के कारण कोई कठिनाई नहीं आ सकी है, ना इस्फूर्त विविध बानियों में कोई मौलिक अंतर ही आ पाये। समाज के विभिन्न जातियों के सदस्यों ने भी इसके लिए अपनी रचनाएँ प्रस्तुत की हैं। वे चाहे बौद्ध रहे हों, चाहे जैनी, चाहे नाथपंथी रहे हों, चाहे सूफी अथवा चाहे वैष्णव रहे हों या शैव उन्होंने इसके अनुकूल मत को सदा पूरे बल के साथ प्रकट किया है। ऐसा करते समय उन्होंने इस बात को ध्यान रखा है कि तथ्य को ही महत्त्व दें, बाह्याडंबर का पूर्ण बहिष्कार करें। किसी प्रकार की स्ति प्रियता का आश्रय ग्रहण करना नहीं चाहते। वे कथनी एवं करनी के सामंजस्य एवं संतुलन को ही महत्त्व देते हैं। हमारे सामाने एक ऐसे मानव - जीवन का आदर्श रखना चाहते हैं जो यथासंभव सर्वदिशी तथा सर्वकालीन हो इसी कारण, सभी के लिए एक समान उपयुक्त भी ठहर सके, संत कवियों के दार्शनिक सिद्धांतों और स्वीकृत साधनाओं में भिन्नता हो सकती है। मगर उनकी बानियों का जीवनी परक होने के संबंध में मत भेद नहीं है। उनका अंतिम लक्ष्य सुधारवादी दृष्टिकोण है। समाज में व्याप्त बाह्याडंबर, अनैतिकता, रुढिवाद जाति - पाँति भेदभाव आदि का खंडन कर सुधारवादी दृष्टिकोण पर अधिक से अधिक बल देने में वे प्रायः एक ही समान कभी चूकते नहीं जान पड़ते।

संत तथा भक्त दोनों शब्दों के प्रयोग अधिकतर विकल्प रूप में होते आए हैं। संत शब्द का प्रयोग विशेषकर वहीं किया गया मिलता है, जहाँ कोई व्यक्ति समाज में रहकर दूसरों के प्रति दया अथवा परोपकार का भाव प्रदर्शित करता पाया जाता है। किन्तु भक्त हम केवल उन्हें ही कहा करते हैं जो सदा भगवत भजन में लीन रहा करते हैं फिर भी इन दोनों शब्दों का प्रयोग करते समय हम इस प्रकार के किसी अंतर पर कभी ध्यान नहीं देते।

रामानुज दक्षिण में इस भक्ति आंदोलन का पुरोधा बने तथा उत्तर में इसे उनके शिष्य रामानंद सामने लाये। रामानुज ने ब्राह्मण अब्राह्मण सभी को यहाँ तक की मुसलमानों को भी अपनी शिष्य परंपरा में लिया तथा दक्षिण में व्याप्त खान पान - संबंधी कट्टरता एवं अस्पृश्यता जैसी सामाजिक विकृतियों पर प्रहार किया। यही काम उत्तर भारत में रामानंद ने किया। समूचे उत्तर भारत में भ्रमण करते हुए उन्होंने अपने क्रांतिकारी सामाजिक विचारों का प्रचार - प्रसार किया। तुलसी को अपनी शिष्य परंपरा में लेते हुए कबीर को भी उसके अंतर्गत स्वीकार किया। राम नाम का उनका मंत्र सगुण तथा निर्गुण दोनों ही प्रकार की भक्ति का संवाहक बना। निम्न जातियों के तमाम संत इस भक्ति आंदोलन की लहर में ऊपर आए जिनमें जुलाहा कबीर, बुनकर दादू, चमार रैदास, नाई सेना, दरजी नामदेव, कसाई सदना अदि प्रमुख हैं। चाहे पूर्व हो या पश्चिम, उत्तर हो दक्षिण भक्ति आंदोलन का मुख्य नेतृत्व नीची कही जानेवाली जातियों के हाथों में ही रहा। इन सतों ने साधारण जनता को वर्ग, धर्म, जाति और संप्रदाय की संकीर्णता से मुक्त करते हुए परस्पर घुलने - मिलने की प्रेरणा दी और इस प्रकार रुढिवाद और सामंतवाद की जड़ों पर कडा प्रहार किया। सभी संत कवि भक्ति को आराधना का उच्चतम स्वरूप माना। बाह्याचारों, कर्मकांडों आदि की निंदा तथा भर्त्सना की। इसके अलावा मनुष्य सत्य को सर्वोपरि मानते हुए वर्गगत, जातिगत भेदभावों के तथा धर्म के नाम पर किए जानेवाले उत्पीडन का दृढ विरोध किया। "दामोदरन लिखते है कि संत कवियों के विचार धार्मिक अर्थों में

श्री. भक्तिपरक भाषाण की उन प्राणियों का देखने हुए किन्तु जिन पौन की गयी और अंगीकारों के फल
सामाजिक समाज का प्रभाव करना अवसर हो गया था, प्रगतिशील या (भारतीय चिंतन परंपरा - 335).

यह भक्ति आंदोलन सहायक धर्म तथा उसके द्वारा अभिमान एक अनैतिक और अमानवीय समाज व्यवस्था
के प्रति सामान्य जन के सार्विक रोष तथा उसकी दुर्दम जिजीविषा की भावनात्मक अभिव्यक्ति था, जो कोई
अनिवार्यता न होगी। निम्नवर्गीय साधारण जन की व्यथा से उदभूत इस भक्ति आंदोलन पर टिप्पणी करने का
समान्य साधक मुक्तिबंध कहते हैं भक्ति आंदोलन का जन साधारण पर जितना व्यापक प्रभाव हुआ उतना
किसी अन्य आंदोलन का नहीं। पहली बार शूद्रों ने अपने संत पैदा किए। कबीर, रेदास नाभा, सिपी, सेना, नाई
आदि महपुरुषों ने ईश्वर के नाम पर जातिवाद के विरुद्ध आवाज बुलंद की। समाज में व्याप्त (न्यस्त) स्वार्थवादी वर्ग
के विरुद्ध नया विचारवाद अवश्यभावी था। वह हुआ। तकलीफ हुई, लेकिन एक बात हो गई। (नयी कविता का
आत्म संघर्ष तथा अन्य निबंध, 88).

नानक संतो की उस परंपरा में अगणी थे जिसका लक्ष्य एकांत भक्ति न होकर राजनीतिक, सामाजिक तथा
सांस्कृतिक अभ्युत्थान था। उन्होंने कबीर की भांति हिन्दू और मुसलमान दोनों को उनकी संकीर्णता तथा बाह्याचार
के लिए फटकारा है। नानक सच्चा जीवन और सच्चा आचरण पर बल दिया है। ब्राह्मणों को संबोधित करते हुए उनका
कहना था, "वह जनेऊ जिसकी कपास टया हो, जिसका सूत संतोष हो, जिसकी गांठ संयम हो; हे पंडित यदि तुम्हारे
पास इस प्रकार का जनेऊ हो तो मेरे गले में पहना दो। ऐसा जनेऊ न तो टूटता है, न गंदा होता है, न जलता है
और न कभी नष्ट होता है, हे नानक वे मनुष्य धन्य है जो अपने गले में ऐसा जनेऊ पहनकर परलोक जाते हैं।
मुसलमानों को उनकी सलाह थी प्राणियों के ऊपर दया भाव को मसजिद बनाओ और श्रद्धा को मुल्ला। हक की
कमाई को कुगन और चुरे कर्मों के प्रति लज्जा को सुन्नत मानो। शील - स्वभाव को राजा बनाओ, हे भाई इस विधि
से मुसलमान बनो" आदि।

कबीर के लिए नारी टगिनी है, माया है। नानक के यहाँ नारी का स्थान सर्वोच्च है। इस बारे में उनकी मान्यता
है कि स्त्री से ही मनुष्य जन्म लेता है स्त्री के उदर में प्राणी का शरीर निर्मित होता है। स्त्री से ही सगाई और विवाह
होता है। स्त्री के द्वारा अन्य लोगों से संबंध जुड़ता है और स्त्री से ही जगत की उत्पत्ति का क्रम चलता है। स्त्री ही
हमें सामाजिक बंधन में रखती है। ऐसी स्थिति में उस स्त्री को दुरा क्यों कहा जाए, जिससे बड़े बड़े राजगण जन्म
लेते हैं। स्त्री से ही स्त्री उत्पन्न होती है। इस संसार में कोई भी प्राणी स्त्री के बिना उत्पन्न नहीं हो सकता। (नानक
वाणी, आसा की वार, सलोक 41) नानक के नारी संबंधी इस दृष्टिकोण ने मूल में वे सामाजिक मान्यताएँ है जो
नारी को उनके अपने समय और समाज में हेय दृष्टि से देखती थीं। नानक अन्य शोषित वर्गों के समान नारी की
भी सामाजिक मुक्ति के आकांक्षी थे। उन्होंने उन सारी मान्यताओं का कड़ा विरोध किया जो नारी की सामाजिक
मुक्ति में बाधा स्वरूप थीं।

कबीर संत कवियों में प्रतिनिधि कवि है। कबीर धर्म गुरु थे किंतु उनकी प्रतिष्ठा समाज - सुधारक के रूप में
अधिक है। उनकी दृष्टि प्रगतिशील थी। प्रगतिशील या जनवादी यानी मानववादी सृष्टि और दृष्टि की भी जो कबीर
- साहित्य में प्रतिष्ठित हुई। कबीर जातिगत, दलगत, वर्णगत और संप्रदायगत सामाजिक व्यवस्था के पक्के विरोधी
थे जिसकी पूर्ण उन्मूलन उनके काव्य में जगह जगह होती है। उनकी दृष्टि में जप, तप, माला, तिलक सब ढोंग है। इसके
करने, पहनने और लगाने से न कोई साधु बन जाता है और न कोई पंडित। वे मन की पवित्रता पर बल देते हुए
आचरण की शुद्धता के प्रति सचेत करते हैं। प्रख्यात आलोचक नामचरसिंह ने लिखा है आज से 600 वर्ष पहले समाज
को अंधाकूप से निकाल रहे थे। सामाजिक कुरीतियों, आडंबरों, विसंगतियों में सुधार के लिए वे आत्मज्ञान की बात
करते हैं। उनका मानना था कि आत्मज्ञान और मन की शुद्धि द्वारा मनुष्य के दृष्टिकोणों में सुधार संभव है। जीवन
के जटिल अनुभवों अनुभूतियों से उपजा उसका काव्य आज भी समाजी - वैविध्य को मिटाने और मानववाद को
विकसित करने की ऊर्जा - शक्ति देता है।



సాహితీ ప్రపంచంలో
 ఒక నిర్దిష్ట ప్రయాణంతో
 అక్షరార్చన చేస్తున్న సృజనశీల
 ప్రగతిదాయక మూర్తిమత్వం
 శ్రీమాన్ వల్లభుని నిర్మల ప్రసాద్ గారిది.
 తెలివిన పుస్తకమైన వీరి సాహితీయశస్సు లోకాన
 మంగళ ప్రాకారమై అలరారుతూనే ఉంటుంది.
 ఏ.పి.జెన్కో డివిజన్ ఇంజనీర్గా ప్రపంచాన్ని వెలుతురు
 వెల్లువలో ముంచెత్తిన వీరు కలంపట్టి అక్షరార్చనలో పునీత
 "సృజనాత్మక ధృతి" బహు ప్రశంసనీయమైనది!
 దీనికి నిలువెత్తు నిదర్శనం చతుష్కావ్యావిష్కరణ సభ!!



సారస్వత లోకాన "సాహితీ ప్రభాకరుని"గా
 అక్షర వైశిష్ట్యాన్ని విశ్వవ్యాప్తి చేస్తున్న
 రసాత్మక మూర్తిమత్వం
 డా॥ తరపట్ల సత్యనారాయణ గారిది
 ఆదికవి నన్నయ విశ్వవిద్యాలయం, రాజమహేంద్రవరంలో
 తెలుగు శాఖలో ఆచార్యునిగా అలుపెరుగని
 అక్షర అభినవేశమై సారస్వతానికి వన్నెతానొతున్న వారు
 డా॥ తరపట్ల సత్యనారాయణ గారు.

ఈ ఇద్దరి కవి పుంగవుల కవన సారధ్యంలో వెలుగు చూస్తున్న
 "సమైక్య భారతి" కవితా పంకలనం సాహితీ ప్రపంచాన అరుదైన
 రసయురిగా అలరారుతూ సమాజంలో భారత రాజ్యాంగం పట్ల
 మరింత విశ్వాసాన్ని పెంపొందింపగలదని నమ్ముతున్నాము.

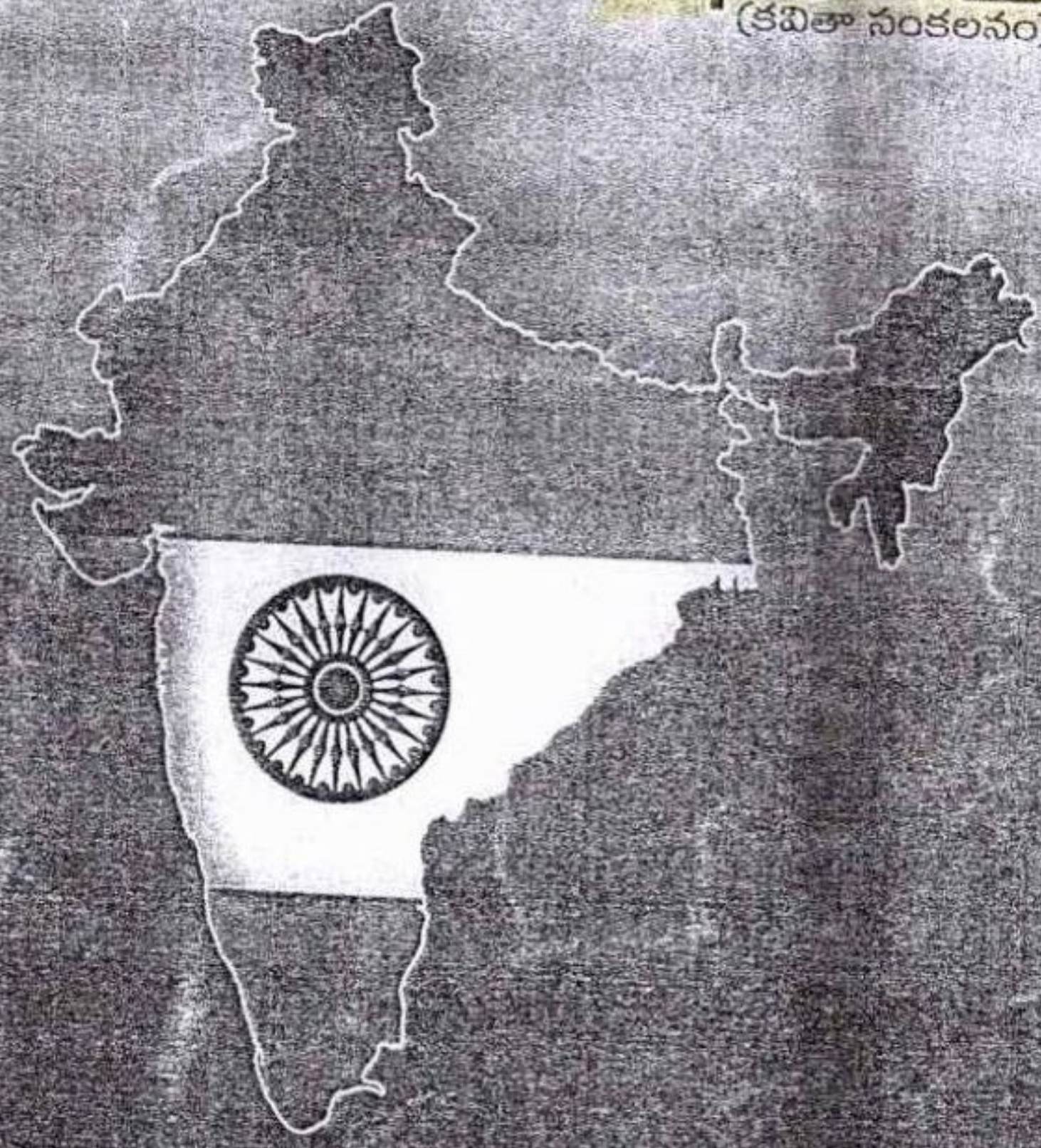
₹ 150



- వడలి రాధాకృష్ణ

సమైక్య భారతి

(కవితా పంకలనం)



సంపాదకులు
 డా॥ తరపట్ల సత్యనారాయణ

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చిత్తానికి శుద్ధిలేదు

శ్రీమతి కె.ఎస్. అన్నపూర్ణదేవి
తెలుగు అధ్యాపకురాలు
ఎస్.కె.ఆర్. మహిళా కళాశాల,
రాజమహేంద్రవరం.

గెలుపు ఓటమిల సంధికాలంలో
దిగజారిన నైతిక ప్రమాణాలు
కోరిక ఒకటే దారులనేకం
కాసులు తిన్న నోరు రుచి ఎరుగదు
పొంతన లేని మాటలు, చేతలు
ధనమధం ముందు తలవంచిన న్యాయం
మనదన్న భావనే అభ్యుదయం
ఆ అభ్యుదయమే మార్గదర్శనం
దొరికినంత దోచుకోవడం బ్రతుకుతెరువు మార్గం
రోజు గడిస్తే చాలనుకునే స్వార్థపరుడి మనస్సు
విత్తం కొద్ది విద్య - అక్కరకు రాని అక్షరసేధ్యం
బుద్ధికోసమా? భుక్తికోసమా విద్య?
సంపాదనతో కాలానికి విలువ
రాజీలేని విజయం నాది
దేశభక్తి కరువైన నాయకులు
ఆర్థికంగా దిగజారుస్తున్న స్వార్థపరులు
స్ఫురణకు రాని మానవత్వం
అన్నీ ఉన్నా అభివృద్ధి శూన్యం
ప్రజాస్వామ్యం పరిహసించబడుతోంది
నిరంతరం అప్రమత్తతతో 'జనం జాగృతం' కావాల
చిత్తానికి శుద్ధిలేదు
రాజకీయానికి చావులేదు.

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సమైక్య భారతి

బండారు నారాయణ
కొత్తపేట.

సరిహద్దుల్లో కంచెకున్న ముళ్ళు
గుండె మీద చేసిన గాయం
ఇంకా పచ్చిగానే ఉంది

నేలమీద
ఆధిపత్య నెరల్లో
మొలకెత్తుతున్న ప్రశ్నలు
ఎండిపోతూనే ఉన్నాయి

అంతరంగాల తడి ఆరిపోయేకా
నవ సమాజపు కొలబద్దలు
అంతరాల్ని కొలుస్తున్నాయి

తాగే పాత్రలే వేరు
నేల గర్భంలో అదే ఊట

ఆరు బయట పడకల్లో
శూన్యం నర్తిస్తుంటే
మూసి ఉన్న మిద్దెల్లో
నింగి పూలు వికసిస్తున్నాయి

ఊరికి దూరంగా
విసిరేసిన బతుకుల్లో
ఏ రంగుల జెండాలు సమైఖ్యజాతిని శ్రేష్టిస్తున్నాయి
సమసమాజాన్ని సృష్టించేందుకు



Synthesis, Characterization and Visible Light Photocatalytic Degradation Study of Thiourea modified Nano Titania Composites

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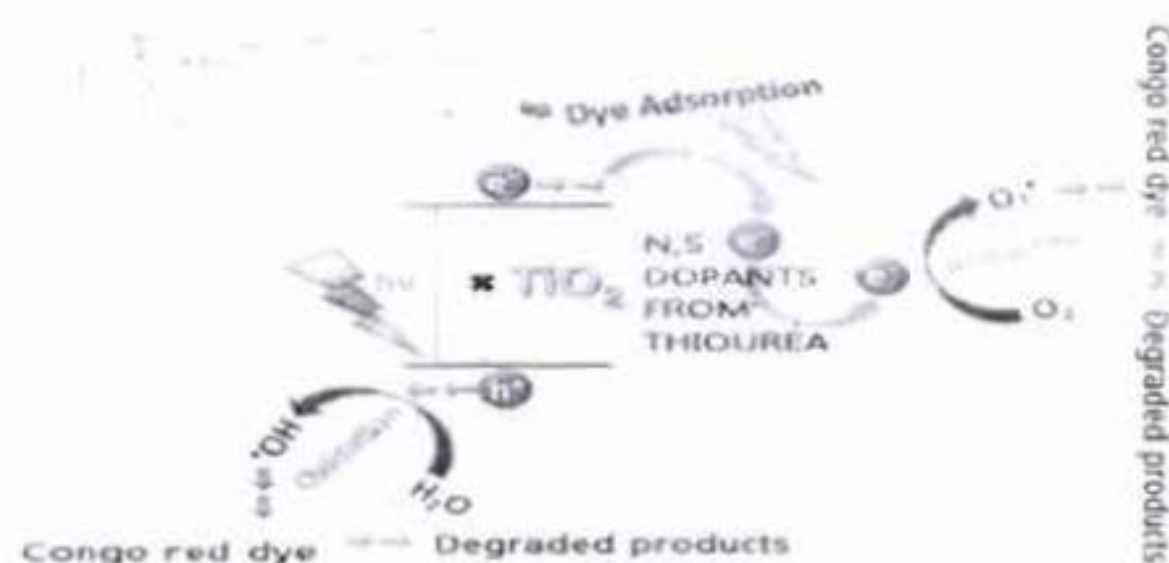
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ABSTRACT

In the present work, visible light induced photocatalytic degradation of Congo red dye in aqueous medium was investigated by employing Thiourea modified nanotitania (NT) particles. The composites were synthesized by organic solvent free controlled hydrolysis of titanium tetrachloride followed by dispersing thiourea and the samples were designated as x mole % thiourea titania nanocomposites (where x= 5, 10, 20 mole %). These composites have been characterized by X-Ray Diffraction (XRD), Field Emission Scanning Electron Microscopy (FE-SEM), and UV-Visible Diffuse Reflectance Spectroscopy (UV-Vis DRS). Efficiency of the composites towards the photocatalytic degradation of Congo red dye was assessed by analyzing the effect of nanotitania particles with increase in the content of Thiourea and effect of pH of the dye solution. Photocatalytic degradation of Congo red dye was enhanced by contriving the composites into visible light absorption on dispersing Thiourea on the surface of nanotitania particles. With an optimum increase in the Thiourea content, the photocatalytic activity of the composites was improved and a superior photocatalytic activity was observed with 10% Thiourea -nanotitania composite material.

Graphical Abstract



Visible light Photocatalytic degradation mechanism of synthesized x mole % thiourea- nanotitania composites on Congo red dye

Keywords: Visible Light Photocatalytic degradation, Thiourea modified Nano Titania, Congo red.

INTRODUCTION

Industrial waste waters containing harmful organic dyestuffs with intense color, high toxicity introduced into the aquatic systems has become an exigent task to handle [1]. These untreated dyes are mostly released from textile industries. Of all the dyes found in the waste waters, aromatic azo dyes were observed to be more complicated in nature due to the presence of carcinogenic azo group (-N=N-) chromophores [2-4]. More than 60% of dyes similar to azo dyes with different chemical structures are used in textile, pharmaceutical, paper, ink industries etc [4]. It is vital to treat the waste waters containing these dyestuffs before released into the water bodies. Over the past few decades, physical and chemical techniques like coagulation, adsorption on activated carbon, reverse osmosis, biodegradation, advanced oxidation processes (AOP) etc are some of the established techniques to degrade the organic dyes [5]. Among these techniques, AOP was found to be one of the promising paths to detoxify the organic pollutants in industrial waste waters [6-8]. Photocatalytic degradation using heterogeneous semiconducting materials is one of the routes in AOP and was adopted in many works [9-10]. The most commonly used photocatalysts are TiO₂, ZnO, Fe₂O₃, Cu₂O, ZnS and WO₃. Owing to its low toxicity, high photostability, low cost and high photo efficiency, nanotitania (NT) with anatase phase was reported as one of the familiar and effective photocatalyst [11-13]. However, its large band gap of around 3.2 eV (anatase) and rapid electron/hole (e⁻/h⁺) recombination confines its usage to UV region [14]. Doping with inorganic metals, modifying titania particles by forming nano composites by introducing carbon materials are few methods to contrive the absorption of the titania particles into visible region. Titanium tetrachloride was reported as one of the discriminating precursor to synthesize photoactive NT particles without impurities [15-16] among many precursors and in the present work the same material was used to synthesize NT particles followed by exfoliation of thiourea on NT particles. The mole % of thiourea was arranged as 5%, 10% and 20 % respectively in the composite materials and its effectiveness were investigated for visible light induced photocatalytic degradation of Congo red dye (Figure 1).

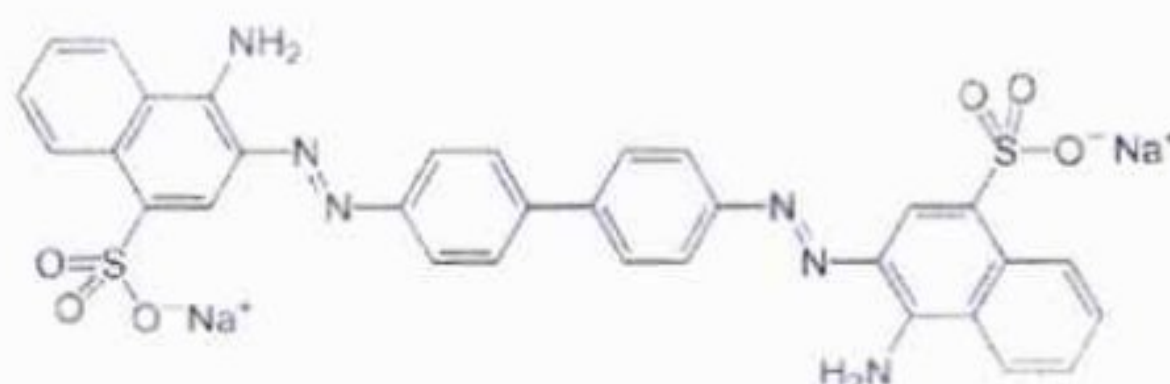


Figure 1. Structure of Congo red dye (C.I. Direct Red 28)

MATERIALS AND METHODS

Titanium Tetrachloride (TiCl₄) and Thiourea of AR grade were used for the present work with more than 99% purity. Congo red dye (Qualigens) with chemical formula C₃₂H₂₂N₆O₆Na₂S₂ (C.I. Direct Red 28, M.W=696.67 g mol/L) was the azo dye selected for the study. All the chemicals were used as procured without any further purification. De-ionised water was used all throughout the study.

Synthesis of Thiourea modified Nano Titania Composites: 350 mL of De-ionised water is taken into three different beakers. In order to maintain a 1:50 mL ratio of TiCl₄/H₂O, 6.9 mL of TiCl₄ was slowly added into each of the three beakers and left for 30 minutes on magnetic stirrers to allow the reaction to proceed. This [Precursor/ Solvent] volume ratio of Titanium Chloride / water produces around 5.0 grams of titania nanoparticles. To the reaction mixture in the three different beakers under constant stirring, stoichiometric quantities of thiourea were added to prepare 5 mole %, 10 mole% and 20 mole % Thiourea – Titania nano composites. The final mixtures were heated at around 100° C to 120° C to vaporise the chloride ions and the gel obtained was dried in an electrical hot air oven at 80° C. The composites obtained were finely ground and sintered at 400° C for 4

hours. The composites were consecutively designated as 5%, 10% and 20% Thiourea-Titania Nano Composites.

Photocatalytic measurements: UV-Visible spectrophotometer (Systronics-105, wavelength range: 340-960nm) was used to study the photocatalytic performance of the synthesized nanocomposites. 10 mg of the each composite material was added to 10 ppm of 100 mL of the dye solution ($\lambda_{max} = 500$ nm) under continuous stirring. After establishing desorption-adsorption equilibrium for 30 minutes in dark conditions, the photocatalytic study was carried out under 400 watts tungsten halide lamp embedded in a wooden breakfront. In pre-determined time intervals, 5mL of aliquots were drawn, centrifuged and the translucent dye solutions were analyzed using UV-Visible spectrophotometer at 500 nm wavelength. The % degradation of the dye was calculated using equation.1.

$$\text{Photocatalytic degradation \%} = \left(\frac{C_0 - C}{C_0} \right) \times 100 \quad \dots (1)$$

where C_0 is initial concentration of the dye and C is the concentration of the dye at a time interval, t .

Instrumentation: The composite materials were characterized by using X-Ray Diffractometer (PANalytical-X' Pert PRO, Japan) at room temperature using Nickel Filter Cu-K α radiation ($\lambda = 1.54059 \text{ \AA}$) over wide range of $10^\circ \leq 2\theta \leq 80^\circ$ with a scanning speed of 2 min^{-1} . UV-Visible diffuse reflectance spectra were recorded using Single Monochromator UV-2600 (optional ISR-2600Plus, λ up to 1400nm). The morphology of the synthesized composites was studied by Field Emission Scanning Electron Microscopy (FE-SEM, LEO1550).

RESULTS AND DISCUSSION

X-Ray Diffraction studies: The XRD patterns of the synthesized composite materials were recorded in the 2θ range of $10-80^\circ$ at a step interval of 0.02° with the counting time of 5s at each point. Figures 2.a, 2.b, 2.c shows the XRD pattern of the 5 mole %, 10 mole %, 20 mole% Thiourea doped titanium oxide nanocomposites respectively. It was clear from the diffraction patterns that the 2θ values at 27.5° , 36.2° , 39.3° , 54.4° , 62.2° , 64.1° , 69.4° , 76.6° and 82.4° can be perfectly assigned to the crystal planes of the (101), (103), (004), (200), (105), (211), (204), (116), and (303) of the body-centred tetragonal titanium dioxide which were in good agreement with anatase phase of nanotitania particles (JCPDS No. 21-1272). Further, the characteristic peak of thiourea at $2\theta = 25.2^\circ$ corresponding to the C (0 2 0) plane was almost not observed in the composites and it may be due to the well exfoliation of the thiourea particles on the surface of nanotitania [17-18].

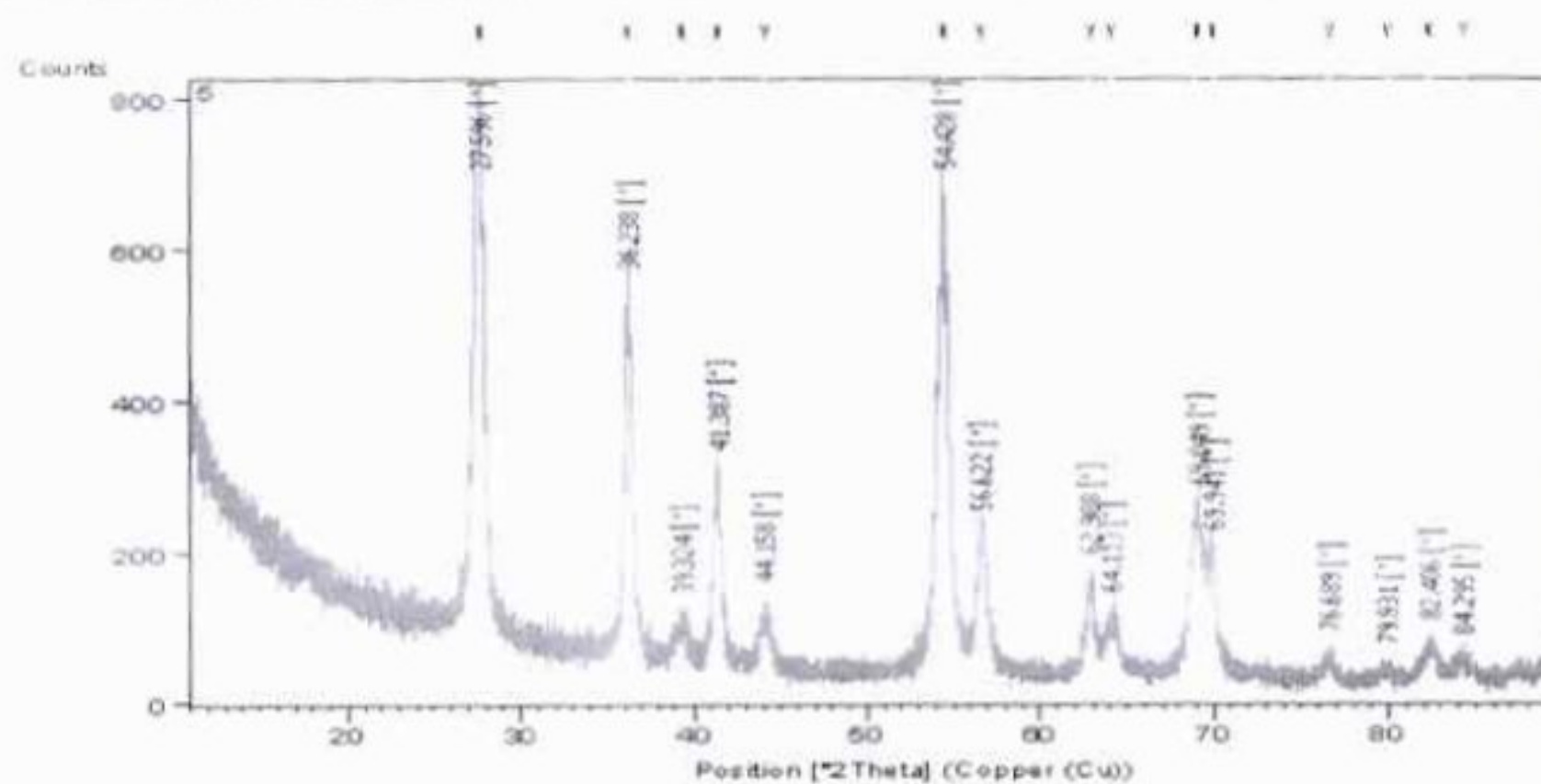


Figure 2.a. XRD Pattern of 5 mole % thiourea-titania nano composite

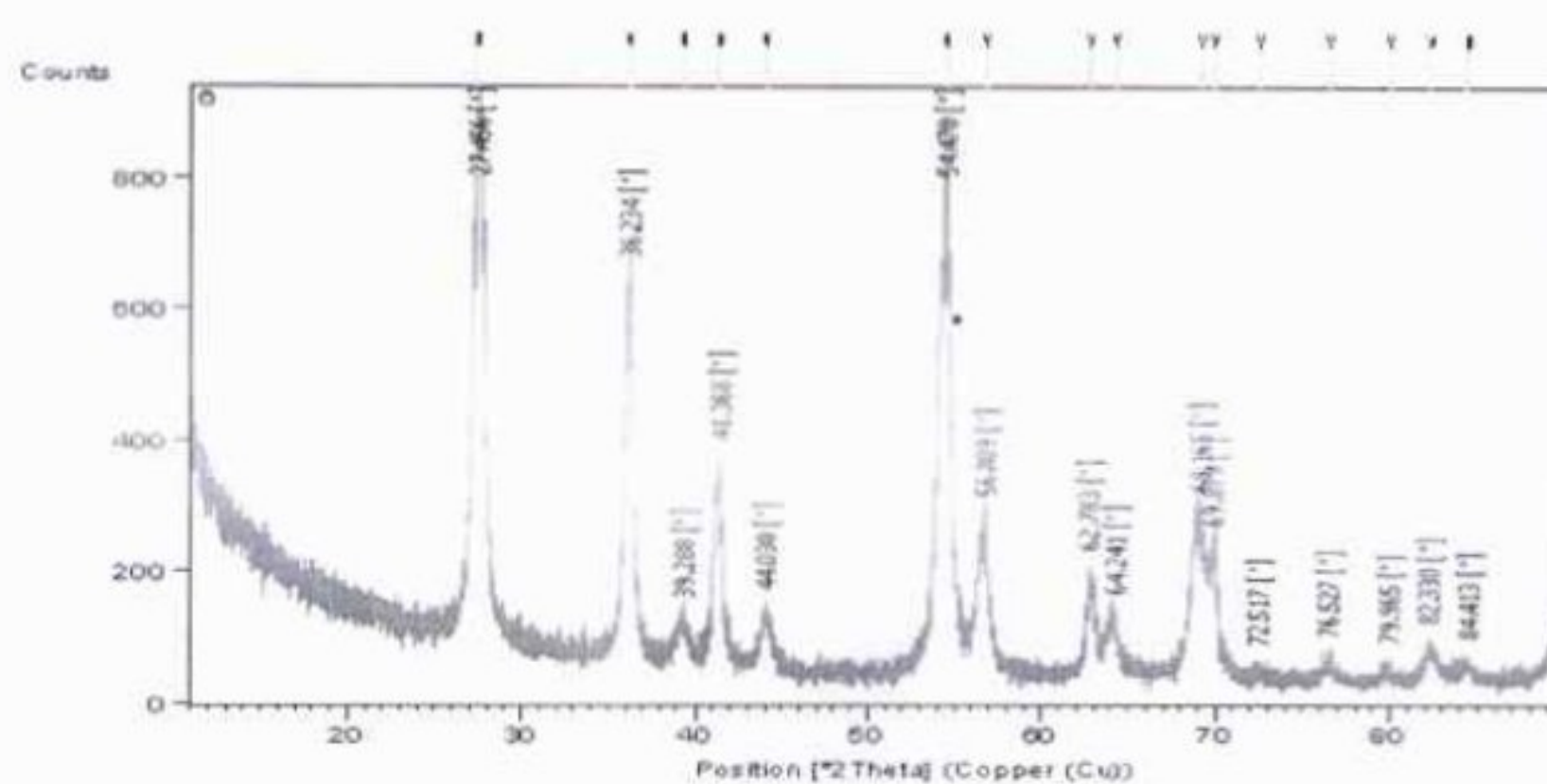


Figure 2.b. XRD Pattern of 10 mole % thiourea-titania nano composite

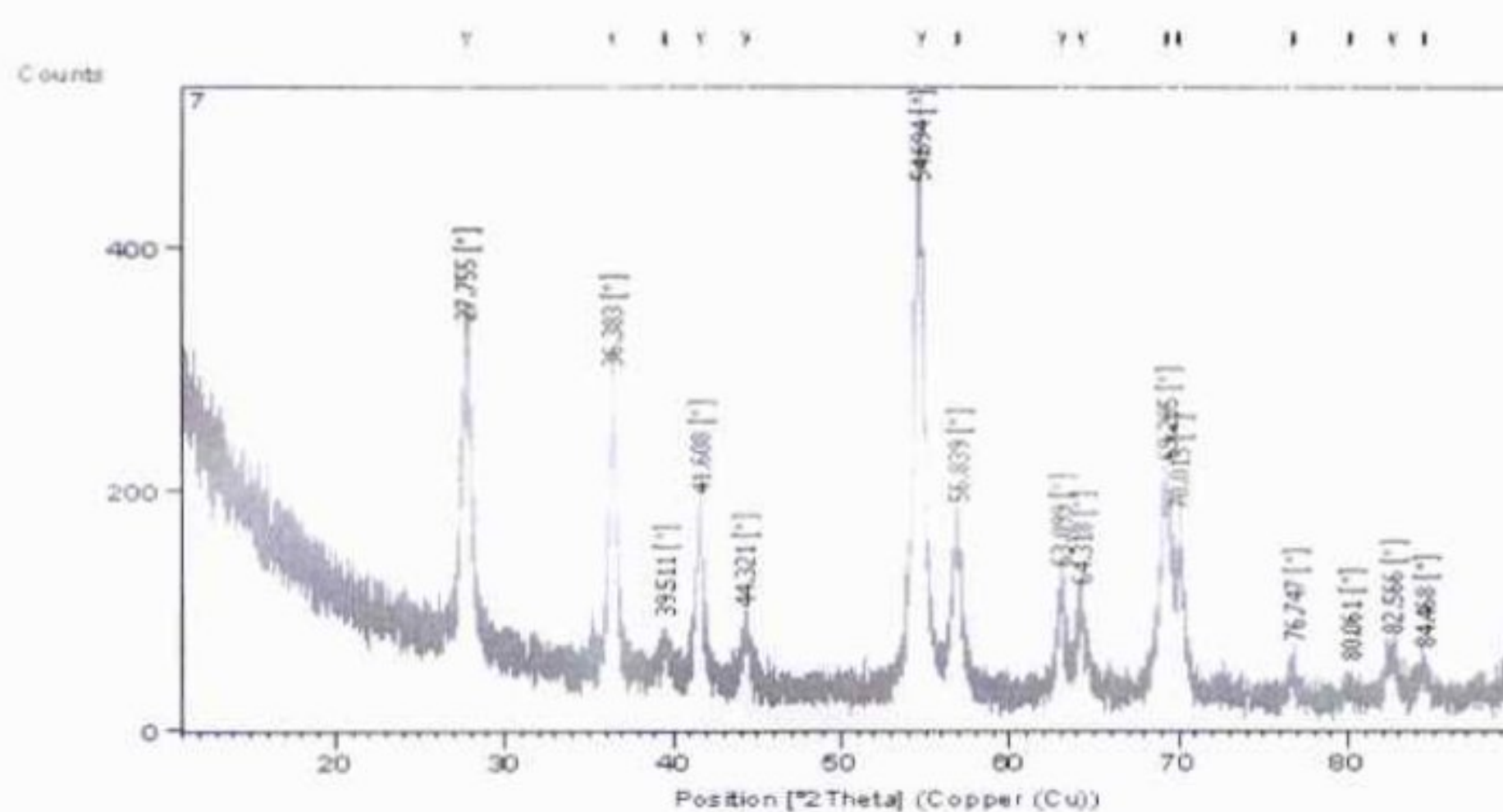


Figure 2.e. XRD Pattern of 20 mole % thiourea-titania nano composite

UV-Diffuse Reflectance (UV-DRS) studies: Figures 3.a, 3.b and 3.c depict the optical properties of the Thiourea-titania nanocomposites. The nanotitania particles were synthesized by maintained 1:50 [precursor]/[solvent] volume ratio and also a higher specific surface area was reported in the earlier works [15]. It is observed that with an increase of Thiourea content in the composites, the absorbance of the composites was increased gradually which may be due to enhanced surface area of the nano composites and active sites in the photocatalyst. This clearly results that the thiourea particles were perfectly exfoliated on the surface of the nanotitania particles enhancing the visible light absorption capacity of the composites. It also indicates a strong chemical interaction between the titanium ions and the oxygen and nitrogen moieties in thiourea. There was also narrow decrease in the band gap of 10 mole % thiourea titania nanocomposite material and this may be due to a strong diffusion of the nitrogen dopants into the titania moiety and caused a reasonable drop in the band gap. Further increase in the mole % of thiourea in the composites did not bring much difference in the band gap as excess dopant atoms may decrease the number of active sites in the composites and these results were presented in table 1. These findings were in close agreement with the earlier works [19].

Morphology studies: The FESEM images of the synthesized composite materials were presented in figures. 8a, 8b, 8c. From the FESEM micrographs of Thiourea-titania nanocomposite material, It was found that there was a significant change in the particle size of the composites which may be due to well exfoliation of Thiourea on nanotitania in the composite materials [20].

Visible Light Photocatalytic Degradation of Methylene Blue and Malachite Green Dyes with CuWO₄-GO Nano Composite

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Abstract

Copper Tungstate-Graphene Oxide nano composites have been successfully applied as excellent catalysts for the photocatalytic degradation with Methylene blue and Malachite green dyes under visible light irradiation. A facile solid state metathesis synthesis of copper tungstate (CuWO₄) followed by ball milling and subsequent preparation of copper tungstate-graphene oxide (CuWO₄-GO) nano composite using a colloidal blending process and its application as a visible light photocatalyst for the degradation of Malachite green and Methylene blue dyes. The morphology and composition of copper tungstate (CuWO₄) nano composite have been characterized using X-Ray Diffraction (XRD), UV-Visible Diffuse Reflectance Spectra (UV-DRS), Raman Spectra, Field Emission Scanning Electron Microscopy (FESEM)-EDS and UV Visible Spectroscopy. It shows a band gap value of 2.13 eV, an increase in range and intensity of light absorption and the reduction of electron-hole pair recombination in CuWO₄ with the introducing of GO on to it.

Keywords

Copper Tungstate, Graphene Oxide, Metathesis, Methylene Blue, Malachite Green, Visible Light Photodegradation

1. Introduction

Many efforts have been made in the past, and in recent years semiconductor

based photocatalysts with high photocatalytic activity for environmental protection have been developed. Procedures such as water disinfection, air purification, polluted waste water remediation, etc. are taken. It has been a promising technique owing to its strong oxidizing nature, chemical inertness, economic viability and non-toxicity [1] [2] [3]. The unique arrangement of electronic structure, light absorption properties and charge transport characteristics in most of the metal oxides and tungstates have proven them to be superior photocatalysts.

Transition metal tungstates are considerable inorganic materials that have a significant application in various fields. Some of the divalent transition metal tungstates have also gained commercial interest in fluorescent lamps and lasers lights, due to its excellent electrical conductivity. In addition to this, these are also used as humidity sensors and catalysts. Copper tungstate is a well-known semiconductor with potential technological applications in scintillates, detectors, photon-odes, laser hosts, optical fibers etc. [4] [5].

Solid-state metathetic approach has been successfully applied for the synthesis of many oxide materials. For example, Gopalakrishnan *et al.* have synthesized oxides of $K_2La_2Ti_3O_{10}$, $Ca_2La_2CuTi_2O_{10}$ belonging to Ruddleson-Popper type of materials, ABO_3 perovskite type of materials like $LaMO_3$ ($M = Co, Mn$), $ATiO_3$ ($A = Ca, Sr$ and Ba) and double perovskites like $Ba_3MM_2O_9$ ($M = Mg, Ni, Zn$; $M_2 = Nb, Ta$) by this approach [6] [7] [8] [9]. In addition, Kaner *et al.* have synthesized oxides of Zr, Hf and Cu using this approach [10] [11]. Copper-tungstate ($CuWO_4$) crystals exhibit only wolframite-type monoclinic structure at high pressure [12]. Many metal tungstates like $CuWO_4$ are also used for water splitting and photocatalysis [13] [14].

Generally, the oxidized graphene sheets, namely, GO, acquire multiple defects and the degree of the defects is subject to the additive amount of oxidant and the oxidizing time [15]. Graphene oxide consists of water-dispersible, soft carbon sheets that can be easily converted to a conductive form and this 2D material continues to inspire many interesting applications and discoveries in a wide variety of fields including liquid-crystal display technology, bioscience, and materials science [16] [17].

Graphene oxide (GO) is a two-dimensional material derived from graphite by introducing covalent C-O bonds [22]. A large number of oxygen-containing functional groups have been implanted on both sides of a single graphite sheet overcomes the inter sheet Vander Waals force and enlarges the interlayer spacing. The sheets in such an expanded structure are easily pulled up using an external force by ultrasonication. Now the copper tungstate nano particles are directly grown on graphene oxide which appears to exhibit strong interactions with the underlying graphene oxide sheets. Since ultrasonication would not lead to any dissociation of the sheets, due to its strong coupling leading to an advanced hybrid materials for various applications including photocatalysis. The photo catalytic activity of the obtained copper tungstate-graphene oxide hetero-architecture was evaluated by the degradation of Malachite green (MG) and Methylene blue (MB) under visible-light, and the results are shown in Figure 1.



VISIBLE LIGHT INDUCED PHOTOCATALYTIC DEGRADATION OF XYLENOL ORANGE DYE USING CoWO₄-CHITOSAN COMPOSITE AND ITS ANTIMICROBIAL ACTIVITY

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ABSTRACT

This paper explores the formation of heterostructure composite of chitosan based cobalt tungstate (CoWO₄) through hydrothermal approach. The desirable samples were further carried out by using sophisticated analytical instruments such as XRD, FTIR, TEM, SEM EDX, XPS, TGA and UV-DRS were employed in this study to get information about their structural, electronic and optical properties. Xylenol orange (XO) is a model dye pollutant was used in this study to determine the photocatalytic performance of prepared composite and pure CoWO₄. The obtained analysis results were stated that prepared composite is effective photocatalyst for the complete degradation of XO dye aqueous solution under visible light irradiations in 1h. As a result, the data reveal that CoWO₄/Chitosan at 10 mg/L at pH 3 is an excellent photocatalyst for the degradation of 10 mg/L XO dye solution. In addition the antimicrobial activity of prepared samples also measured over the pathogens of E.coli and S.aureus.

Keywords: CoWO₄-Chitosan Composite; Xylenol orange dye; Photocatalytic degradation; Antimicrobial activity.

1. Introduction

A severe threat to water is due to rapid industrialization, urbanization and population. Copious industries such as petrochemical, textile, printing, pharmaceutical, and chemical industries require great quantity of water and also discharge large amount of wastewater. Dye waste is an important toxic pollutant which is a non-biodegradable nature and destructs the whole ecosystem [1]. Researchers among the world have been done fabulous work to explore more convenient, economical and ecological process. The conventional methods including chlorination, adsorption, reverse osmosis, ion exchange and filtration have been reported for organic compounds from one phase to another [2]. However, owing to the great amount of aromatic compounds and stability of dye molecules, the conventional approaches are ineffective for the removal of dye pollutant. Yet, heterogeneous photocatalysis has proven to be an effective advanced oxidation process (AOP) technique for the complete decolourisation of dye pollutant owing to the active formation of hydroxyl free radical (OH) is a main product via light irradiating with

semiconductors metal oxides. Photocatalytic mechanism is mainly based on the formation of electron and hole pairs are capable of removing organic dyes upon light illumination. Efforts have been made by many researchers to introduce metal [3-4], non-metal [5] or metal oxide [6-7] into the semiconductor materials to effectively increase the catalytic activities of semiconductors [8]. The literature survey has shown that the semiconductor supported materials widely enhance the photocatalytic activity because of their controllable pore space and surface chemistry as well as photostable. Various support have been investigated such as alumina, zeolite, silica gel, fiber optic cable, glass beads, quartz, stainless steels, clays, cellulose, activated carbon and polymers [9-11].

The binary metal oxide CoWO₄, one of the tungstates, has been receiving more and more attentions for its multitude of applications, including oxygen evolution catalyst [12] and production of hydrogen [13]. However, no literatures reported the application of CoWO₄ as the electrode material in supercapacitors until

now, to our best knowledge. Based on the high super capacitive performances of the metal oxide, CoWO_4 with a $\text{Co}^{3+}/\text{Co}^{2+}$ redox couple should be a promising electrode material for supercapacitors. Besides, as reported in some literatures, the binary metal oxides of tungstate present the conductivity on the order of $10^{-7} - 10^{-3} \text{ S cm}^{-1}$, because the incorporation of W atoms can greatly enhance their conductivity in comparison with pure metal oxide [14]. In this work, CoWO_4 has been prepared by the wet-chemical and hydrothermal approaches starting from solutions of Co^{2+} and $[\text{WO}_4]^{2-}$. In general, such a quick precipitation reaction usually forms amorphous compounds in wet-chemical method, while the hydrothermal reaction often obtains compounds with crystal structure. These CoWO_4 nanoparticles were used in electrode materials for supercapacitors and their electrochemical performances were investigated by cyclic voltammetry (CV), galvanostatic charge/discharge (GV) and electrochemical impedance spectroscopy (EIS) studies [15].

Natural biopolymer chitosan has wide range of applications in pharmaceutical, biomedical and environmental activities. Chitosan is an interesting biopolymer for immobilization due to its excellent film-forming ability, high permeability, good mechanical strength, nontoxicity, biocompatibility, low cost and easy availability [16-17]. The binding ability of chitosan was attributed to the chelating groups such as $-\text{NH}_2$ and $-\text{OH}$ with metal. The different chitosan composite materials such as chitosan/ TiO_2 [18-19], chitosan/cuprous oxide [20], chitosan/ CdS [21] and chitosan/ ZnO [22-23] were prepared for the application of antibacterial agent, biosensor and photocatalyst to remove organic pollutants. The present investigation deals with the synthesis of Cobalt tungstate nanoparticles using a Chitosan biopolymer, characterisation and its application on photocatalysis and antibacterial activity. The photocatalytic experiment on the degradation of xylene orange (XO) were carried out under irradiation of visible light. Antibacterial activity for the nanoparticles was performed for Gram-negative *Escherichia coli* (*E. coli*) bacteria and gram-positive *Staphylococcus aureus*.

2. Materials and methodology

2.1 Materials:

The chemicals including Sodium tungstate ($\text{Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$), Cobalt nitrate ($\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$), Glutamic acid ($\text{C}_5\text{H}_9\text{NO}_4$) and Chitosan polymer were purchased from Merck Co., India and used as such. Double distilled water was used for preparing aqueous solutions. All the chemicals used in these studies were of Analytical grade without any further purification. All the reagents and dye solutions of desired concentrations were prepared with double distilled water.

2.2 Methodology:

Preparation of CoWO_4 via hydrothermal route: The CoWO_4 nanoparticles were prepared by the

hydrothermal method from Sodium tungstate and Cobalt nitrate. For preparing CoWO_4 via hydrothermal, 0.05 M of Na_2WO_4 was prepared in 100 mL of distilled water. 0.05 M of $\text{Co}(\text{NO}_3)_2$ was prepared in 100 mL of distilled water and was added to the above solution under magnetic stirring, followed by add 1 M NaOH solution to maintain pH-7 for 30 min. The obtained mixture solution was transfer to autoclave, which was maintained at 100°C for 1 h. After reaction completion, autoclave was allowed to cool at room temperature. The obtained reddish-brown precipitation was washed several times with deionized water and ethanol and dried at 70°C . Finally obtained product was calcined at 220°C for 12 h in furnace and then cooled it to room temperature.

2.3 Instrumentation:

The optical properties were investigated using a UV-Vis DRS in the air at room temperature in the wavelength range of 200-800 nm using Shimadzu UV-2600R spectrophotometer. Functional groups of the nanocomposites were analyzed by using the Fourier-Transform Infrared (FT-IR) spectrophotometer (JASCO-FTIR-460 plus). The crystalline structure of the nanoparticles was identified by an X-ray diffractometer (XRD; XPERT PRO X-RAY) with the Cu-K α radiation at 25°C and the structural assignments were made regarding the JCPDS powder diffraction files. The surface morphology was examined using a Scanning Electron Microscope (SEM) (JSM 6701F-6701) in both secondary and backscattered electron modes and the elemental analysis was also done with EDAX. The surface area was measured on approximately 250 mg of the samples using Kr at the liquid nitrogen temperature by a Micromeritics ASAP 2020 apparatus. Before the measurements, the samples were degassed at 350°C for 18 h. The pH was monitored using EUTECH instrument pH meter.

2.4 Photocatalytic degradation of Xylene orange dye:

The photocatalytic experiments were carried out in a 250 mL beaker and the whole setup along with magnetic stirrer was kept under the visible light. 100 mL of Xylene orange (XO) with an initial concentration of 20-30 mM were used. 25 mg-100 mg of the nanocomposite was taken for degradation. Before the light irradiation, the reaction mixture was stirred in the darkness for 30 min to achieve the adsorption-desorption equilibrium between the catalyst and the dye molecules. During the exposure to visible light, 5 mL of aliquot was collected at regular time intervals. Then the samples were centrifuged to remove the photocatalyst and the filtrate was evaluated for the absorbance by UV-Visible spectrometry at $\lambda_{\text{max}} = 583 \text{ nm}$. The photodegradation of XO dye was calculated by the Equation (2).

$$\text{Photodegradation (\%)} = \frac{[C_0 - C]/C_0}{100} \quad (2)$$

Where, C_0 is the concentration of MB before the irradiation and C is the concentration of MB after a certain irradiation time.



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Keywords: CoWO₄-Chitosan Composite; Xylenol orange dye; Photocatalytic degradation; Antimicrobial activity.

1. Introduction

A severe threat to water is due to rapid industrialization, urbanization and population. Copious industries such as petrochemical, textile, printing, pharmaceutical, and chemical industries require great quantity of water and also discharge large amount of wastewater. Dye waste is an important toxic pollutant which is a non-biodegradable nature and destructs the whole ecosystem [1]. Researchers among the world have been done fabulous work to explore more convenient, economical and ecological process. The conventional methods including chlorination, adsorption, reverse osmosis, ion exchange and filtration have been reported for organic compounds from one phase to another [2]. However, owing to the great amount of aromatic compounds and stability of dye molecules, the conventional approaches are ineffective for the removal of dye pollutant. Yet, heterogeneous photocatalysis has proven to be an effective advanced oxidation process (AOP) technique for the complete decolourisation of dye pollutant owing to the active formation of hydroxyl free radical (OH) is a main product via light irradiating with

semiconductors metal oxides. Photocatalytic mechanism is mainly based on the formation of electron and hole pairs are capable of removing organic dyes upon light illumination. Efforts have been made by many researchers to introduce metal [3-4], non-metal [5] or metal oxide [6-7] into the semiconductor materials to effectively increase the catalytic activities of semiconductors [8]. The literature survey has shown that the semiconductor supported materials widely enhance the photocatalytic activity because of their controllable pore space and surface chemistry as well as photostable. Various supports have been investigated such as alumina, zeolite, silica gel, fiber optic cable, glass beads, quartz, stainless steels, clays, cellulose, activated carbon and polymers [9-11].

The binary metal oxide CoWO₄, one of the tungstates, has been receiving more and more attentions for its multitude of applications, including oxygen evolution catalyst [12] and production of hydrogen [13]. However, no literatures reported the application of CoWO₄ as the electrode material in supercapacitors until

now, to our best knowledge. Based on the high super capacitive performances of the metal oxide, CoWO_4 with a $\text{Co}^{3+}/\text{Co}^{2+}$ redox couple should be a promising electrode material for supercapacitors. Besides, as reported in some literatures, the binary metal oxides of tungstate present the conductivity on the order of $10^{-7} - 10^{-3} \text{ S cm}^{-1}$, because the incorporation of W atoms can greatly enhance their conductivity in comparison with pure metal oxide [14]. In this work, CoWO_4 has been prepared by the wet-chemical and hydrothermal approaches starting from solutions of Co^{2+} and $[\text{WO}_4]^{2-}$. In general, such a quick precipitation reaction usually forms amorphous compounds in wet-chemical method, while the hydrothermal reaction often obtains compounds with crystal structure. These CoWO_4 nanoparticles were used in electrode materials for supercapacitors and their electrochemical performances were investigated by cyclic voltammetry (CV), galvanostatic charge/discharge (GV) and electrochemical impedance spectroscopy (EIS) studies [15].

Natural biopolymer chitosan has wide range of applications in pharmaceutical, biomedical and environmental activities. Chitosan is an interesting biopolymer for immobilization due to its excellent film-forming ability, high permeability, good mechanical strength, nontoxicity, biocompatibility, low cost and easy availability [16-17]. The binding ability of chitosan was attributed to the chelating groups such as $-\text{NH}_2$ and $-\text{OH}$ with metal. The different chitosan composite materials such as chitosan/ TiO_2 [18-19], chitosan/cuprous oxide [20], chitosan/ CdS [21] and chitosan/ ZnO [22-23] were prepared for the application of antibacterial agent, biosensor and photocatalyst to remove organic pollutants. The present investigation deals with the synthesis of Cobalt tungstate nanoparticles using a Chitosan biopolymer, characterisation and its application on photocatalysis and antibacterial activity. The photocatalytic experiment on the degradation of xlenol orange (XO) were carried out under irradiation of visible light. Antibacterial activity for the nanoparticles was performed for Gram-negative *Escherichia coli* (*E.coli*) bacteria and gram-positive *Staphylococcus aureus*.

2. Materials and methodology

2.1 Materials:

The chemicals including Sodium tungstate ($\text{Na}_2\text{WO}_4 \cdot 2\text{H}_2\text{O}$), Cobalt nitrate ($\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$), Glutamic acid ($\text{C}_5\text{H}_9\text{NO}_4$) and Chitosan polymer were purchased from Merck Co., India and used as such. Double distilled water was used for preparing aqueous solutions. All the chemicals used in these studies were of Analytical grade without any further purification. All the reagents and dye solutions of desired concentrations were prepared with double distilled water.

2.2 Methodology:

Preparation of CoWO_4 via hydrothermal route: The CoWO_4 nanoparticles were prepared by the

hydrothermal method from Sodium tungstate and Cobalt nitrate. For preparing CoWO_4 via hydrothermal, 0.05 M of Na_2WO_4 was prepared in 100 mL of distilled water. 0.05 M of $\text{Co}(\text{NO}_3)_2$ was prepared in 100 mL of distilled water and was added to the above solution under magnetic stirring, followed by add 1 M NaOH solution to maintain pH-7 for 30 min. The obtained mixture solution was transfer to autoclave, which was maintained at 100°C for 1 h. After reaction completion, autoclave was allowed to cool at room temperature. The obtained reddish-brown precipitation was washed several times with deionized water and ethanol and dried at 70°C . Finally obtained product was calcined at 220°C for 12 h in furnace and then cooled it to room temperature.

2.3 Instrumentation:

The optical properties were investigated using a UV-VisDRS in the air at room temperature in the wavelength range of 200-800 nm using Shimadzu UV-2600R spectrophotometer. Functional groups of the nanocomposites were analyzed by using the Fourier Transform Infrared (FT-IR) spectrophotometer (JASCO-FTIR-460 plus). The crystalline structure of the nanoparticles was identified by an X-ray diffractometer (XRD; XPERT PRO X-RAY) with the Cu-K α radiation at 25°C and the structural assignments were made regarding the JCPDS powder diffraction files. The surface morphology was examined using a Scanning Electron Microscope (SEM) (JSM 6701F-6701) in both secondary and backscattered electron modes and the elemental analysis was also done with EDAX. The surface area was measured on approximately 250 mg of the samples using Kr at the liquid nitrogen temperature by a Micromeritics ASAP 2020 apparatus. Before the measurements, the samples were degassed at 350°C for 18 h. The pH was monitored using EUTECH instrument pH meter.

2.4 Photocatalytic degradation of Xlenol orange dye:

The photocatalytic experiments were carried out in a 250 mL beaker and the whole setup along with magnetic stirrer was kept under the visible light. 100 mL of Xlenol orange (XO) with an initial concentration of 20-30 mM were used. 25 mg-100 mg of the nanocomposite was taken for degradation. Before the light irradiation, the reaction mixture was stirred in the darkness for 30 min to achieve the adsorption-desorption equilibrium between the catalyst and the dye molecules. During the exposure to visible light, 5 mL of aliquot was collected at regular time intervals. Then the samples were centrifuged to remove the photocatalyst and the filtrate was evaluated for the absorbance by UV-Visible spectrometry at $\lambda_{\text{max}} = 583 \text{ nm}$. The photodegradation of XO dye was calculated by the Equation (2).

$$\text{Photodegradation (\%)} = [C_0 - C/C_0]/100 \quad (2)$$

Where, C_0 is the concentration of MB before the irradiation and C is the concentration of MB after a certain irradiation time.