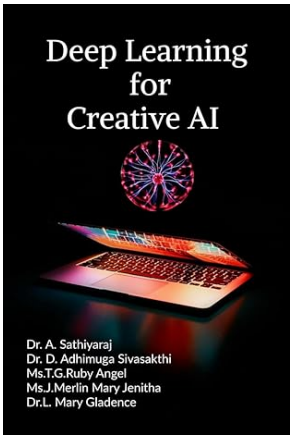
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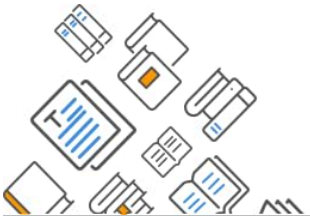
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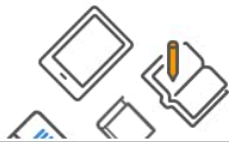
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GUEST EDITORIAL

DEEP LEARNING IN BIOMEDICAL AND HEALTHCARE: EMERGING TRENDS, APPLICATIONS AND RESEARCH CHALLENGES

Published 29 May 2023

1. Introduction

Machine learning has been applied to solve complex problems in human society for years, and the success of machine learning is because of the support of computing capabilities as well as sensing technology. An evolution of artificial intelligence and data-driven approaches will soon cause considerable impacts on the field. Search engines, image recognition, biometrics, speech and handwriting recognition, natural language processing, and even medical diagnostics and financial credit ratings are all common examples. It is clear that many challenges will be brought to the public as artificial intelligence infiltrates our world, and more specifically, our lives.

Deep learning has been more mature in the field of supervised learning, but other areas of machine learning have just started, especially the areas of unsupervised learning and reinforcement learning. Deep Learning has very good performance in speech recognition and image recognition. Two common models, Convolutional Neural Network (CNN) and Recurrent Neural Network (RNN), are the best instances. However, applying deep learning to solve problems will encounter some challenges. In order to have good performance, deep learning algorithms require a large and diverse range of data, and a large number of parameters need to be tuned. Furthermore, well-trained deep learning models tend to have overfitting problems and are not easily applied in other areas. In addition, the training process of deep learning is still a black box, and researchers have a hard time understanding how they learn and how they deduce conclusions.

Thus, this special issue aims to bring together various research and development achievements in exploring techniques, applications, and challenges that face the evolution of artificial intelligence in the context of deep learning.

2. Papers in the Issue

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Biomedical and Healthcare". Veeramalla *et al.*[1] proposed an active contour model

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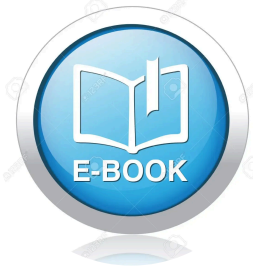
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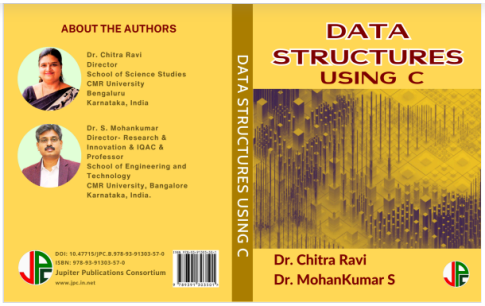


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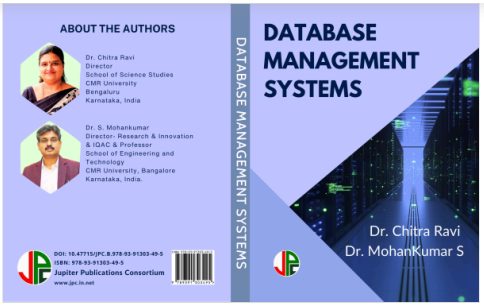
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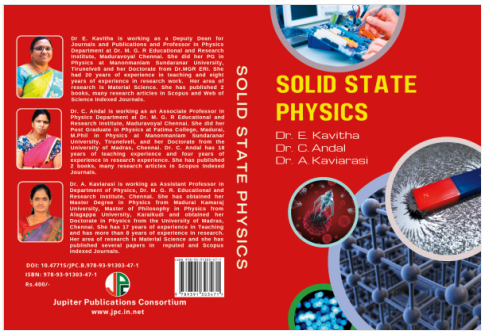
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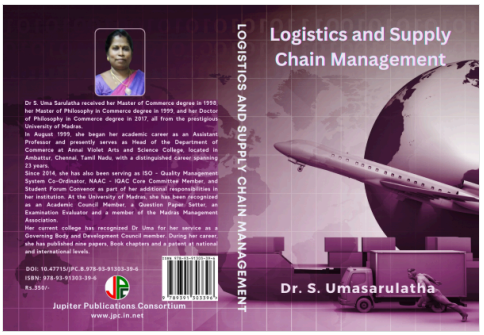
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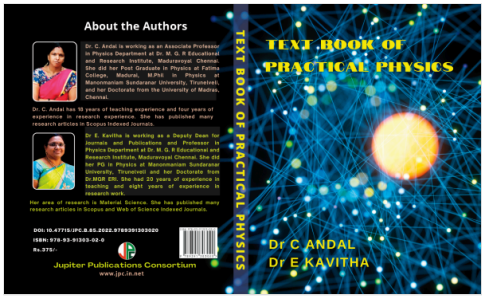
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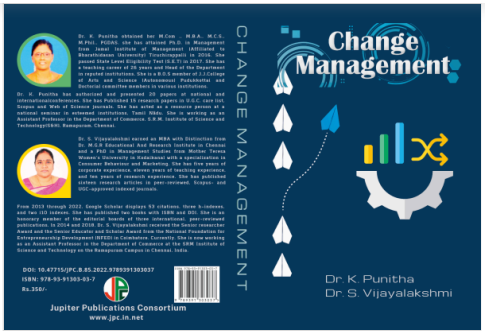
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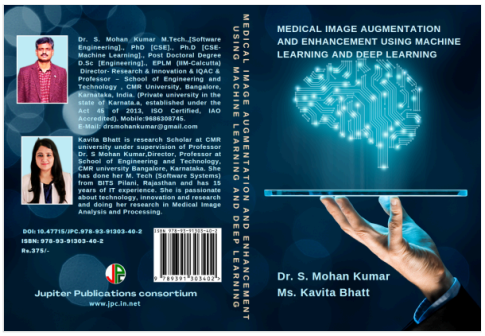
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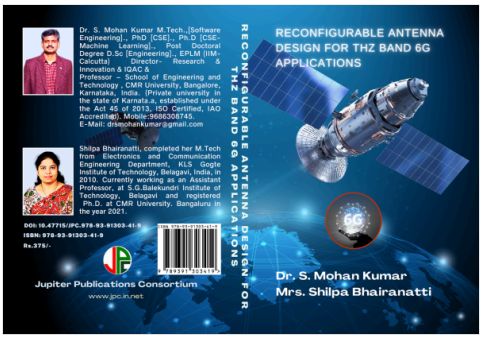
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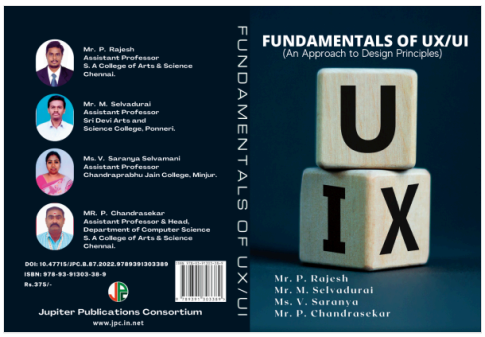
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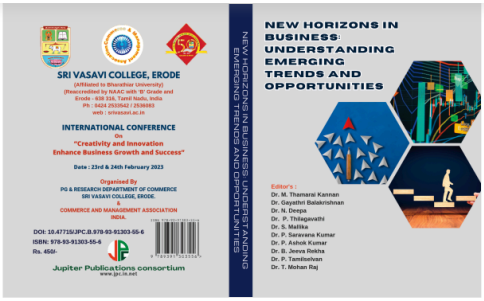
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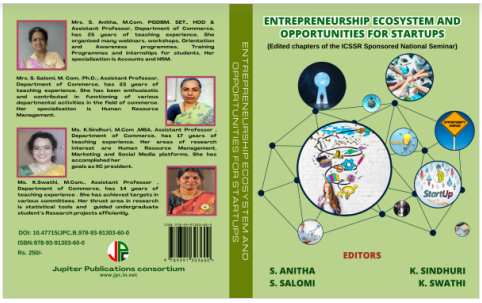
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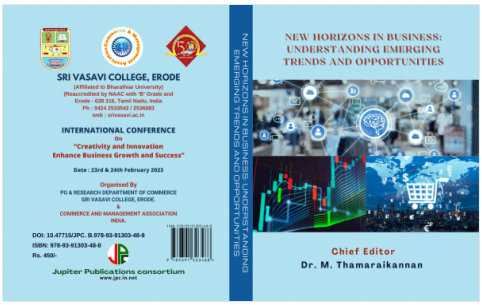
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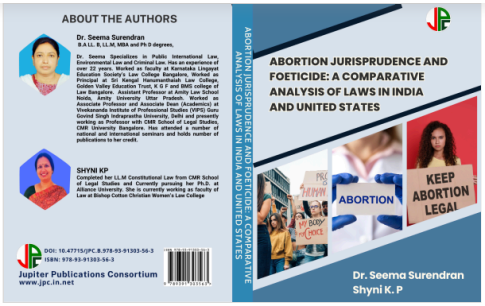
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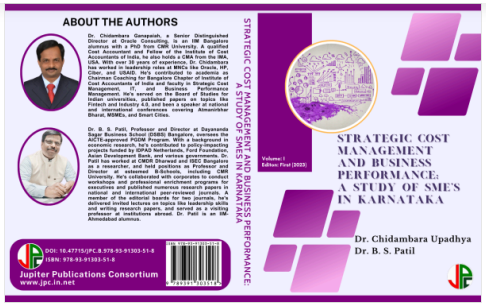
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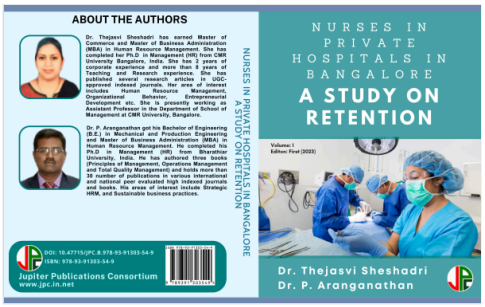
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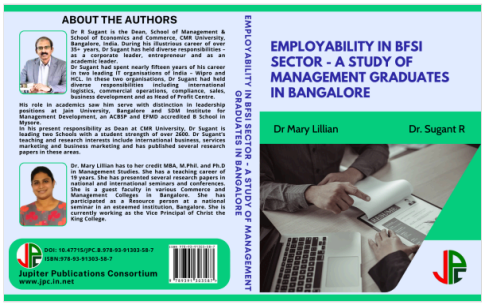
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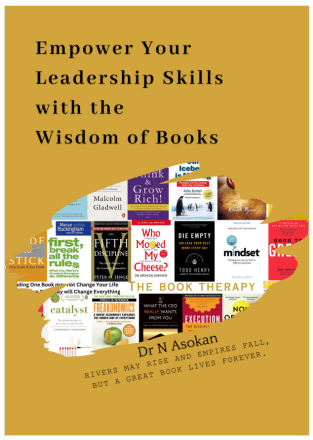
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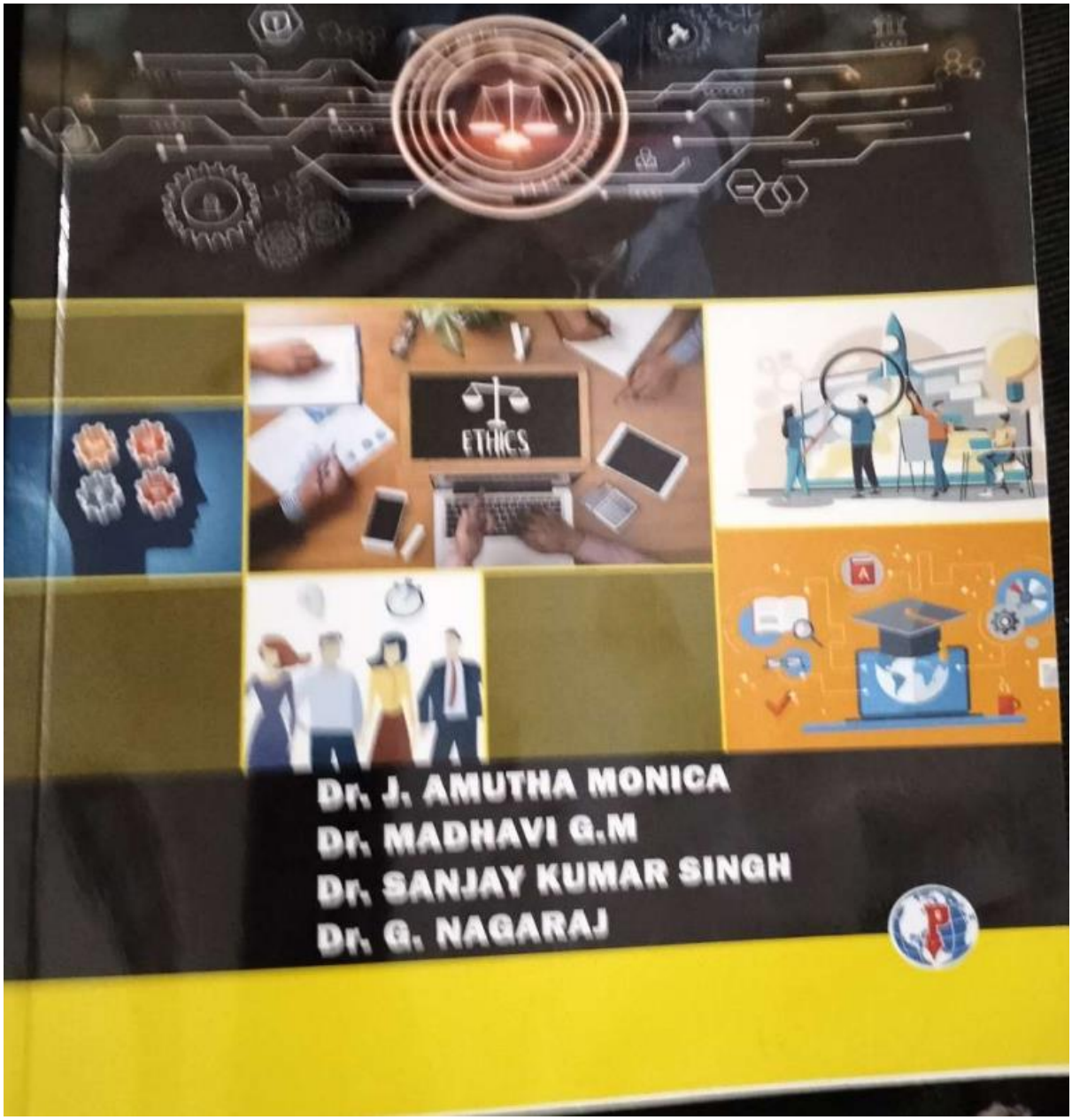
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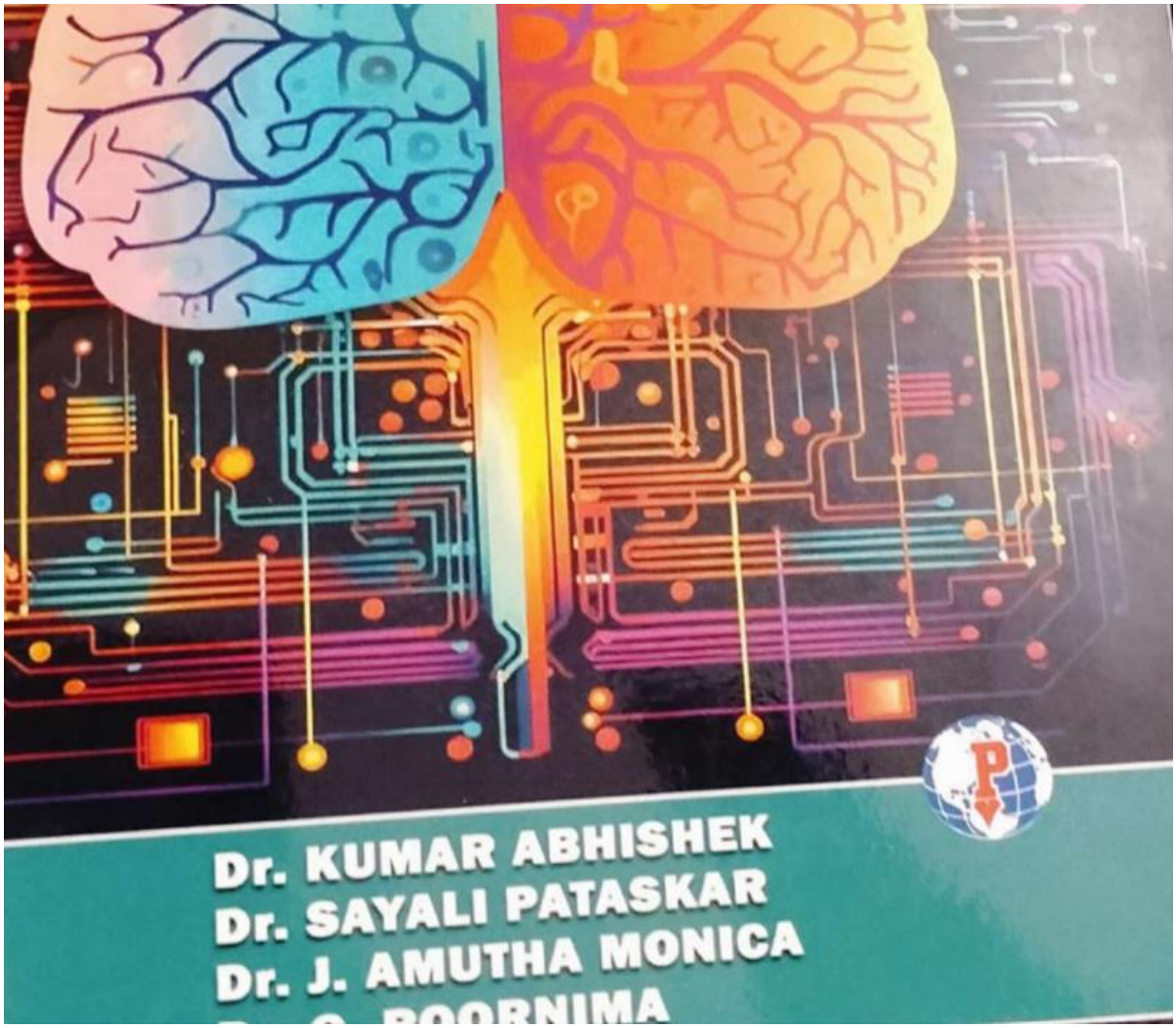
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Dr. Sayali Pataskar working as an Assistant Professor at the Department of Management Studies, H. N. College of Commerce, Solapur, Maharashtra. She has completed her MBA from Pune University and Ph.D. in Retail Management. She has got teaching experience of 22 years in the field of management education. She has published more than 25 research papers in National and International level Journals. She has also presented research papers in many National and International Conferences. Her interest areas are Entrepreneurship, Retail Marketing, Brand Management and Operations Research.



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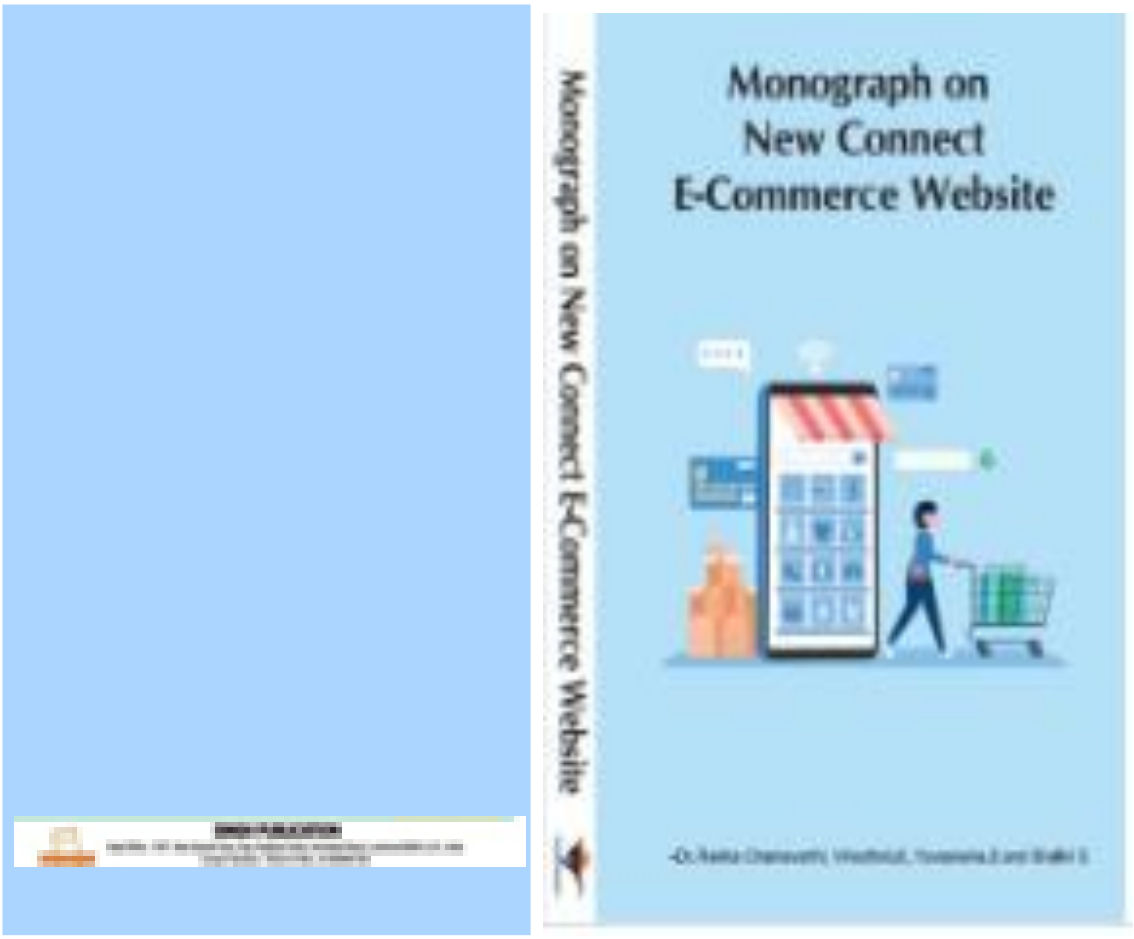
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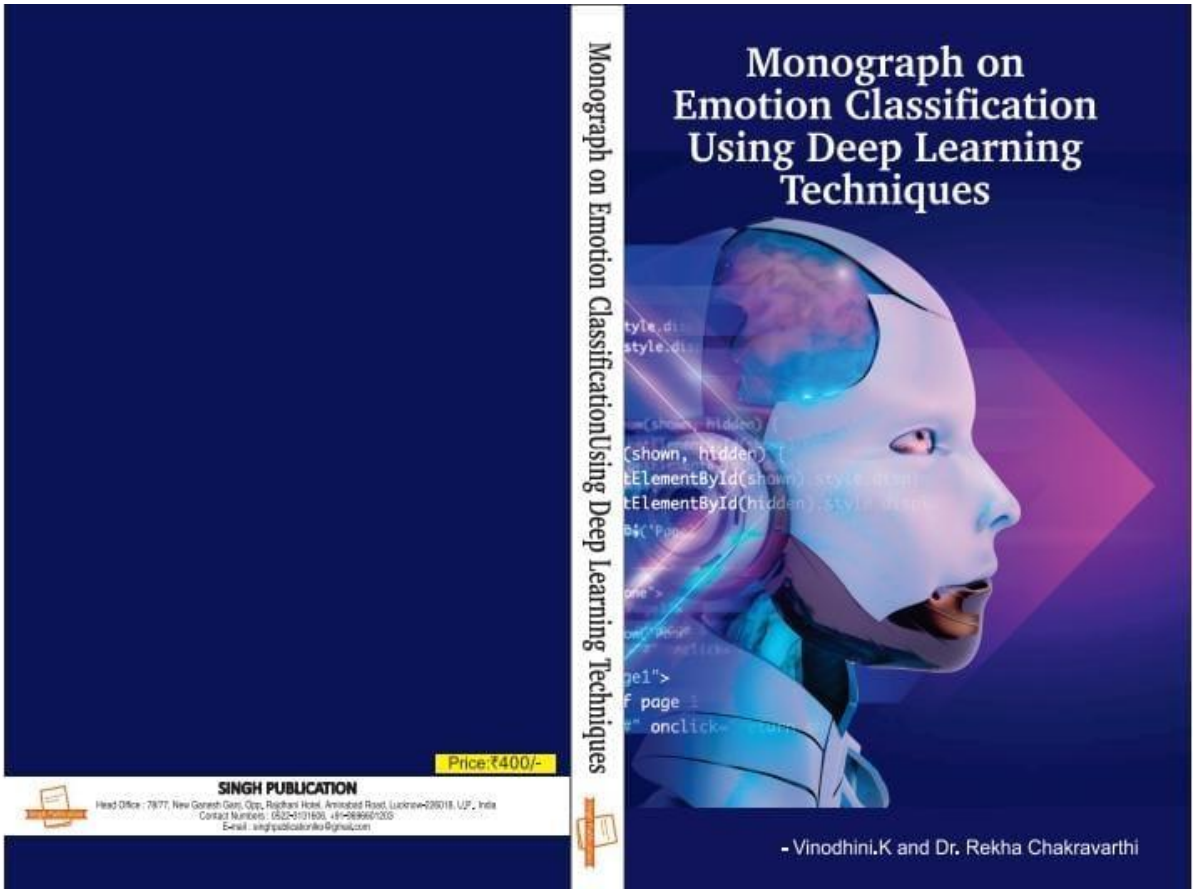
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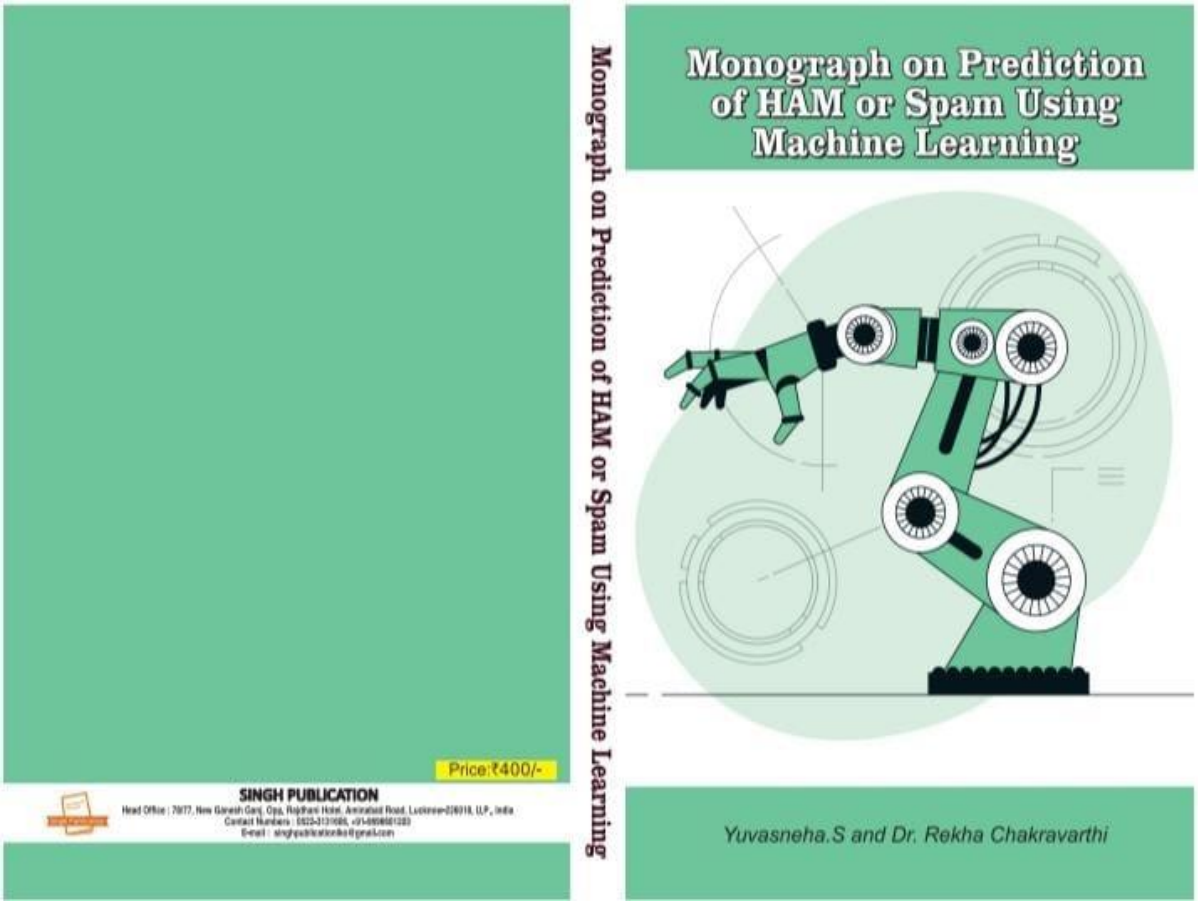
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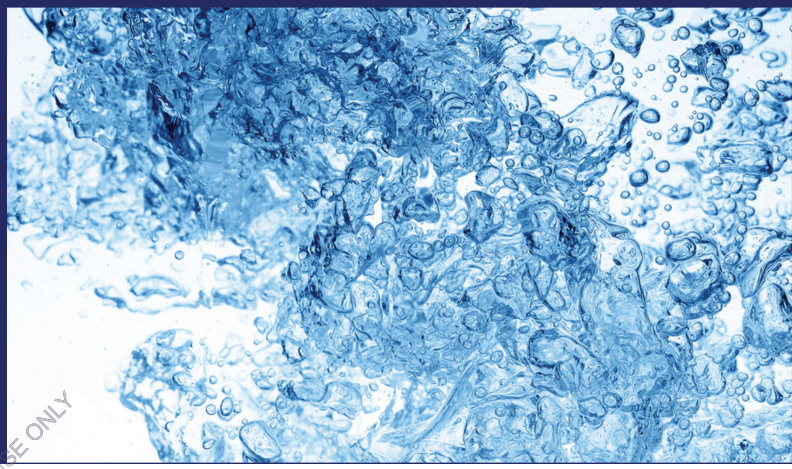


Monograph on Emotion Classification using Deep Learning Techniques



Monograph on Prediction of Ham or SPAM using Machine Leaning

A Text book written completely for Post Graduate and Research Scholars in Applied Mathematics, Fluid Mechanics. This book mainly focuses on the unsteady MHD fluid/Dusty fluid through porous plates with or without an inclined magnetic field. The behavior of the unsteady MHD flow in the presence of inclined magnetic forces and the flow of fluid between parallel porous plates using the analytical method and differential transformation method is also investigated.
The unsteady MHD dusty fluid flow between parallel plates through a porous medium with the heat source. The exact solution of the axial and transverse velocities in the porous medium is analytically derived; its behavior is computationally discussed with reference to the various governing parameters. The axial and transverse velocities of fluid and the temperature distribution are presented. The exact solution of the temperature distribution is analytically derived and discussed for different governing parameters in detail.



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Dr. V. W. J. Anand

Analytical and Numerical Solutions of Fluid Flows

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ABSTRACT

The objective of the book is to investigate the unsteady MHD fluid/Dusty fluid through porous plates with or without an inclined magnetic field. The behaviour of the unsteady MHD flow in the presence of inclined magnetic forces and the flow of fluid between parallel porous plates using the analytical method and differential transformation method is also investigated.

The flow is assumed to be laminar, incompressible and viscous. The Navier Stokes is assumed for the viscous flow, and magnetic effects are also considered for unsteady cases. Exact solutions have been found for the problems. An analytical solution has been obtained using the similarity transformation method.

The present thesis deals with six chapters. Chapter 1 investigates some fluid flow problems theoretically. It gives the basic equations of the clean fluid, dusty fluid flows, differential transformation method and the available literature connected with the present work.

Chapter 2 analyses the unsteady MHD dusty fluid flow between parallel plates through a porous medium with the heat source. The exact solution of the axial and transverse velocities in the porous medium is analytically derived; its behaviour is computationally discussed with reference to the various governing parameters. The axial and transverse velocities of the clean fluid and the temperature distribution are presented. The exact solution of the temperature distribution is analytically derived and discussed for different governing parameters.

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Chapter 3 analyses the study's extension by changing the geometry viz. (i) Vertical parallel plates, (ii) Oscillatory dusty fluid flow. Unsteady MHD oscillatory dusty fluid flow between vertical parallel plates through porous medium with constant suction/ injection occurs at the cool left vertical plate and heated right vertical plate, respectively. The governing equations are transformed into the ordinary differential equation of 2nd order by using similarity transformation. The exact solution of the equation is derived by finding the arbitrary constants using the boundary conditions associated with the problem. The various analytical quantities, such as the axial velocity fluid and temperature distribution, are explained through graphical representation.

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Chapter 4 analyses the unsteady MHD Couette viscous flow between two parallel plates through a porous medium with constant suction in the lower plate subjected to angular rotation and an inclined magnetic field. Various angles apply external uniform magnetic fields to the plates while the fluid motion is subjected to an exponential gradient. The exact velocity solution through the porous medium and pressure distribution are analytically derived. The axial and transverse velocity of the fluid are presented diagrammatically.

Chapter 5 focuses on a comparative study by a differential transformation method and analytical method of unsteady viscous fluid flow between the jet engines combustion unit subject to the inclined magnetic field. Unsteady MHD viscous fluid flow between two parallel plates through a porous medium with constant suction takes in the lower plate, and constant injection takes in the upper plate subjected to the inclined magnetic field.

Chapter 6 discussed the overall observation from the result and concluded with the present research of this research work.

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TABLE OF CONTENTS

CHAPTER NO.	TITLE	PAGE NO.
	ABSTRACT	**i**
	LIST OF TABLE	**vii**
	LIST OF FIGURES	**viii**
	LIST OF SYMBOLS AND ABBREVIATIONS	**xvi**
1	**INTRODUCTION**	
	1.1 FLUID MECHANICS: A SURVEY	1
	1.2 FLOW BETWEEN POROUS WALLS	5
	1.3 MAGNETOHYDRODYNAMICS	6
	1.4 FUNDAMENTAL ASPECTS OF DUSTY FLUID FLOWS	7
	1.5 PARALLEL FLOWS IN DUSTY FLUIDS	11
	1.6 CHANNEL FLOWS OF DUSTY FLUIDS	13
	1.7 DUSTY FLUID FLOWS IN A POROUS MEDIUM	15
	1.8 BASIC EQUATIONS OF THE FLOW	15
	1.9 OBJECTIVES AND SCOPE	16
	1.10 DESCRIPTION OF RESEARCH WORK	17
	1.10.1 Research Problem	17
	1.10.2 Research Methodologies	18
	1.10.3 Differential Transformation Method	18

FOR AUTHOR USE ONLY

CHAPTER NO.	TITLE	PAGE NO.
2	**UNSTEADY MHD DUSTY FLUID FLOW OF AN EXPONENTIALLY STRETCHING SHEET WITH HEAT SOURCE THROUGH POROUS MEDIUM**	
	2.1 INTRODUCTION	19
	2.2 FORMULATION AND SOLUTION OF THE PROBLEM	20
	2.3 EXACT SOLUTION OF THE PROBLEM	25
	2.4 RESULTS AND DISCUSSION	34
	2.5 CONCLUSION	42
3	**SEMI ANALYTICAL SOLUTION OF UNSTEADY MHD OSCILLATORY DUSTY FLUID FLOW BETWEEN VERTICAL POROUS PARALLEL PLATES SUBJECTED TO HEAT SOURCE**	
	3.1 INTRODUCTION	43
	3.2 MATHEMATICAL FORMULATION	45
	3.2.1 Assumptions	46
	3.3 METHOD OF SOLUTION	49
	3.4 RESULTS AND DISCUSSION	60
	3.5 CONCLUSION	103
4	**UNSTEADY MHD COUETTE VISCOUS FLUID FLOW THROUGH SILVER METALLIC PARALLEL PLATES WITH AN INCLINED MAGNETIC FIELD AND ANGULAR VELOCITY SUBJECTED TO CONSTANT SUCTION AT LOWER PLATE**	
	4.1 INTRODUCTION	104

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CHAPTER NO.		TITLE	PAGE NO.
	4.2	MATHEMATICAL DESIGN AND MODEL	105
	4.3	PRESSURE DISTRIBUTION	120
	4.4	RESULTS AND DISCUSSION	123
	4.5	CONCLUSION	129
5	**COMPRATIVE STUDY BY DTM FOR UNSTEADY VISCOUS FLOW BETWEEN THE JET ENGINES COMBUTION UNIT SUBJECTED TO INCLINED MAGNETIC FIELD**		
	5.1	INTRODUCTION	131
	5.2	MATHEMATICAL FORMULATION	132
	5.3	INTRODUCTION TO DIFFERENTIAL TRANSFORMATION METHOD	138
	5.4	RESULTS AND DISCUSSION	144
	5.5	CONCLUSION	156
	5.6	APPENDIX	157
6	**CONCLUSION**		**158**
	REFERENCES		**160**
	LIST OF PUBLICATIONS		**171**

FOR AUTHOR USE ONLY

LIST OF TABLE

TABLE NO.	TITLE	PAGE NO.
5.1	Some basic operations of DTM	139

FOR AUTHOR USE ONLY

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE NO.
2.1	Temperature profiles for different values of λ	35
2.2	Temperature profiles for different values of Pr	35
2.3	Temperature profiles for different values of N	36
2.4	Axial velocity profiles when t=20 for different values of C^2	37
2.5	Axial velocity profiles when t=0.5 for different values of C^2	37
2.6	Axial velocity profiles for different values of N	38
2.7	Axial velocity profiles for different values of Pr	39
2.8	Axial velocity profiles for different values of Re	40
2.9	Axial velocity profiles for different values of Ha	40
2.10	Axial velocity profiles for different values of Decay parameter L	41
2.11	Axial velocity profiles for different values of Decay parameter L	41
3.1	Temperature profile when t=1, S=2.1, D=1.1, ω =1 for different Values of Pr	61
3.2	Temperature profile when S=0.1,t=0.1,D=0.2, ω=0.3 for different Values of Pr	62
3.3	Temperature profile when t=0, S=2.2,D=0.2,ω=0.3 for different Values of Pr	62
3.4	Temperature profile when t=0, S=2, D=0.2, ω=0.3 for different Values of Pr	63
3.5	Temperature profile when t=7, S=0, D=0.2, ω=0.3 for different Values of Pr	63

FOR AUTHOR USE ONLY

FIGURE NO. **TITLE** **PAGE NO.**

3.6	Temperature profile when t=7, S=1, D=0.2, ω=0.3 for different Values of Pr	64
3.7	Temperature profile when t=7, S=2, D=0.2, ω=0.3 for different Values of Pr	64
3.8	Temperature profile when t=0, S=1, D=0.2, ω=0.3 for different Values of Pr	65
3.9	Temperature profile when t=0.1, S=0.125, ω=1.5, Pr =1.2 for different Values of δ	65
3.10	Temperature profile when t=0.1, S=0.125, ω=π, Pr=1.2 for different Values of δ	66
3.11	Temperature profile when t=0.1, S=0.125, ω=π/4, Pr=1.2for different Values of δ	66
3.12	Temperature profile when t=0.1, S=0.125, ω=π/2, Pr=1.2 for different Values of δ	67
3.13	Temperature profile when t=7, S=0.125, ω=1.5, Pr=1.2 for different Values of δ	67
3.14	Temperature profile when t=0.5, S=0.125, ω=1.5, D=1.25, Pr=1.2 for different Values of S	69
3.15	Temperature profile when t=0.5, S=0.125, ω= π, D=1.25, Pr=1.2 for different Values of S	69
3.16	Temperature profile when t=0.5, S=0.125, ω= π/2, D=1.25, Pr=1.2 for different Values of S	70
3.17	Temperature profile when t=1, S=0.125, ω=π, D=1.25, Pr=1.2 for different Values of S	70
3.18	Temperature profile when t=1, S=0.125, ω=π/2, D=1.25, Pr=1.2 for different Values of S	71
3.19	Temperature profile when t=7, S=0.125, ω=1.5, D=1.25, Pr=1.2 for different Values of S	71
3.20	Temperature profile when t=0, S=2, D=1.5, Pr=2.5 for different Values of ω	72

FOR AUTHOR USE ONLY

FIGURE NO.	TITLE	PAGE NO.
3.21	Temperature profile when t=0, S=1.2, D=1.5, Pr=2.5 for different Values of ω	72
3.22	Temperature profile when t=0.5, S=1, D=1.5, Pr=2.5 for different Values of ω	73
3.23	Temperature profile when t=1, S=0, D=10, Pr=1.5 for different Values of ω	73
3.24	Temperature profile when t=1, S=1, D=10, Pr=2 for different Values of ω	74
3.25	Temperature profile when t=1, S=1.2, D=1.5, Pr=2 .5 for different Values of ω	74
3.26	Temperature profile when t=1, S=2, D=3, Pr=2 .5 for different Values of ω	75
3.27	Temperature profile when t=10, S=1.2, D=1.5, Pr=2 .5 for different Values of ω	75
3.28	Temperature profile when t=2.5, S=2, D=3.1, Pr=1.5 for different Values of ω	76
3.29	Axial velocity profiles when t=0, D =1, ω=π, Pr=1 for different Values of S	76
3.30	Axial velocity profiles when t=1, D =1, ω=π/2 for different Values of S	77
3.31	Axial velocity profiles when t=5.5, D =1, ω=π for different Values of S	77
3.32	Axial velocity profiles when t=7.2, D =1, ω=π for different Values of S	78
3.33	Axial velocity profiles when t=10, D =1, ω=π/4 for different Values of S	78
3.34	Axial velocity profiles when S=1, t=0.1, D=1.2, ω=π/4 for different Values of Pr	80
3.35	AxialvelocityprofileswhenS=1,t=0.1, ω=π/2 for different Values of Pr	80

FOR AUTHOR USE ONLY

FIGURE NO.	TITLE	PAGE NO.
3.36	Axial velocity profiles when S=1, t=0.5, ω=π for different Values of Pr	81
3.37	Axial velocity profiles when S=1, t=1, ω=π for different Values of Pr	81
3.38	Axial velocity profiles when S=1, t=5.5, ω=π for different Values of Pr	82
3.39	Axial velocity profiles when S=2, t=1, ω=π for different Values of Pr	82
3.40	Axial velocity profiles when S =0, t=1, ω=π for different Values of Ha	83
3.41	Axial velocity profiles when S =0, t=10, ω=π/4 for different Values of Ha	83
3.42	Axial velocity profiles when S =1, t=1, ω=π for different Values of Ha	84
3.43	Axial velocity profiles when S =1, t=10, ω=π/4 for different Values of Ha	84
3.44	Axial velocity profiles when S =2.125, t=1, ω=π, D=10 different for Values of Ha	85
3.45	Axial velocity profiles when S =7.5, t=10, ω=π/4 for different Values of Ha	85
3.46	Axial velocity profiles when S =7.5, t=1, ω=π for different Values of Ha	86
3.47	Axial velocity profiles when S =12.5, t=1, ω=π for different Values of Ha	86
3.48	Axial velocity profiles when S =12.5, t=10, ω=π/4 for different Values of Ha	87
3.49	Axial velocity profiles when S =15, t=1, ω=π for different Values of Ha	87
3.50	Axial velocity profiles when S =20, t=3, ω=π for different Values of Ha	88

FOR AUTHOR USE ONLY

FIGURE NO.	TITLE	PAGE NO.
3.51	Axial velocity profiles when S =35, t=3, ω=π for different Values of Ha	88
3.52	Axial velocity profiles when S =2, t=0.9125, ω=π for different Values of Gr	89
3.53	Axial velocity profiles when S =0, t=1, ω=π for different Values of Gr	89
3.54	Axial velocity profiles when S =1, t=1, ω=π for different Values of Gr	90
3.55	Axial velocity profiles when S =0, t=0.5, ω=π for different Values of Da	90
3.56	Axial velocity profiles when S =0, t=1, ω=π for different Values of Da	91
3.57	Axial velocity profiles when S =1, t=0.5, ω=π for different Values of Da	91
3.58	Axial velocity profiles when S =2, t=0.5, ω=π for different Values of Da	92
3.59	Axial velocity profiles when S = 1, t=0.9, ω=π for different Values of C^2	92
3.60	Axial velocity profiles when S = 0, t=1, ω=π different Values of λ	93
3.61	Axial velocity profiles when S = 3, t=1, ω=π for different Values of λ	94
3.62	Axial velocity profiles when S = 0, t=1, ω=π for different Values of Re	94
3.63	Axial velocity profiles when S =0, t=1, ω=π D=0.25 for different Values of Re	95
3.64	Axial velocity profiles when S =0, t=1, ω=π D=1.55 for different Values of Re	95
3.65	Axial velocity profiles when S =1, t=1, ω=π for different Values of Re	96

FOR AUTHOR USE ONLY

FIGURE NO.	TITLE	PAGE NO.
3.66	Axial velocity profiles when S =2, t=0.2, ω=π for different Values of Re	96
3.67	Axial velocity profiles when S= 0, t=0, Da=1, P=1, Gr=1, Re=1 for different Values of ω	97
3.68	Axial velocity profiles when S= 0, t=1, Da=1, P=1, Gr=1, Re=1for different Values of ω	97
3.69	Axial velocity profiles when S= 1, t=1, Da=1, P=1, Gr=1, Re=1for different Values of ω	98
3.70	Axial velocity profiles when S= 2, t=1, Da=1, P=1, Gr=1, Re=1for different Values of ω	98
3.71	Axial velocity profiles when S= 3, t=0, Da=1, P=1, Gr=1, Re=2.5 for different Values of ω	99
3.72	Axial velocity profiles when S= 10, t=0.1, Da=1, P=1, Gr=1, Re=2.5 for different Values of ω	99
3.73	Axial velocity profiles when S= 10, t=0.7, Da=1, P=1, Gr=1, Re=2.5 for different Values of ω	100
3.74	Axial velocity profiles when S= 10, t=0.5, Da=1, P=1, Gr=1, Re=2.5for different Values of ω	100
3.75	Axial velocity profiles when S= 10, t=5, Da=1, P=1, Gr=1, Re=2.5for different Values of ω	101
3.76	Axial velocity profiles when S= 10, t=0.2, Da=1, P=1, λ=1.2, Gr=1, Re=2.5for different Values of ω	101
3.77	Axial velocity profiles when S= 10, t=10, Da=1, P=1, Gr=1, Re=2.5 for different Values of ω	102
4.1	Schematic Diagram	106
4.2	Axial velocity profiles for different values of ωt	124
4.3	Radial velocity profiles for different values of ωt	124
4.4	Axial velocity profiles for different values of Kr	125
4.5	Radial velocity profiles for different values of Kr	126
4.6	Axial velocity profiles for different values of α	127

FOR AUTHOR USE ONLY

FIGURE NO.	TITLE	PAGE NO.
4.7	Radial velocity profiles for different values of α	127
4.8	Axial velocity profiles for different values of M	128
4.9	Radial velocity profiles for different values of M	128
5.1	Simulation Model	133
5.2	α Varies from 1, 3, 4 and 4.5 at h=0.75, M=2, θ=0.25, D =1	146
5.3	M Varies from 1, 5, 7 and 10 at h=0.25, θ=6.65, α=0.3, D =500	146
5.4	θ Varies from π/2, π/3, π/4 and π/6 at h=0.7, M=5, α=0.125, D =50	147
5.5	D Varies from 0.06, 0.09, 0.13 and 0.35 at h=0.2, M=1, α=0.25, θ=6.25	147
5.6	α Varies from 1, 5, 8 and 10 at h=0.25, M=1, θ=0.5, D =1	148
5.7	M Varies from 5, 10, 15 and 20 at h=0.7, θ=3, α = 0.125, D =20	149
5.8	θ Varies from π/2, π/3, π/4 and π/6 at h=0.25, M=3, α=0.25, D =2	149
5.9	Da Varies from 0.15, 0.35, 0.75 and 2.5 at h=0.2, M=1, α=0.25, θ =6.25	151
5.10	Axial velocity profile for different values of M at t=1, n=1, u_0 = 0.5, h =1, v_0 = 0.135 θ= 6.5, α=1.5, D = 500	152
5.11	Radial velocity profile for different values of M at t=1, u_0 = 0.5 n=1, v_0 = 0.025, h=1, θ=1, α=1.5, D=500	152
5.12	Axial velocity profile for different α values at t=1, n=1, u_0 = 0.5 h=2.5, v_0 = 0.25 θ=1, M=2, D=50	153
5.13	Radial velocity profile for different α values ath=1, t=1, u_0 = 0.5, v_0 = 0.5, n=1, θ=1,M=2,D=1	153

FOR AUTHOR USE ONLY

FIGURE NO. **TITLE** **PAGE NO.**

5.14 Axial velocity profile for different θ values at t=10, n=2.5, u_0 = 0.5 h=0.425, v_0 = 0.25, α =1.2, M=5, D=50 154

5.15 Radial velocity profile for different θ values at h=0.1, t=10, u_0 = 0.5 n=2.5, v_0 = 0.25, α =1.2, M=3, D=50 154

5.16 Axial velocity profile for different D values at t=1, n=1, u_0 = 0.5, h=1.25, v_0 = 0.025, α =1.5, M=3, θ=1 155

5.17 Radial velocity profile for different D values at t=1, n=1, u_0 = 0.5, h=0.01, v_0 = 0.025, α =0.5, M=3, θ=6.57 155

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LIST OF SYMBOLS AND ABBREVIATIONS

Symbols

u	-	Axial component of the velocity
μ	-	Coefficient of viscosity
ν_0	-	Constant horizontal velocity
Da	-	Darcy Parameter
ρ	-	Density of the fluid
η	-	Dimensionless distance
σ	-	Electrical conductivity
U	-	Flow mean velocity
P	-	Fluid Pressure distribution
T	-	Fluid temperature
Gr	-	Grashof number
g	-	Gravitational force
Ha^2	-	Hartmann's number
h	-	Height of the channel
γ	-	Kinematic viscosity,
B_0	-	Magnetic Field intensity
N_0	-	Number density of the dust particles
M	-	Particle mass parameter
K	-	Porous Permeability Coefficient
Pr	-	Prandtl Number
T_0	-	Referenced fluid temperature
Re	-	Reynolds number
ν	-	Slip parameter
C_p	-	Specific heat at constant pressure
$K_0(6\rho\pi\upsilon D)$	-	Stokes resistance coefficient-average radius of dust particles
ψ	-	Stream function
S	-	Suction/injection parameter

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m_d	-	The average mass of the dust particles.
κ	-	Thermal conductivity
α	-	Thermal radiation coefficient
δ	-	Thermal radiation parameter
t	-	Time
v	-	Transverse Component of the velocity
H_0	-	Transverse magnetic field
u_d	-	Velocity of the dust particles

Abbreviations

DTM	-	Differential Transformation Method
MHD	-	Magnetohydrodynamics

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CHAPTER 1

INTRODUCTION

The main objective of this chapter is to survey the literature on Fluid Dynamics (Section 1.1), Flow between porous walls and Magneto hydrodynamics (Section 1.2 and Section 1.3), Fundamental aspects of dusty fluid flows (Section 1.4), Parallel flows in dusty fluids (Section 1.5), Channel flows of dusty fluids (Section 1.6), and Dusty fluid flows through a porous medium (Section 1.7).

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1.1 FLUID MECHANICS: A SURVEY

Fluid Mechanics is a field of science that studies the behaviour of fluids (liquids or gases) both in motion and at rest. As a result, this field of study is concerned with fluids' static, kinematic, and dynamic characteristics. Fluid statics is the study of fluids that are at rest. When pressure forces are not taken into account, the study of fluids in motion is termed fluid kinematics; when pressure forces are taken into account, the discipline of inquiry is called Fluid Dynamics.

A fluid is anything that flows, which is either a liquid or a gas, with the latter differentiated by its high relative compressibility. Fluids are viewed as continuous media. Their motion and condition may be expressed in terms of velocity u, pressure p, density d, and other

Chapter 1
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Computational Models for the Prediction of Rainfall in Chennai, India

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ABSTRACT

Weather forecasting is a daunting challenge the world faces nowadays. Rainfall prediction is especially vital for agricultural and meteorological departments and is one of the most challenging tasks. Many researchers have contributed to rainfall prediction using methods ranging from statistical models to computational models.The computational model K-nearest Neighbour Technique (KNN) has been used to predict Chennai Rainfall for various data transformations in the study. Comparison and analysis was made using the error measure MAPE.

Keywords: Rainfall prediction; K-Nearest neighbour; Inverse distance weighting; MAPE.

1. INTRODUCTION

Rainfall is a natural climatic phenomena whose prediction is quite essential , challenging and demanding.It plays a very crucial role in the life of human beings. The effect of rainfall is very colossal. Information about the rainfall is really required for the planning and management of water resources. It is one of the most complex elements in hydrology to understand and to model. Thus,accurate prediction of rainfall is one of the greatest challenges despite so many advances in weather forecasting.Various techniques like ARIMA,SARIMA, ANN, Regression analysis, Genetic Algorithm, Fuzzy logic, SVM etc., have been applied and many attempts have been made by researchers on a large scale. Rainfall is basically nonlinear in nature.Hence prediction accuracy by the above mentioned techniques were satisfactory. Statistical approaches involve many assumptions which is not required in the case of Artificial neural networks.Hence

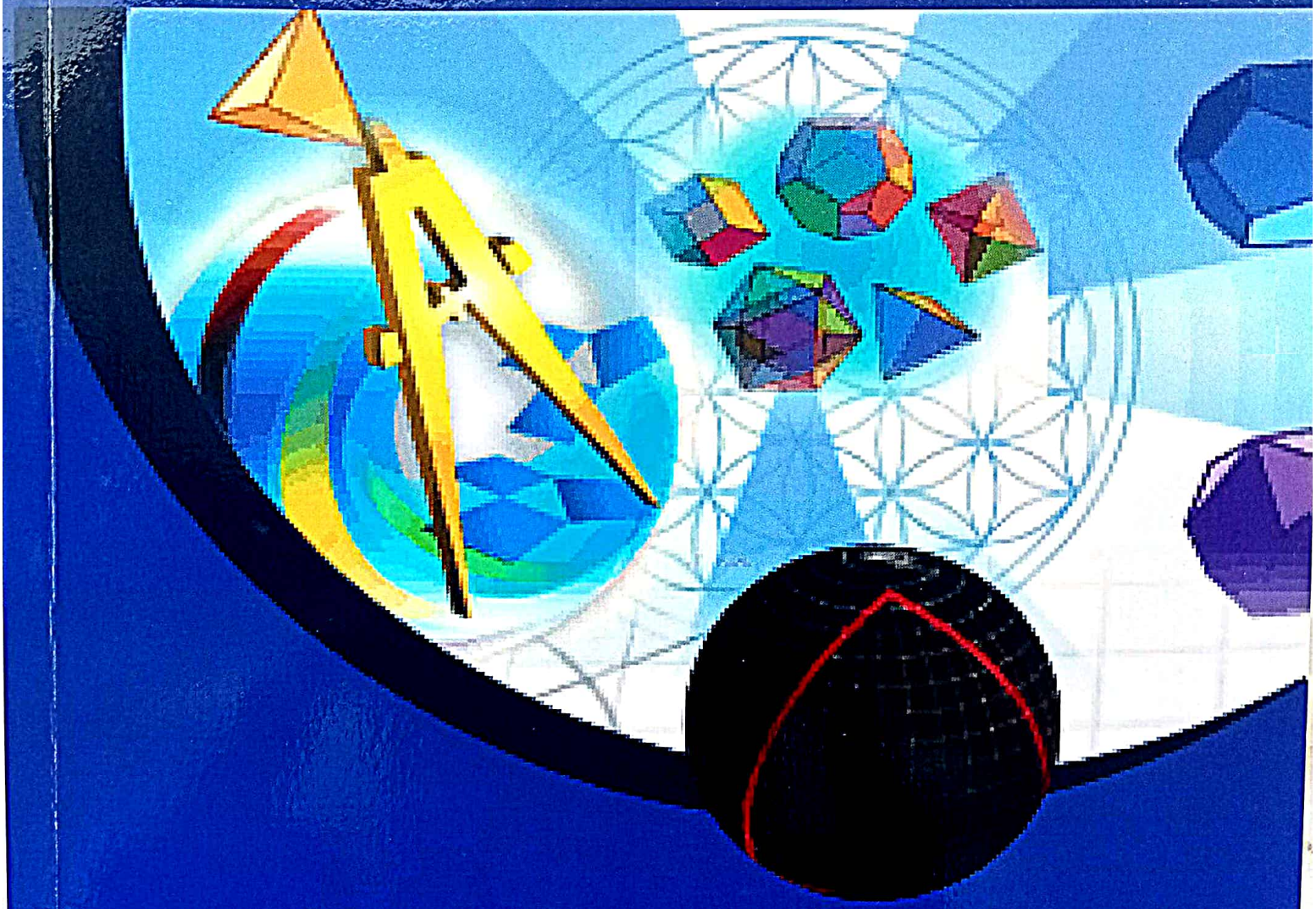
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it is preferred over conventional methods. In this research article, another technique which uses no assumptions or restrictions of the data, K-Nearest neighbour technique have been tried to predict rainfall.

Akashdeep Gupta et al., presents a study of neural network model for prediction of Indian rainfall. In their research article,multilayered artificial neural network with learning by backpropagation algorithm is used . The proposed model predicted values quite reasonably using the criteria namely correlation, RMSE and standard deviation [1]. A.H.M.Rahamatullah Imon et al., have made an attempt in their paper in using logistic regression model for predicting the rainfall efficiently [2]. Deepak Ranjan Nayak et al., made a survey of methodologies employed by different researchers and concluded that Artificial Neural Network(ANN) is more suitable than traditional statistical and numerical methods [3]. N.Q.Hung et al., developed an ANN model which used generalised feedforward network with hyperbolic tangent function and meteorological parameters as input for training the model and found the result most satisfactory [4]. Inderjeet Kaushik et al., implemented Seasonal Autoregressive Integrated Moving Average(SARIMA) in forecasting the levels of ambient air quality parameters [5]. Inderjeet Kaushik et al., also applied SARIMA for forecasting monthly rainfall and temperature [6]. Indrabayu et al., proposed a new approach which is a combination of support vector machines and fuzy logic for rainfall prediction [7] whereas Khalid Alkhatib and et al., used K- nearest neighbour for doing stock price prediction [8]. M. Kannan et al., have used multiple linear regression for predicting rainfall fall in the ground level of Chennai [9]. Mahalakshmi et al., used hybrid ARIMA-ANN model for forecasting Tamil Nadu rainfall [10]. Mahbub Hasan et al., implemented Fuzzy set theory for prediction of rainfall [11] whereas M. Mallika et al., used K-nearest neighbour technique for the prediction of Annual mean temperature of India [12]. Nirmala. M, Sundaram S.M. in their paper, have done forecasting of monthly rainfall in Tamilnadu using the model Seasonal ARIMA [13]. M.Nirmala forecasted the annual rainfall of Tamilnadu using Artificial Neural Network Algorithms.Three algorithms namely Gradient Descent Algorithm, Scaled Conjugate Algorithm and Radial Basis Function Algorithm were considered and proved that Radial Basis Function Algorithm gives better forecasting results [14]. Nikhil Sethi and Dr.Kanwal Garg used multiple linear regression technique for forecasting the rainfall of Udaipur City of Rajasthan [15].

The Gateway to South India, Chennai, one of the four metropolitan cities, is located on the southeastern coast of India in the northeast part of the Indian state of Tamil Nadu [16]. Its geographical coordinates are 13°04'N latitude and 80°17'E longitude [17].The weather in Chennai city is hot and humid throughout the year.The main source of Chennai's water is ground water source [18]. Hence rainwater is extremely vital and thus water supply for the whole city is a great challenge for the government. The city receives rainfall both from the North-East Monsoon(Oct-Dec) and South-West Monsoon(Jun-Sep) which is so helpful in filling its water reservoirs.The major part of the rainfall is received during the northeast monsoon [19,20]. The average rainfall in Chennai is approximately 1276 mm [21].

TRIGNOMETRY AND 2D ANALYTICAL GEOMETRY



Dr. P. CHANDRASEKAR

TRIGNOMETRY AND 2D ANALYTICAL GEOMETRY

ABOUT THE AUTHOR



Dr. P. CHANDRASEKAR, Assistant Professor of Mathematics, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, Since 2011. Obtained his B.Sc. from Sacred Heart College, Tirupattur in 2001, M.Sc & M.Phil from Loyola College, Chennai in 2003 & 2004 and Ph.D. from Sathyabama Institute of Science and Technology (Deemed to be University) in 2022, He has 19 years of teaching experience. He serving as the Associate NCC Officer Army Wing from 2016 onwards. He has published 14 research articles in various reputed National and International Journals with 2 Patents and presented papers in National and International.

Received Awards

- " Dr.Radhakrishnan Teaching Excellence Award" from International Lions Club, Chennai in 2019
- "Star of Excellence Award" from Sathyabama Institute of Science and Technology (Deemed to University) in 2022 and "Certificate of Appreciation" for High Impact Journal in 2021.
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The underlying object of this book is to provide the readers with the thorough understanding of topics included in the syllabus of Mathematics for B.Sc Mathematics.

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CONTENTS

EXPANSIONS AND HYPERBOLIC FUNCTIONS	1-26
SUMMATION OF TRIGONOMETRIC SERIES	27-42
CONIC	43-58
ASYMPTOTES	59-90
POLAR EQUATION OF A CONIC	91-100

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An Application of Graph Vertex Coloring

S. Srividhya [a++*]

DOI: 10.9734/bpi/rumcs/v3/2699G

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Abstract

Graph coloring has many applications including task scheduling, parallel computation, frequency allocation, Network design, register allocation etc. Here we concerned about the problem of vertex coloring on scheduling or assigning where these graph coloring provide algorithm to prevent or at least minimize the conflict scheduling. The objective is to provide simple way for solving worker scheduling problem in big industries. To overcome these problems we can schedule the task for workers by applying the concept of vertex coloring of graph theory using GRIN software.

Keywords: G – graph; X- Group of workers; w – workers; points – vertices; links – edges; A(G) – adjacency matrix; i – rows of a matrix; j – columns of a matrix; chromatic number - the least number of colors required to do a coloring of a graph.

1 Introduction

Leighton FT [1] discussed Graph coloring has considerable application to a large variety of complex problem involving optimization. In particular conflict resolution, or the optimal partitioning of mutually exclusive events, can often be accomplished by means of graph coloring. Examples of such problems include: the scheduling of exams in the smallest number of time periods such that no individual is required to participate in two exams simultaneously. Amponsah SK et al. [2] investigated the assignment of nurses using graph colouring to the maternity department of a hospital. Legrain Antoine et al. [3] discussed about the various teams of nursing in the hospital to compare the performance of optimization software CPLEX solver. Demange Marc, et al. [4] offered a new approach to solve the problem using graph colouring for wavelength assignment in the optical networks. Malaguti Enrico et al. [5] discussed a new approach to derive the heuristic algorithms for the vertex coloring problem. Kawanaka Hiroharu et al. [6] used

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Contents

Chapters	Page No.
1. Revolution & Transition in Urban Transport in India: With Reference to Mumbai Monorail *(Dr. Akansha Thakur)*	01-11
2. Cloud Security Vulnerabilities and Mitigation Techniques *(Dr. Sangeeta Joshi and Lalit Kumar Joshi)*	13-32
3. Predictive Analysis of Forex and Gold Rates Using Artificial Neural Network *(Dr. E. Priyadarshini, Dr. M. Vidhya, Dr. S. Geethamalini and Dr. K. Bhuvaneswari)*	33-43
4. LGBTQIA+ Rights in India: An Exploration to Historical Context and Future Perspectives *(Eli Nasrin Farhana, Rashmi Rekha Gohain and Dr. Sampreety Gogoi)*	45-56
5. The Drying of Badkhal Lake Faridabad: An Examination of Illegal Mining in the Aravalli Range *(Dr. Parul Rana)*	57-68
6. Review on Technical Textiles *(Anima Mandal, Ngangkham Basanti Chanu, Rickey Rani Baruah and Momita Konwar)*	69-80
7. Environment Takes a Backseat Over Social Needs: Goa's Ecology and Economy under threat Due to MWDT Water Sharing Verdict *(Shripad S Merchant)*	81-92
8. Navigating the Landscape of Regulatory Medical Writing: Essential Skills for Aspiring Professionals *(Rajesh Hadia, Cyril Sajan, Varunsingh Saggu, Kinjal Patel, Rahul Trivedi, Sunil Kardani, Sunil Baile and Hemraj Singh Rajput)*	93-102

Chapter - 3

Predictive Analysis of Forex and Gold Rates Using Artificial Neural Network

Dr. E. Priyadarshini, Dr. M. Vidhya, Dr. S. Geethamalini and Dr. K. Bhuvaneswari

Abstract

The exchange rates and gold rates play a vital role in controlling the dynamics of the world market. As a result, the appropriate prediction of both of them is a crucial factor for the success of many businesses and fund managers. Artificial Neural Network (ANN) is a modern non -linear technique used for prediction that involves learning and pattern recognition. The historical monthly data from Jan 2011 to Dec 2020 (10 years) for five exchange rates namely US Dollar (USD), Great Britain Pound (GBP), Kuwaiti Dinar (KWD), Japanese Yen (JPY), and Hong Kong Dollar (HKD) and the average monthly gold rates from the June 2011 to Sept 2020 (10 years) were modeled using this technique and the Mean Absolute Error (MAE), Mean Square Error (MSE), Root Mean Square Error (RMSE), Mean Absolute Percentage Error (MAPE) are used to evaluate the accuracy of the models.

Keywords: Forecasting, prediction, artificial neural network, error measures

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CHAPTER I
INTRODUCTION

1.1. Reviews of Artificial Intelligence

What is Artificial Intelligence (AI)?

In today's world, technology is growing very fast, and we are getting in touch with different new
technologies day by day.

Here, one of the booming technologies of computer science is Artificial Intelligence which is ready to create a new revolution in the world by making intelligent machines. The Artificial Intelligence is now all around us. It is currently working with a variety of subfields, ranging from general to specific, such as self-driving cars, playing chess, proving theorems, playing music, Painting, etc.

Artificial Intelligence is composed of two words **Artificial** and **Intelligence**, where Artificial defines *"man-made,"* and intelligence defines *"thinking power"*, hence AI means *"a man-made thinking power."*
"It is a branch of computer science by which we can create intelligent machines which can behave like a human, think like humans, and able to make decisions."
Artificial Intelligence exists when a machine can have human based skills such as learning, reasoning, and solving problems.

Why Artificial Intelligence?

Before Learning about Artificial Intelligence, we should know that what is the importance of AI and why should we learn it. Following are some main reasons

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An innovative approach for continuous health monitoring in medical applications is presented in this r proposed system is composed of Raspberry Pi, cloud storage, machine learning, and IoT sensor. Th monitors patients' vitals in real time and quickly identifies any anomalies. The patient wearing the ser real-time data with Raspberry Pi processors. The Raspberry Pi collects the real time data from sensc temperature, blood pressure, heart rate, and pulse oximeter. Then the IoT transmits the data collecte server. K-Nearest Neighbors (KNN) is a data processing and analysis method used in the cloud serv algorithm categorizes and analyzes the data collected, discovers the trend and anomalies present in signs. The proposed system has a simple user interface that can be accessed via a web or mobile ap doctors and nurses to remotely look at the patient's data and generate real-time alerts in case of sev situations. While cloud technology ensures scalability, data storage, and advanced analytics, the inte Raspberry Pi devices makes it possible to process data locally and reduce latency.

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This research study proposes an innovative method for enabling real-time monitoring of soil health a in agricultural areas by integrating Internet of Things (IoT) and Geographic Information Systems (GIS The conventional approach to soil monitoring is more difficult and challenging; it provides the most c required for making smart decisions. The proposed method makes use of IoT devices configured wit sensors to continuously monitor essential soil qualities including moisture, pH, temperature, and nutr concentrations. These sensors are strategically placed around rural areas to provide full coverage a collection. To process, analyze, and store the information collected by IoT devices, it is sent wirelessl database. Using GIS capabilities, data collected is spatially mapped, providing farmers and agricultu a comprehensive overview of the soil health and nutrient status over the whole farm or field. Monitori nutrient status in real-time provides invaluable insights to farmers, allowing them to make data-driver when and how much water and fertilizer should be applied to crops and other crop management met the system may send automatic warnings and messages to farmers when critical circumstances are reducing the potential of lost crops and making the most efficient use of available resources. The ad

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Sound Navigation and Ranging (SONAR) is a device that uses radio signals of sound to communicat such as troops and tanks (typically submarines, for submarine guidance). Sonar is often used to des that generates and collects sound. Sonar uses echoes. Whenever a living creature or device makes sound waves into the environment. Nowadays, most Defense Department uses robots to carry out ris soldiers cannot perform. These defensive robots often use an integrated system consisting of video s a laser gun, a metal detector, and cameras. The Defense robots' forms also change depending on wh for. The brand-new system that is being proposed uses a wireless camera to find intruders (unknown work with integrated systems. This proposed study detects things within a small range and displays i the object and its behavior on an LED screen. It also shows real-time footage of that tracking system work aims to develop and construct an automated object tracking and destruction system. The target

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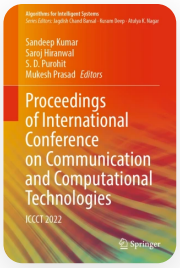
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Svana: Sound Classification Device for Hearing Impaired

| Conference paper | First Online: 27 September 2022

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Proceedings of International Conference on Communication and Computational Technologies

M. S. Godwin Premi, N. Mathan, R. Narmadha, T. Bernatin & V. Vijaya Baskar

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339 Accesses 1 Citations

Abstract

The purpose of this study is to determine the value of an environmental sound classification device for classifying diverse ambient sounds for hearing challenged people. MobileNet is the model that was used to train the acoustic data. This research employs the notion of transfer learning, with a model termed MobileNet being trained using a variety of ambient sounds. Audio data is jam-packed with useful information. Unfortunately, those with hearing loss miss out on important information. Even if sign language may be used to communicate, there is no practical way to detect noises such as doorbells, pressure cooker whistles, and so on. Using current advances in deep learning, it has been designed a lightweight portable device that can recognise and categorise various noises and display them in text form on a screen. A Raspberry Pi 3 will be used to run a machine learning model that will categorise the sound source and convert it to text. To record the sound, will connect a microphone to the Raspberry Pi. Using the machine learning model constructed and trained with Python machine learning tools, the sound will be categorised and text output will be provided. The result will then be shown as text on an LCD monitor.

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Strain Measurement Using Digital Image Correlation Technique

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Abstract- Strain is a critical parameter within engineering and construction of projects. The objective of the paper is to investigate a material's crack propagation and deformation. The automobile industry has an increasing demand for lightweight composite materials, improved product performance, efficiency and increased safety. Composites are also extensively used in aerospace and automotive applications due to their high specific stiffness and strength. It is critical to understand the influence of high strain rate on the mechanical behaviour of composite materials in order to develop durable composite structures. In this project, influence of high strain rate on the tensile strength, tensile modulus, and failure strain of any material is determined. Strain is a measure of the deformation of a body when subjected to an applied force. There are various methods for the measurement of strain, one of them is the UTM machine used for measuring the strain of any material, the other one is the traditional method-extensometer which only gives an average value of the strain. In order to overcome the problems faced by the older methods, the Digital image correlation technique is proposed. It is a novel optical approach for sensing strain and displacement that is non-contact. Digital Image Correlation is easier to use and less expensive than other techniques like speckle interferometry, and it is more precise and subjective than manual measuring methods, opening up a wide range of possible applications. Digital Image Correlation is applied in the developing systems to characterise the material and to monitor engineering components

Index Terms—Strain, Digital Image correlation, Image processing, temporal matching, Displacement measure

I. INTRODUCTION

The proposed method compares the digital image correlation technique's results with the strain measured using conventional techniques to calculate the percentage of strain present in a material. Strain is the response of a system to an induced stress. When a material is exposed to force, a stress is created, which causes deformation. Understanding the fundamentals of stress and strain is necessary for the engineering design of structures. The ratio of the length change to the beginning length may be used to determine strain in any material. Several significant material characteristics and features includestrains. In order to further the research of the behaviour of materials and structural components, new and more crucial investigations now need strain measurements at any point inside an area of interest. It would be exceedingly expensive and impractical to construct strain maps using some standard devices that measure strains. Because of these restrictions, a new technology was created to produce the necessary out-comes. The Digital Image Correlation, a novel technique, givesa contour map of stresses on a whole specimen surface that has undergone mechanical testing. In several branches of science and engineering, DIC is commonly used. Because of rapid ad- vances in computer technology, high resolution digital cameras for static and dynamic applications, and DIC methodologies, which have shown to be adaptive and important instruments for deformation research, the applications for this measurement methodology have broadened. Digital image correlation is a cutting-edge non-contact optical technology for detecting strain and displacement. DIC is less expensive and easier to utilise than other methods. It's crucial to comprehend how high strain rates affect the mechanical behaviour of composite materials in order to build sturdy composite structures. In this work, several metrics like correlation factor, entropy, variance, standard, elongation, and percentage of strain is calculated.It is demonstrated that the DIC approach may be used for calculating specified mechanical parameters as well as stress- strain curves and full-field strain maps. Also, the technique may be effectively utilised to find strain distributions in a variety of tests and

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Data reliability is compromised by various cyber-attacks. Computational infrastructure is completely c or guided by these attacks. The current status of cyberspace foretells uncertainty for the future of the rising user base. Data collected by the sensors and other input devices can be easily stolen by the u is a severe threat to the programming environment and individual personals. It is necessary to take i advanced technologies to counterfeit these cyber-attacks. Existing algorithms are decoded over certa Because of this always important to adapt the new technology that can prevent cyber-attacks. In this cyber-attacks predictions are analyzed and combines as a group based on its features. After analyzi cyber-attacks and its classification, recent technologies which can prevent the cyber-attack is studied technologies that can able to learn themselves is the machine learning. Networking environment mus machine learning approaches to protect the Data. Machine learning technique is classified as superv unsupervised technique. Supervised machine learning technique uses features that can be extracted dataset. The most effective machine learning algorithm for predicting the types of cyber-attacks has b through a comparison study of different algorithms. We categorize attacks into four categories: R2L a attacks, U2R attacks, and probe attacks. Various machine learning algorithms are applied to detect a cyber-attacks. Their performances are compared and analyzed in terms of accuracy, F1 score, precis

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I. Introduction

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III. Proposed System

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This research presents a cloud-based water tank management system that uses Raspberry Pi, sens
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computer controls the system. To keep updated on how much water is in each storage tank, use vari
including ultrasonic and pressure sensors. The data from these sensors is sent to and processed by
Raspberry Pi can now communicate with a cloud server after being connected to a local network thro
ability to remote access and monitor the water storage system from afar is made possible by this link
stored, analyzed, and shown using ThingSpeak, a cloud-based IoT platform. It has a simple interface
to monitor water levels in real-time, examine data from the past, and develop findings that can be use
water resources better. Several benefits can be acquired by using the suggested system. Water leve
monitored in real-time, making it possible to identify problems like leaks or overflow fast as events oc
check in on their water storage tanks from anywhere the happen to be due to this feature's remote ac
For more effective water management, less water waste, and increased use of available water resou
sustainable process. Cloud infrastructure helps reduce the problems caused by water shortages by p
water management and encouraging water use in a sustainable method.

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III. Proposed Methodology

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Published in: 2023 7th International Conference on Intelligent Computing and Control Systems (ICI

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Centralized control system employing Node MCU and IoT for finding the the event of an accident, theft, or alcohol overdose

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Aranganathan Aranganathan ; Gomathi. T ; Sakthi Prabha R ; V. Vedanarayanan ; S. Sivasundarapandian ; Rajinikanth E **All Authors**

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Car theft is a big problem today. The number of recorded vehicle thefts has increased by 25 during th according to the NICB data report. The government is successfully stopping vehicle theft. But, they fr find enough proof to follow it. In the suggested system, when unauthorized access occurs, the buzze instantly. Also, the control room is informed of the device's location via the GPS. Consequently, the th be stopped. In the event of an emergency, such as an accident, the suggested system will also comr information. When a car accident happens, immediately The NODEMCU controller will receive the si vibration sensor when an automobile rolls over. Node MCU transmits the alert message to the contro delay. so that an ambulance service may be called right away and help to preserve the life by acting subsequent module in this is for alcohol detection. When the driver drank alcohol while still sending i loved ones and the control room, the car wouldn't start. In this way, once the crucial arrangements ha the police may act quickly. This message can be impeded by the driver to attempt to not eat up the c

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The quick rise of smartphone malware indicates that cybercriminals are switching from traditional per systems to mobile devices. For adequate security, technology specialists are currently creating new a techniques. This study proposes the use of a block chain to identify malicious smartphone applicatio and external proprietary block chains are combined to create a private dual block chain and a block c the decision-making process in the system. While the external block chain stores the blocks for apps models, the private internal block chain stores include blocks drawn from both statically and dynamic removers. Additionally, the proposed system blocks the outside parties, enabling anti-malware vendo precise solutions. Because cloud resources can control loads and durability, resource monitoring ma nature. The additional feature of the proposed system is that authentication techniques like cryptogra signature can be integrated. Finally, the effectiveness of the suggested structure is assessed in terms and precision rate for malware detection.

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I. Introduction

II. Architectural View

III. Proposed Module

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Abstract:
Fake scams are one of the most common attacks used to combat customer scams. Currently, there i response to test certification and detection of fake tests. Instead, banks have to wait longer to detect specifically, our approach allows banks to provide percent of public and used test without disclosing p provided by financial institution customers. Fake tests come in many forms. They are like corporate c cashier tests, checkout order tests, or email tests. These scams paint like a real test because the tes employees of financial institutions. The name and title of a valid financial institution is regularly stamp security, the bank will deal with you promptly and offer security offers for financial transactions that re approval. Some charities want to register, approve, and send to users through headquarters and cha to help a charity, you can help by submitting the charity to an account sent to your financial institution charity transactions, and incoming charity amount transactions are sent to top-level workstations and level workstations. The transaction completes when it receives a response from the affected custome

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introduction of wild animals produces multiple losses in a variety of biome zones, with agricultural los
large portion of the losses. This conflict, in addition to crop loss, destroys human habitat and claims l
Because loss occurs on both sides, this research may provide a solution to stop the loss of human a
the proposed work, we use a mechanism to detect the animal correctly and sensitively. When an ani
the warning system emits a loud beep, alerting forest officers and those nearby to take appropriate a
was recognized in this scenario utilizing a convolutional neural network filled with GLCM features an
method. The obtained image of the animal goes through several steps before being trained and chec
database we collected. Finally, 98% of the desired production is obtained.

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Date of Conference: 23-24 November 2023 **DOI:** 10.1109/ICSSS58085.2023.104070

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II. Related Study

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Abstract:
Driving ability may be negatively impacted by prolonged sitting and lack of sleep. Therefore, knowing objective sitting and sleeping patterns might assist to lessen potential dangers. Study participants' ra information was collected throughout a simulated driving activity, and deep learning was used to cate participants' sitting and sleeping habits. The students work in the lab for a whole week. During a 20-m drive, raw accelerometry data was acquired via a device worn on the thigh. Accelerometry data was t convolutional neural networks to create four distinct categories. Five-fold cross-validation was used t Using class activation mapping, researchers were able to identify class-specific differences in the dyn movement and posture. Results from a simulated drive using a thigh-mounted accelerometer show th option for categorization. The results of this method might help in the detection of potentially impaired exhaustion.

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ANND: Identification and Prediction of Tooth Decay based on Artificial Neural Network and DenseNet Model

A. Gnana Soundari, R. Dhanalakshmi, Venkatramanan C B, B Rajasekar, S. Mahaboob Basha

Department of Computer Science and Engineering, Saveetha School of Engineering, Saveetha Institute of Medical And Technical Sciences, Saveetha University, Chennai 602105, Tamilnadu. India.
Department of Electrical and Electronics Engineering, Sona College of Technology,Junction Main Road, Salem-636005, Tamil Nadu, India
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Abstract— Scientists working in the field of Human health science and technology have recently shown an extraordinary interest in healthcare. Caries is the breakdown of enamel, the protective coating that covers your teeth. It's not only an issue for kids and teenagers, but also for grownups. Plaque, a coating of germs that sticks to your teeth, continually develops. Plaque bacteria secrete acids that wear away dental enamel when you consume sugary foods and beverages. Plaque's stickiness keeps those acids in touch with your teeth, where they may slowly dissolve the enamel. When this happens, holes might develop. Tooth decay, Periodontitis, squamous cell cancers, etc., all poses serious threats to oral health, a complicated area of healthcare. The most important thing is to provide an identifying system to stop these illnesses from spreading to the general population. Scholars can do extensive study on health concerns, including oral health, thanks to the abundance of data available online. Computer-based technology has shown to be able to execute various jobs in limited time and at a lower cost than when utilizing comparable healthcare instruments to conduct the same sort of work, such as dental consultation tools that are already accessible and are very effective. Dental caries prediction is only one area where machine learning has proven useful in oral healthcare. This study used blended model to identifying the tooth decay by highlights the necessity of combining several data sources, also known as multi-modality, to retrieve additional characteristics and produce reliable behaviors, in comparison to the traditional tooth decay prediction previously provided.

***Index Terms*— dental caries; multi-modality; hybrid neural network; convolutional neural network**

I. INTRODUCTION

In 2019, dental caries was identified as one of the most prevalent forms of chronic oral illness impacting people of all ages all over the globe [1]. The World Health Organization (WHO) estimates that 3.5 billion people worldwide suffer from dental caries each year.

Caries in teeth are a major issue in modern dentistry and healthcare. Poor oral health practices and inability to attend appointments owing to economical circumstances are thought to be the causes for the increased recurrence of caries despite the action performed by current healthcare [2]. But the efforts made so far to address the problem of dental caries are limited or inadequate. The development of dental caries may be influenced by a number of variables, including saliva, genetics, bacteria, and nutrition. Radiographic approaches, which include identifying dental caries in digital X-ray pictures [3]; and the clinical method, which is defined as a visual evaluation of the oral state to identify caries, are both used to make a diagnosis of dental caries. All of these studies use the same method for detecting dental caries: they rely only on either images or clinical data. In the meanwhile, merging several sources of tooth decay data may lead to a more reliable treatment, therefore eliminating the mystery around the disease's origins. Increases in the population-to-tooth decay-incidence ratio are possible as a result of this uncertainty. Dental caries impact an increasing number of individuals, and there aren't enough effective preventative measures to stop that trend. Thus, to reduce the prevalence of dental caries, it is necessary to have access to a Decision Support System (DSS) that can give reliable information on this condition. Recent years have seen the use of ML to the enhancement of a complex DSP system. Several prediction models have been used to identify tooth decay, and ML has been used in some research on oral health. Classification of dental root caries was accomplished with the use of Support Vector Machines

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Literature review on numerous antenna for small satellites-CubeSats

Sangeetha Surendran ;
Maheswaran Umaiyorupagan;
Thenmozhi Renganathan; Arun Mathiyalagan;
Rajakumar Singarayan; Subraja Rajarethnam

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AIP Conf. Proc. 2790, 020078 (2023)

https://doi.org/10.1063/5.0165636

This research examines current advancements in sophisticated antenna designs for tiny spacecraft (especially CubeSat, etc.). Due to the low-profile requirements, the coupling aperture produces a lot of back radiation. Electromagnetic coupling of radiating element method is used. Cube Satellites, often known as CubeSats, are a type of nano satellite that has recently acquired popularity, particularly among those who see CubeSats as a potential replacement to traditional satellites for space initiatives. This is due to the fact that they are inexpensive and may be constructed using commercial off-the-shelf components [2]. This study examines different antenna designs.

Topics

Computer software, Antennas, Spacecrafts

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In recent decades, there has been a lot of fascination with THz innovation. THz antennas are vital co wireless communication for transferring and receiving electromagnetic fields in the developing THz s their appealing qualities of compact size, wider spectrum, and greater data rate. This paper suggests rectangular patch antenna based on a metamaterial structure and analyses the antenna performance noted that the traditional antenna's efficiency is really subpar and that the metamaterial structure influ radiation and improves the performance. As a result, the rectangular patch is modified with the metar by incorporating a tube slot into the antenna. Furthermore, the features of the patch antenna are stud the slot number and thickness. The optimized tube slot patch antenna produces an excellent result o loss with a good gain of 8.6 dBi at the operating frequency of 2.37 THz. The proposed typical metam suitable for wireless devices with greater data rates, THz imaging and medical domains.

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One of the primary design requirements for any electronic system, but especially for portable ones, is minimization. This paper introduces a 4–2 compressor that performs well and uses less power. The a 4–2 compressor comprises full adder blocks, ands, and ors. In this work, a roughly unique 4–2 comp examined. This compressor offers high performance at the cost of a decrease in accuracy. This comp performance at the cost of a decrease in accuracy. The 130nm, 32nm CMOS and 32nm CNTFET tec used to implement the 4–2 compressor. Since there is no best approximation compressor, the optima relies on the level of precision needed by the customer. The complete adder is the most popular com of them. This proposed 4–2 compressor is a reduction in both the space and the power of the compre researching other compressors. The and gate of the proposed circuit is one less than that of the exist general, the proposed 4–2 compressor uses less electricity. Measured variables include delay, the po product, and the average of the powers. The HSPICE tool is used to perform simulations. These imp make the system's design, delay, power usage, and complexity less difficult. For many applications, r crucial arithmetic operation. The approximation compressor is a crucial component for creating a pow approximate multiplier. For computer techniques that call for faster performance and lower power cor approximate multiplication is a frequently used operation. Using simulation data to assess the 4–2 co

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II. Literature Suevey

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MOLECULAR DOCKING APPROACH ON THE ENERGETICS AND BINDING STABILITY OF SYMMETRICAL AND UNSYMMETRICAL UREA DERIVATIVES WITH DYE-HSA COMPLEX

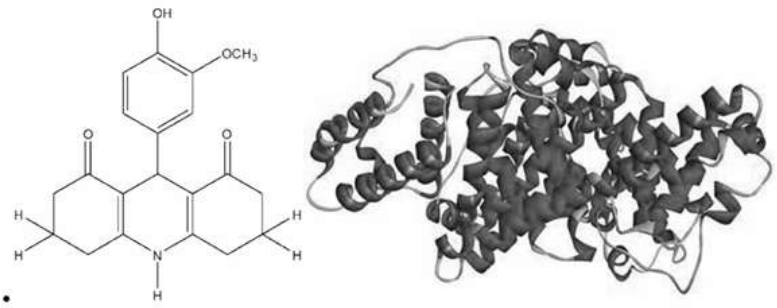
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ABSTRACT

Molecular docking studies of urea derivatives in the presence and absence of acridinedione (AD) dye-HSA complex with were carried. A variation in the binding energy and the binding sites of urea derivatives with HSA results. This is attributed to bimolecular forces existing between the host and guest molecule wherein urea derivatives act as the guest and dye-HSA complex as the host. The extent of substitution of methyl moieties in the urea molecular framework influences the energetics of urea-HSA and urea-ADdye-HSA complex. Unsymmetrical urea derivatives interaction with dye-protein complex is more favored than symmetrical urea derivatives were established through the docking score. The binding sites and domains of urea derivatives in HSA is illustrated by docking methodologies by generating several conformers that could theoretically exist. A simple and precise illustration on the binding studies of competing host with guest molecules in the absence of water molecules provides an in-depth analysis of hydrogen-bonding solutes role on the molecular interactions.

Keywords: acridinedione dyes, urea derivatives, Human Serum Albumin, molecular docking, hydrogen-bonding, hydrophobic interactions, Sudlow sites



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GREEN SYNTHESIS OF SrO_2 NANOPARTICLES USING HENNA LEAVES AND ITS CATALYTIC ACTIVITY

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Department of Chemistry, Sathyabama Institute of Science and Technology, Chennai

*Corresponding author: krithi_t2001@yahoo.com

ABSTRACT

Strontium oxide nanoparticles was carried out by sol-gel method which were green synthesized by using strontium nitrate and sodium hydroxide at room temperature in presence of henna leaves extract which is very simple and cost effective method. The characterization of synthesized strontium oxide nanoparticles was done using X-ray diffraction, scanning electron microscopy (SEM) and Fourier transform infra-red (FTIR) spectroscopy. X-ray diffraction pattern indicates that the nanoparticles are crystalline in nature. The crystalline size of strontium oxide nanoparticle was calculated by Debye-Scherer formula and the crystallite size was found to be 40 nm. The surface morphology of nanoparticles was observed and investigated using SEM. The material at room temperature desiccated at 200 °C and 400 °C respectively and shows crystallite of pseudo spherical shape with strong agglomeration of particles. The presence of Strontium – Oxygen bond (**Sr – O**) bond in the synthesized sample was confirmed by the peak at 821.23 cm^{-1} in the FTIR spectrum of strontium oxide nanoparticles. The catalytic activity of the synthesized Strontium oxide nanoparticles was tested by the one-pot synthesis of ethyl- 6- amino- 5- cyano- 4- (4-hyroxy-3methoxyphenyl -2-methyl -4H- pyran- 3-carboxylate. The product formation was confirmed by the FTIR and Mass Spectrometry.

Keywords: Strontium oxide nanoparticles, sol-gel, henna leaves extract, one-pot synthesis

EXPERIMENTAL ESTIMATION OF MINIMUM FLUIDIZATION VELOCITY FOR SILICA SAND BED AND ITS THEORETICAL VERIFICATION

Abstract

In this report experimental estimation of minimum fluidisation velocity, carryover velocity, and pressure drop across the experimental setup for silica sand of different sizes (0.0003m, 0.0004m, 0.0005m) has been done. An experimental setup consisting of two glass column in which one filled with silica sand of bed height 30cm has been used. The medium used for the fluidisation was air at ambient conditions .The pressure drop and air flow rates were measured using pressure gauges at inlet and outlet of the column and rota meter respectively. The velocity (Air flow rate/cross sectional area) of the air passed was slowly increased. The corresponding pressure gauge readings were noted. At a certain velocity, the bed height of 30 cm height was observed to be increasing. This velocity at which maximum pressure drop was obtained was noted as the minimum fluidization velocity. The velocity was further increased to up to the silica sand getting carried over to the next column. This velocity has been noted as carry over velocity. The experiment was repeated for above mentioned particle sizes to obtain the same parameters. Theoretical validations of the above parameters were done using four correlations to examine which correlation is more or less matching with the experimental results.

Keywords: Fluidization; Minimum fluidization velocity; Carry over velocity; Pressure drop.

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I. INTRODUCTION

When a gas or liquid is passed through a solid bed at very low velocity, the particles will not move, and the pressure drop across the bed is given by the following equations

1. **Kozeny-Carman Equation:** It is applicable for flow through solid bed at Reynolds numbers up to about 1.0

$$\frac{\Delta p}{L} \qquad \frac{\Delta p}{L} = \frac{150\bar{V}_0\mu}{\Phi_s^2 D_p^2}\frac{(1-\varepsilon)^2}{\varepsilon^3}$$

2. **Burke-Plummer Equation**: An empirical at Reynolds number >1000 for pressure drop in packed beds

$$\frac{\Delta p}{L} = \frac{1.75\rho\bar{V}_0^2}{\Phi_s D_p}\frac{1-\varepsilon}{\varepsilon^3}$$

3. **Ergun Equation:** An equation covering entire range of flow rates

$$\frac{\Delta p}{L} = \frac{150\bar{V}_0\mu}{\Phi_s^2 D_p^2}\frac{(1-\varepsilon)^2}{\varepsilon^3} + \frac{1.75\rho\bar{V}_0^2}{\Phi_s D_p}\frac{1-\varepsilon}{\varepsilon^3}$$

If the velocity of fluid across the bed is steadily increased, both the drag force acting on the particle and pressure drop across it will increase, and bed particles will start to move and eventually will get suspended in the fluid. Thus the fluidisation term is used to represent the particles in fully suspended condition, and the suspension will behave like a dense fluid.

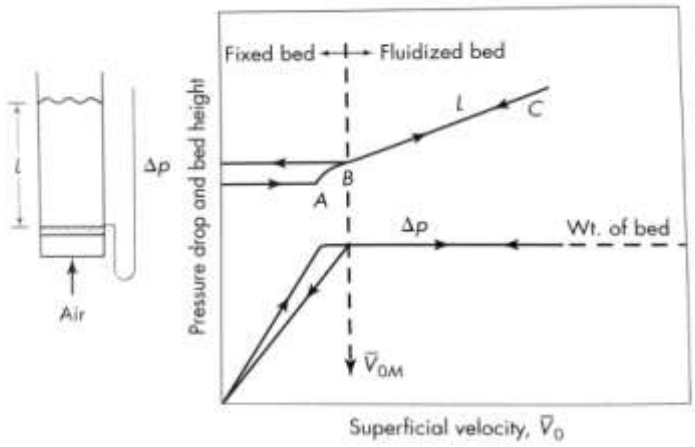


Figure 1: Superficial Velocity versus Pressure Drop and Bed Height for a Solid Bed

In Figure 1 we can see that the pressure drop across the solid bed is directly proportional to the superficial velocity and it increases as the velocity increases. But there will not be any change in bed height and the particles will not move. At a point, the

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pressure drop across the bed will become equal to the weight of the bed or the force of gravity on the particles.

From this point onwards, further increase in velocity will make the particle to move, this is represented by point A in the figure. The particles become separated from each other and will start to move about in the bed with further increase in velocity. This is represented by point B and is called as the point of fluidisation.

Once the bed is fluidised, the pressure drop across the bed will remain constant and at the same time bed height will continue to increase with the increase in velocity. The bed which is once fluidised will have a greater bed height than the initial once the velocity is reduced. This is because the solids dumped in a column will have more tightly packing than that of the fluid settling from fluidised state.

4. **Minimum Fluidisation Velocity:** The superficial gas velocity at which the particles are just suspended by the upward flowing fluid is called as minimum fluidisation velocity. It is represented as $\nabla_{om.}$

For Reynolds Number < 1, the equation for minimum fluidisation velocity is

$$\bar{V}_{0M} \approx \frac{g(\rho_p - \rho)}{150\mu} \frac{\varepsilon_M^3}{1-\varepsilon_M} \Phi_s^2 D_p^2$$

For Reynolds Number >1000, the equation for minimum fluidisation velocity is

$$\bar{V}_{0M} \approx \left[\frac{\Phi_s D_p g(\rho_p - \rho)\varepsilon_M^3}{1.75\rho} \right]^{1/2}$$

Correlations used

- **Wen and Yu**

  $\bar{V}_{om}$ $= \mu / \rho_g \, Dp * (\sqrt{(33.7^2 + 0.0408 \, Ar)} - 33.7)$
  $Ar = g \, \rho_g \, (\rho - \rho_g) Dp^3 / \mu^2$

- **Doichev &Akhamov**

  $\bar{V}_{om}$ $= \mu / \rho_g \, Dp * (1.08 * 10^{-3} * \, Ar^{0.947})$

- **Saxena & Vogel**

  $\bar{V}_{om}$ $= \mu / \rho_g \, Dp * (\sqrt{(25.28^2 + 0.0571 \, Ar)} - 25.28)$

- **Grace**

  $\bar{V}_{om}$ $= \mu / \rho_g \, Dp * (\sqrt{(27.2^2 + 0.0408 \, Ar)} - 27.2$

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II. MATERIALS AND METHODS

The experimental set up consists of two identical cylindrical columns (Length-60cm, Dia-10cm, Thickness-0.5cm), in which one of the column is filled with silica sand up to a height of 30cm (50% of column height). Motive fluid used in the experiment was air which is admitted to the packed bed column through a rota meter. The outlet of the first column is connected to the second column which is open to atmosphere. Pressure gauges were provided at the inlet and outlet of the first column to obtain the pressure drop across it.

Experiment was started with low air flow rates, and it was gradually increased. Change in pressure drop across the bed was noted down from the pressure gauges provided. Air flow rate was further increased up to a point were bed height started to increase. This velocity was noted down and the velocity increased up to a point where the material got carried away to the next column. The experiment was repeated for three different particle sizes (0.0003m, 0.0004m, and 0.0005m).

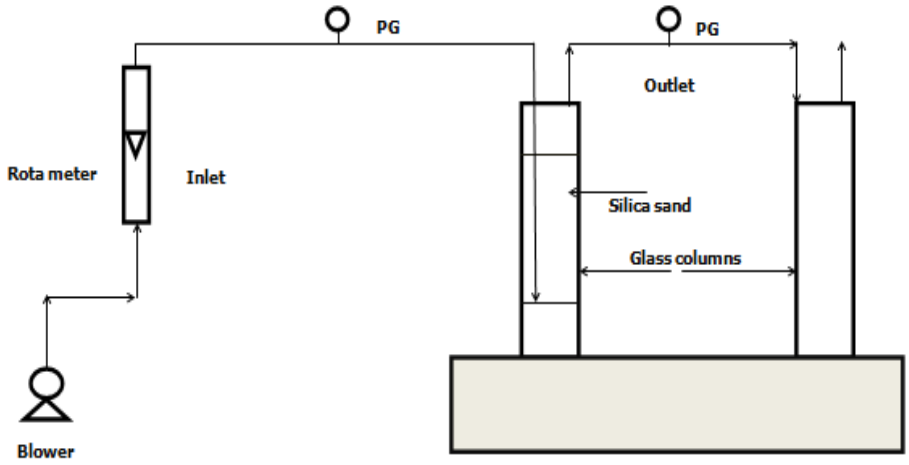


Figure 2: Schematic Representation of Experimental Set Up



Figure 3: Experimental Setup

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Table 1: Typical Characteristics of Silica Sand

S. No.	Characteristics	Silica Sand
1.	Specific gravity	2.2 – 2.5
2.	Bulk density	2.4 - 2.6 gm/cc
3.	Moisture content in the cake	0.1 %
4.	Sizes	0.0003,0.0004,0.0005
5.	Appearance	White crystalline
6.	Chemical purity	Silica > 95% SiO_2
7.	Hardness	7-8 moh
8.	Strength	25 kg/cm^2

Table 2: Sand Composition

S. No.	Component	Percentage (%)
1.	Silica as SiO_2	97.48
2.	Magnesium as $MgCO_3$	0.63
3.	Iron as Fe_2O_3	1.14
4.	Calcium as CaO	0.14
5.	Alumina as Al_2O_3	0.2

III. RESULTS AND DISCUSSION

1. **Experimental Outcomes:** Three experimental runs for different particle sizes (0.0003m, 0.0004m, and 0.0005m) were conducted. As the air flow rate increased from zero, the pressure drop across the column started to increase with the same. At a certain flow rate the pressure drop across the bed became steady and the column bed height started to increase. This was noted as the point of fluidisation. This condition shows the point at which the gas velocity becomes high enough that the drag force becomes equal to the weight of the particle. Experimentally obtained results of minimum fluidisation velocity ($\bar{V}_{om}$), pressure drop across the bed(Δ p), and carry over velocity were tabulated as below

Table 4: Experimental Results of Minimum Fluidisation Velocity and Carry Over Velocity

Material	Dia (m)	Minimum fluidisation velocity (m/s)	Carry Over Velocity (m/sec)
Silica Sand	0.0003	0.0891	0.160
	0.0004	0.155	0.283
	0.0005	0.246	0.376

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Table 5: Experimental Results of Pressure Drop

Material	Diameter (m)	Velocity (m/sec)	Pressure drop (kg/cm^2)
SILICA	0.0003	0.0445	0.021
	0.0004	0.0775	0.036
	0.0005	0.123	0.055

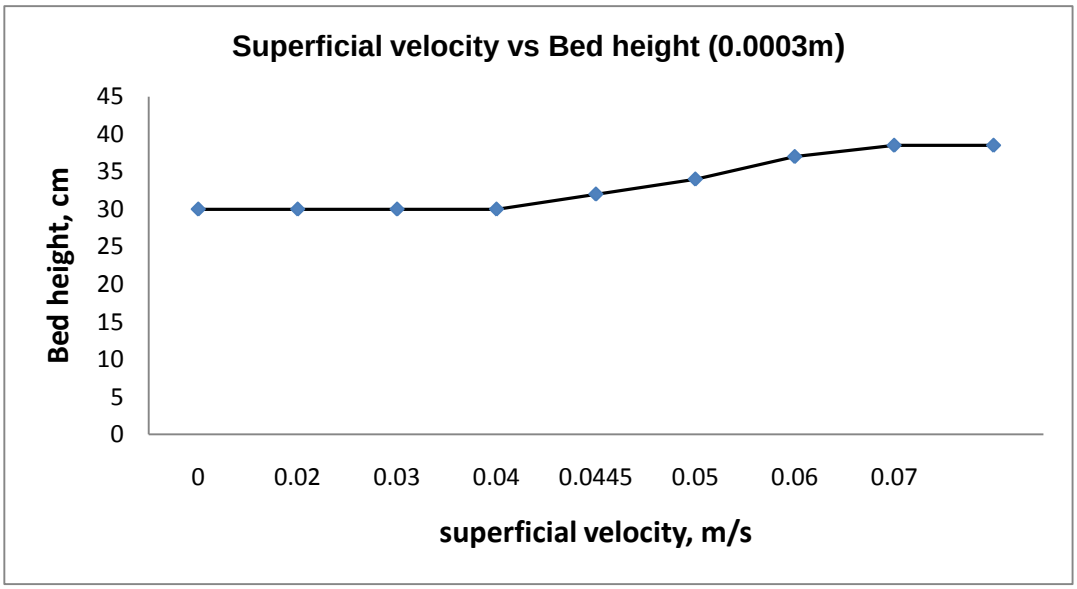


Figure 4: Superficial Velocity Vs Bed Height (0.0003m

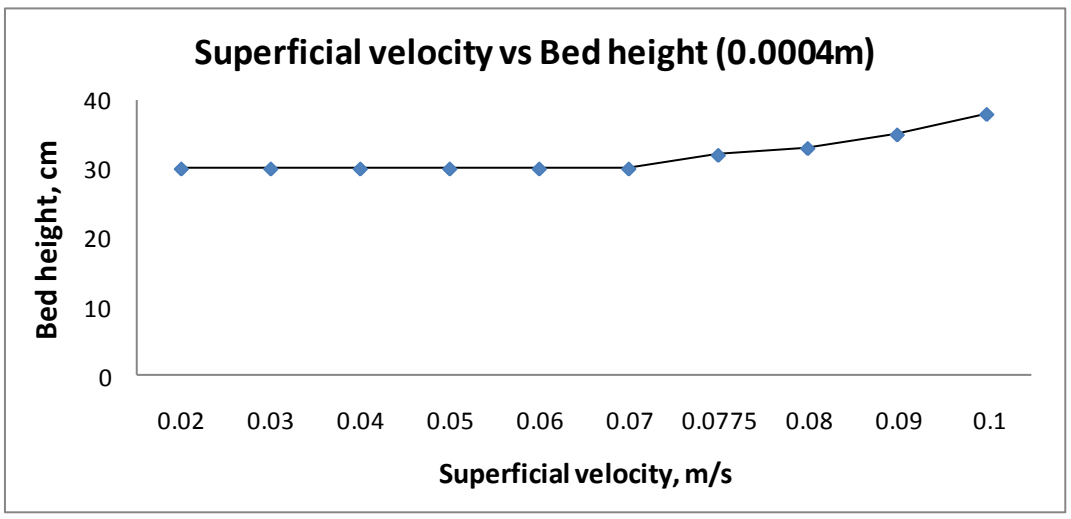


Figure 5: Superficial Velocity Vs Bed Height (0.0004m)

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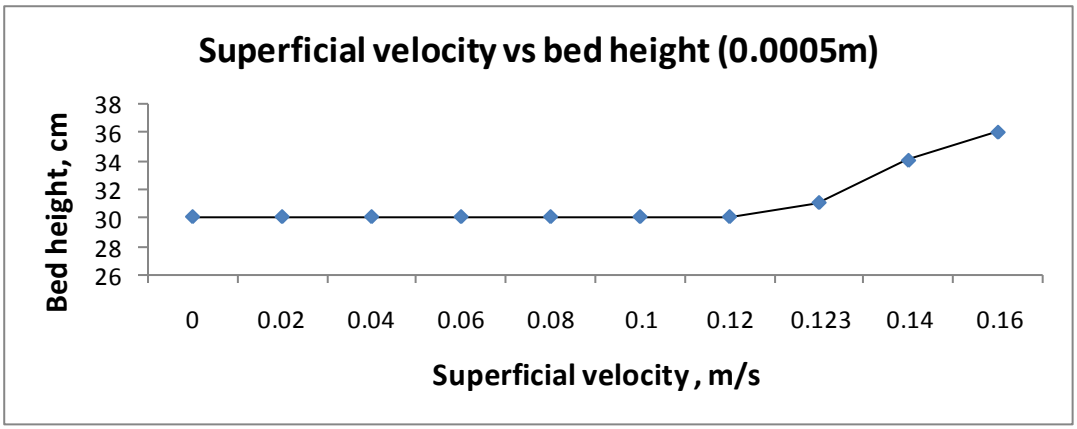


Figure 6: Superficial Velocity Vs Bed Height (0.0005m)

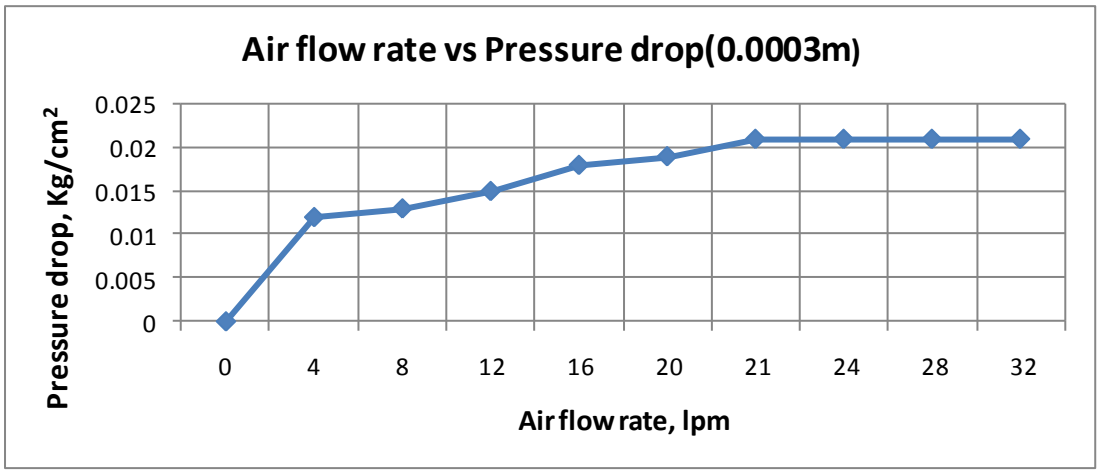


Figure 7: Air Flow Rate Vs Pressure Drop (0.0003m)

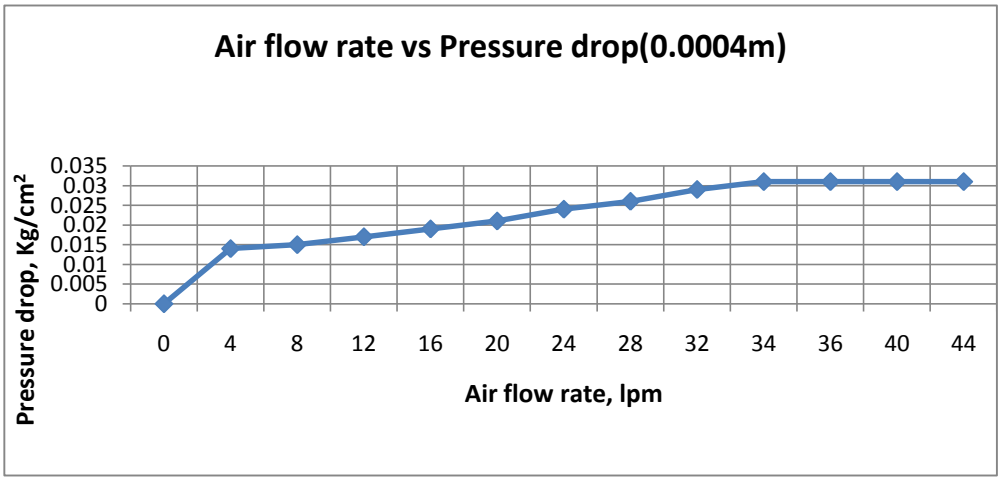


Figure 8: Air Flow Rate Vs Pressure Drop (0.0004m)

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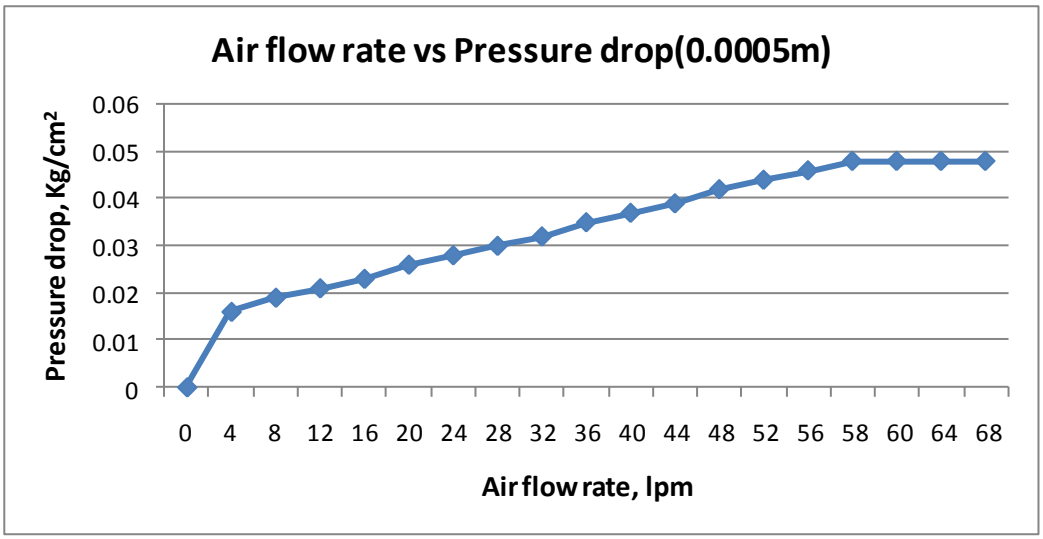


Figure 9: Air Flow Rate Vs Pressure Drop (0.0005m)

2. Pressure Drop

Table 7: Pressure Drop Theoretical Vs Practical

Diameter (M)	Theoretical (Kg/Cm2)	Practical (Kg/Cm2)
0.0003	0.0257	0.021
0.0004	0.0259	0.0312
0.0005	0.0271	0.048

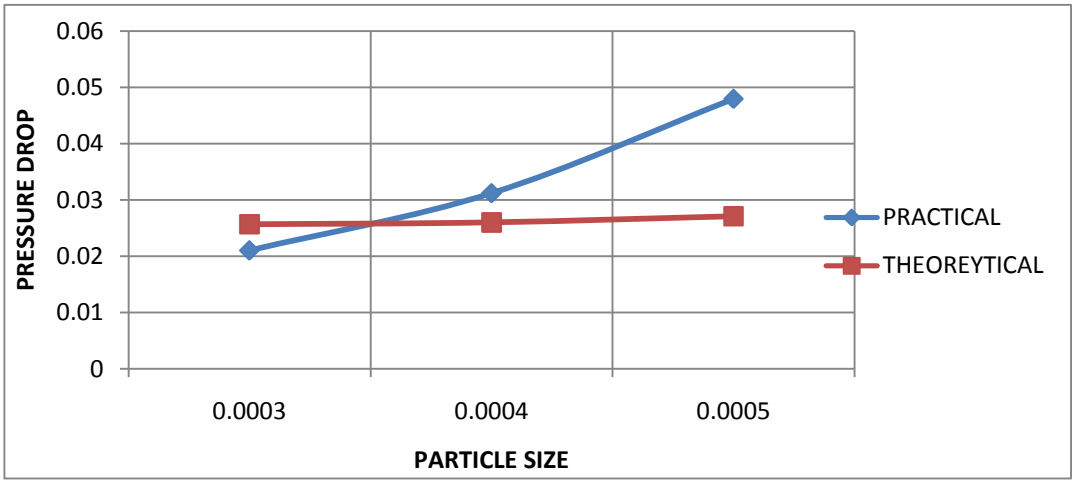


Figure 10: Pressure Drop Theoretical Vs Practical

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3. Minimum fluidisation velocity

Table 8: Minimum Fluidisation Velocity Theoretical Vs Practical

Diameter (M)	Theoretical Models				Practical (m/s)
	Grace (M/S)	Wen & Yu (M/S)	Doichev& Akhmakov (M/S)	Saxena& Vogel (M/S)	
0.0003	0.0866	0.0706	0.0853	0.1280	0.0891
0.0004	0.148	0.1224	0.1449	0.2150	0.1550
0.0005	0.2194	0.1840	0.2185	0.3114	0.2460

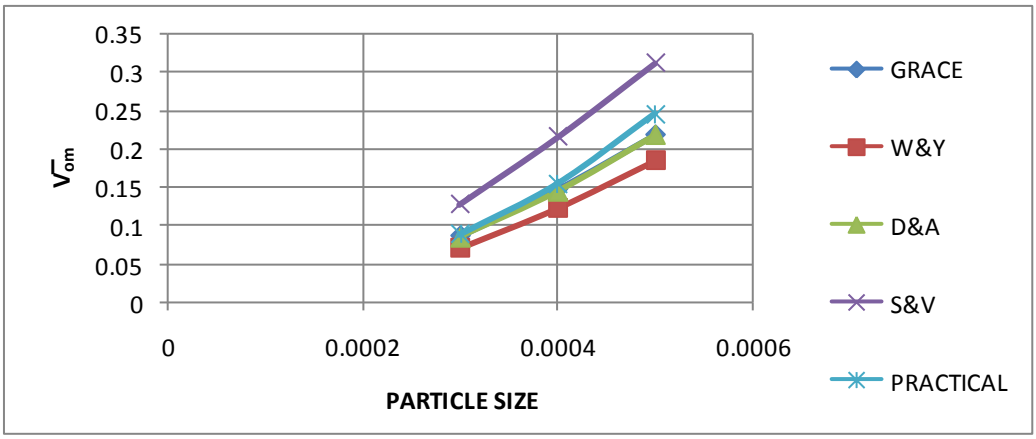


Figure 11: Minimum Fluidisation Velocity Theoretical Vs Practical

IV. CONCLUSION

The experimental results show that the minimum fluidisation velocity ($\bar{V}_{om}$) as well as the pressure drop (Δp) across the column increases with the increasing particle geometric mean size. This validates the nature of the theoretical results obtained. Out of four theoretical correlations used, experimental values of minimum fluidisation velocity ($\bar{V}_{om}$) is more closely matching with Doichev & Akhmakov, Grace Correlations with a deviation of ~5%. It has been observed that the theoretical result obtained by Saxena & Vogel correlation is showing more deviation with the experimental results when compared with the other correlations. Practical values of pressure drop (Δp) obtained is observed to be having large deviation when it is compared with the theoretical results. This deviation may be due to the fact that a small change in porosity (ε) of the bed will have very large impact on ΔP. This makes it difficult to predict ΔP accurately and to reproduce experimental values after the bed is repacked. From the studies we can come to a conclusion that Doichev& Akhmakov, Grace Correlations are preferred for the plant scale minimum fluidisation velocity ($\bar{V}_{om}$) calculations.

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DRYING CONDUCT OF OSMO-CONVECTIVE DRYING OF DAUCUS CAROTA AND MANGIFERA INDICA: QUALITY ATTRIBUTES OF DEHYDRATED PRODUCTS

Abstract

Drying seasonal fruit and vegetables are essential for safe storage and preservation by reducing the moisture content to a certain level. In this study, green mangoes and carrots were treated with an osmotic solution and followed by drying in a micro oven-assisted convective dryer. The green mangoes sample was treated with 10 % (w/w) NaCl solution for 4 h, and carrot slices were osmotically dehydrated with 30 % honey (w/w) for 10 h. The moisture content was reduced after osmotic treatment was 5.2 and 5 % for green mangoes and carrots, respectively. Moreover, the behavior of convective and osmo-convective drying was investigated. Furthermore, the curve for moisture %, drying rate, and convective drying were plotted. The results show that the osmo-convective process reduced the time consumption for drying than regular convective drying at the same temperature. It was reduced to 70 and 20 min for green mangoes and carrots, respectively. Additionally, the fresh samples of carrots and green mangoes that were osmotically dried had much higher nutritional value. Altogether, osmotic dehydration followed by convective drying is a commercially acceptable process for the preservation of fruits and vegetables without altering the nutrition value.

Keywords: Convective drying, Osmotic dehydration, Carrots and mangoes, Micro oven assisted convective dryer, Nutrient retention

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I. INTRODUCTION

In the typical human diet, fruits and vegetables play a significant role as sources of nutraceuticals. The term "nutraceuticals" refers to substances that are naturally present in foods or other ingestible forms and that have been shown to be advantageous to the human body in terms of either improving physiological performance beyond the effects of adequate nutrition or preventing or treating one or more diseases in a way that is relevant to both an improved stage of health and well-being and a decreased risk of disease. These ingredients may include advantageous antioxidants, natural colourants (such carotenoids), minerals, and vitamins, many of which may have additional benefits [1,2]. India offers a diverse spectrum of climatic and physio-geographical conditions, ensuring the availability of most fruits and vegetables. An estimated 486 million tonnes of vegetables and 392 million tonnes of fruits are produced worldwide each year. India is the second-largest producer of fruits and vegetables in the world, producing 90.534 million tonnes every year (National Horticulture Board 2015–2016).

Although fruits and vegetables are produced during peak seasons, there are insufficient preservation and storage facilities at those times, thus the market becomes overstocked and gets rotten before it reaches the consumer. A lack of postharvest handling up to consumption causes between 30–40% of the overall yield in affluent countries to perish. However, postharvest losses in developing nations like India were close to 50% of the total production of fruits and vegetables, which has a negative impact on the consumers' access to fresh produce [3]. Transforming it into a variety of commodities for sale, such as slices, powder, juice, or concentrate, would be one efficient way to lessen this enormous waste. The advantages of processed products include a longer shelf life, greater bacterial resistance, and less expensive handling, transportation, and storage. As a result, it is essential to produce a finished product that is both healthful and of acceptable quality for consumers [4]. Food products are frequently preserved using a variety of techniques, including smoking, dehydration, and minimal processing. It is dried to remove moisture, preserving and extending shelf life so that dried goods can be sold year-round and, in the places, where these are not produced. Moreover, drying lowers the price of packaging, handling, and transportation in addition to reducing bulk and weight. However, food quality alterations in terms of physical, sensory, nutritional, and microbiological aspects could potentially result from drying [5].

Drying is a mass transfer technique used to reduce the bulk of agricultural output by removing moisture from food products [6]. Since drying requires the transfer of heat, modern drying methods are focused on the use of less energy, improve drying efficiency, and produce high-quality items at the lowest cost [7]. There has been extensive research on the processing of vegetables and fruits using air, sun, convection-microwave, and combinations of freeze drying, microwave heating, air or vacuum drying, and solar drying; however, few have attempted to combine different levels of pre-treatments prior to drying and the impact on the nutritional quality and sensory acceptance[8].

In the food processing industry, osmotic dehydration is a supplementary treatment and food preservation method. It lessens heat-related flavour and colour loss and stops enzymes from browning. As it can be done at low or ambient temperatures, it requires less energy than air or vacuum drying. Osmotic dehydration might not produce a product with a low enough

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moisture content to make it shelf-stable, thus additional processing, like air drying, vacuum drying, or freeze-drying, is required.Therefore, an innovative method of drying that combines osmosis (which causes partial dehydration of the fruit) has drawn attention in recent years as a method for producing foods with intermediate moisture levels and foods that are shelf-stable, as well as a pre-treatment before drying to minimise energy use and heat damage[9]. In this experiment green mangoes and carrots were selected as model fruit and vegetable. Mango is a well-known tropical fruit that is widely grown. The fruit is high in antioxidants and should be included in one's daily diet because of its health benefits, which include a lower risk of cardiovascular disease, anti-cancer, and anti-viral properties[10]. It also contains a large quantity of β-carotene, a carotenoid, that are responsible for the typical yellow colour of the mangoes[11]. Furthermore, as a provitamin A and antioxidant, β -carotene is extremely beneficial for human consumption[12]. On the other hand, Carrot is one of the most important root vegetable crops and is extremely nutritious, containing significant amounts of vitamins B1, B2, B6, and B12[13]. It also contains a variety of essential minerals. Carrots have the largest β-carotene content of any human nutrition, with approximately 5-8 mg of β -carotene per 100 g. Carrot pigment β-carotene is a precursor to vitamin A. Carrots also have a high fibre content, which helps to maintain a balanced diet[14]. This research involves a combination of convective and osmo-convective drying of mangoes and carrots. This study includes osmotic treatment with salt solution and honey solution followed by drying. The specific objectives of this research include, (i) to study the drying characteristics of mango and carrot without treating osmotic solution, (ii) to study the osmotic behavior of mango and carrot, (iii) to study the drying characteristics of mango and carrot treated with osmotic solution.

II. MATERIAL AND METHOD

1. **Materials:** Freshgreen mangoes (Mangiferaindica) and carrots (Daucus carota) were procured from the local vegetable market at Madhavaram, Chennai, India (13.09º N, 80.13ºE). The reagents used in the experiments were NaCl (purity: 99%) and Honey (purity: 100%). These were supplied by Merck India Ltd., Mumbai and local supermarket at Chennai, India. All experimental solutions were prepared with purified drinking water, which was obtained from the Livpure Smart Water Purifier unit.

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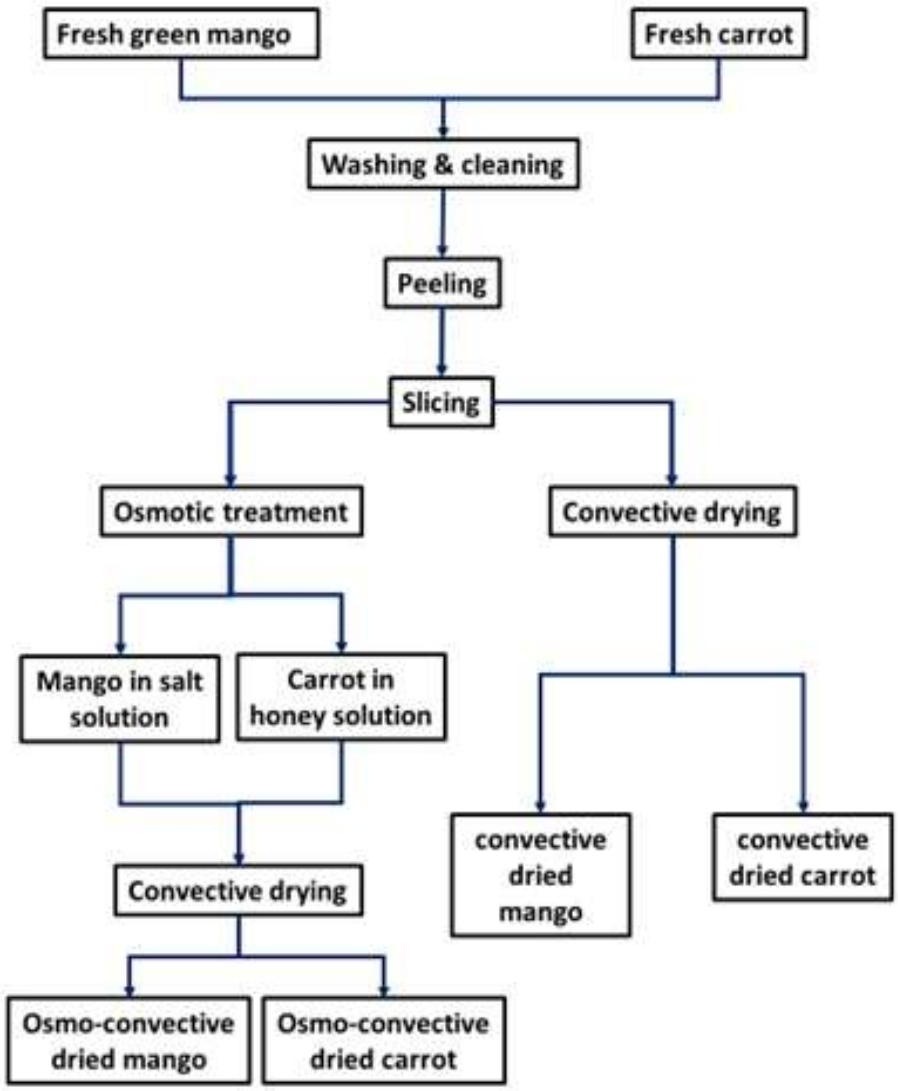


Figure 1: Process flow diagram of convective and osmo-convective drying of mango and carrot

2. **Sample Preparation:** The mangoes and carrots were washed thoroughly with tap water to remove all the dirt and debris. These were peeled off and cut in small pieces with a sharp knife. The average size of the mangoes and carrots were 30*10*10 mm and 5mm slices respectively. These samples were weighted and used for further convective drying and osmo-convective drying. A stock solution of osmotic agent was prepared by dissolving accurately weighed amounts of NaCl and honey in purified drinking water. The desirable experimental concentrations of solutions were prepared by diluting the stock solution with purified water according to necessity.

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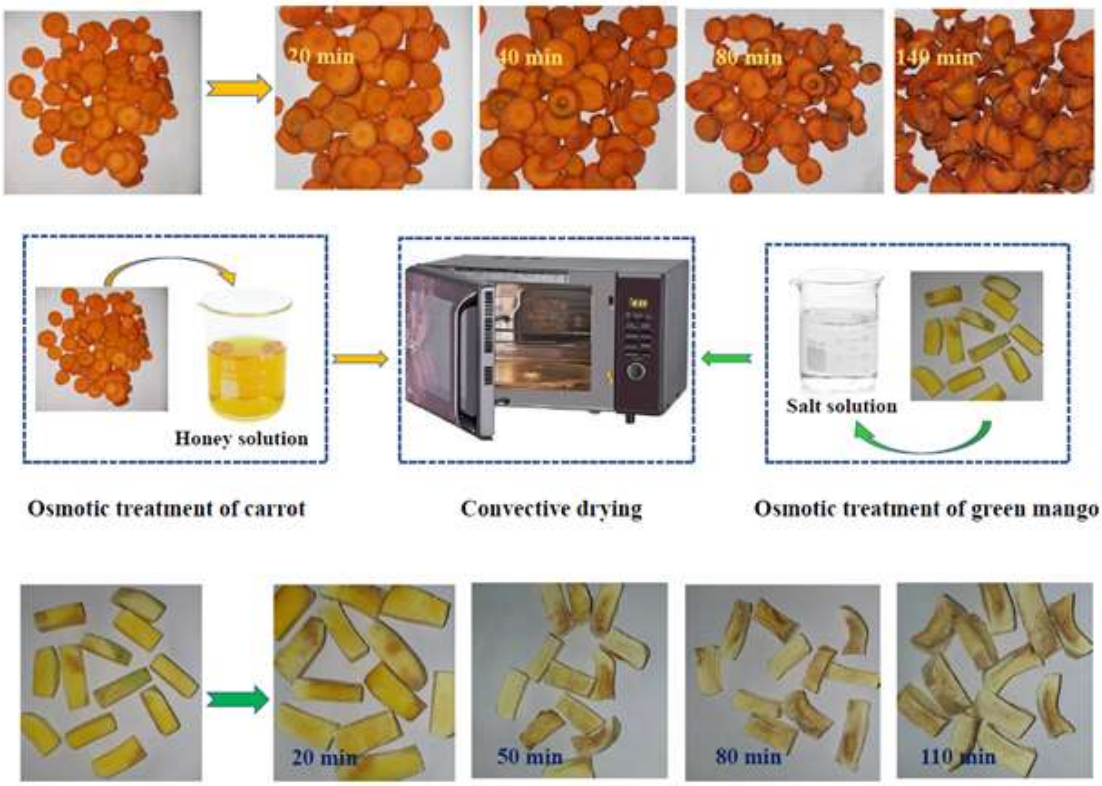


Figure 2: Experimental setup for osmo-convective drying of green mangoes and carrots

3. **Osmotic treatment:** Previously weighted mango pieces were subjected to osmotic treatment in 10 % NaCl solution, at room temperature of 30±5°C. Moreover, the material to solution ratio was 1:10 (w/w) and samples were kept submerged for 4 h. Similarly, the slices of carrots were immersed into 30% of honey solution for 10 h with a ratio of 1:10 (w/w) sample to osmotic solution. The solution containing samples was stirred manually at a regular interval to make it uniform. Furthermore, the solutions were drained after osmotic treatment. The samples were blotted with tissue paper to remove the excess of osmotic solution from their surface and weighed.

4. **Convective drying:** Convective drying of the samples without osmotic treatment and with osmotic treatment was carried out in micro oven assisted convective dryer. The samples were placed in one layer on a tray and dried at 110 °C for 180 min.

5. ***Quality* evalution*:*** All the samples including before and after osmotic treatment, and the dehydrated product quality was evaluated in Scientific Food Testing Services Pvt Ltd. (13.07 ºN, 80.15 ºE). The different testing was carried out by using specific method to determine the moisture and nutritive parameters for mango and carrot samples. All the testing methods are listed in Table 1.

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Table 1: Test methods applied for quality evalution

Sl. no	Test parameters	Test method
1	Moisture	FSSAI Lab Manual, Fruits & Veg Products 4.1
2	Fat	SFTS/FCL/SOP/003 Issue No: 01Issue date: 03.01.2015
3	Crude Fiber	IS 10226 (Part-1)
4	Protein	SFTS/FCL/SOP/002 Issue No: 01 Issue date: 03.01.2015
5	Carbohydrates	IS 1656
6	Energy	Food Energy Method of analysis and Conversion Factor (FAO)

6. Drying characteristics

- **Moisture content:** The moisture content of fresh and osmotically dehydrated green mango and carrot samples was determined using the AOAC (1984) method. It was obtained by taking a small amount sample and estimating the moisture content by recording the weights using the equation below,

$$\%\ moisture\ content = \frac{W_1 - W_2}{W_2} \times 100 \quad (1)$$

Where, W_1 and W_2 indicates mass of original sample and dry sample.

- **Drying rate:**The moisture content of this study was analysed to determine the amount of moisture lost from a sample of green mango and carrot over a specific time interval. The drying rate of the samples was calculated using the mass balance equation,

$$R = \frac{WML\ (Kg)}{Time\ interval\ (min) \times DM\ (Kg)} \quad (2)$$

Where, WML signifies [Initial weight of sample – Weight of sample after time (t)] and DM implies Dry material.

- **Water content:** The following equation is used to estimate the water content of green mango and carrot during dehydration at a specific temperature,

$$Water\ content\ (d.b) = \frac{W_1 - W_2}{W_2} \times \frac{Kg\ water}{Kg\ DM} \quad (3)$$

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III. RESULT AND DISCUSSIONS

I. Drying characteristics

- **Effect of moisture percentage of convective and osmo-convective drying:**The variation of moisture percentage with time for green mango is duplicates is shown in Figure 3 (a). It has been found that the initial moisture content in green mango was 75%. After osmotic treatment the moisture content was reduced to5.2%. In case of convective drying, moisture removed was up to 2% in 180 min. However, in osmo-convective drying 1.6% sample moisture was left behind after drying within 110 min. On the other hand, moisture percentage during convective and osmo-convective drying are given in Figure 3 (b). Initial moisture content in carrot was tested 88 %. Whereas, after osmotic dehydration in honey solution the moisture content reduction was 5%. In convective drying, moisture was removed up to 2 % in 160 min. Nevertheless, in osmo-convective drying 0.5 % sample moisture remained after drying within 140 min. In comparison to direct convective drying, osmotic pre-treatments reduced the rate of complementary convective drying and increased the total dehydration time.

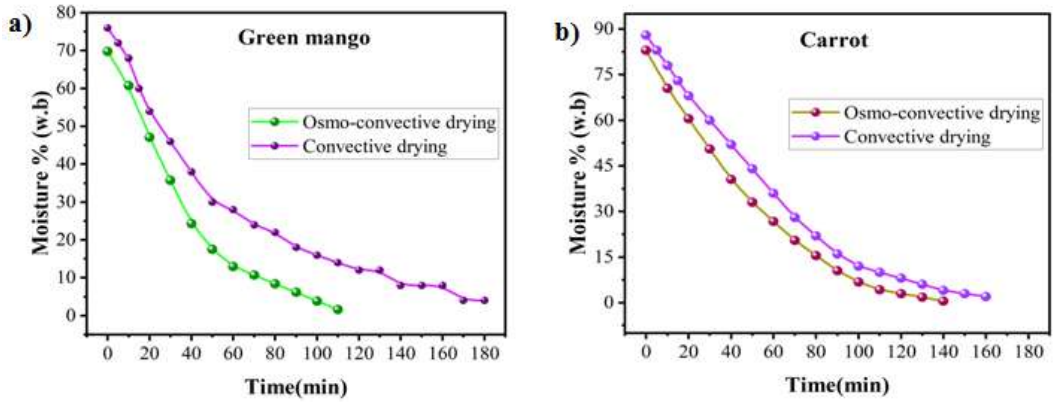


Figure 3: Moisture percentage (w.b) during osmo-convective drying and convective drying for (a) green mango and, (b) carrot

- **Drying rate curve for convective and osmo-convective drying:** The weight of green mango slices was determined after a subsequent time interval. The drying rate at different time was evaluated by using water content, amount of moisture removed and the drying rate equation. Here, the drying rate curve was plotted against water content [Kg water/Kg DM] which is represented in Figure 4(a). From the drying rate curve, it can be justified that the green mango pieces were dried in falling rate period. A constant rate period was unidentified in both the convective and osmo-convective drying. The falling rate period drying implies that the internal mass transfer was done by diffusion**.** Similarly, the weight of carrot slices was evaluated after a regular time interval. From the drying rate curve in Figure 4(b) it can be justified that the carrot pieces were also dried in falling rate period. Again, a constant rate period was unidentified for both the convective and osmo-convective drying of carrots.

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Moreover, falling rate period drying here again implies that the internal mass transfer was done by diffusion.

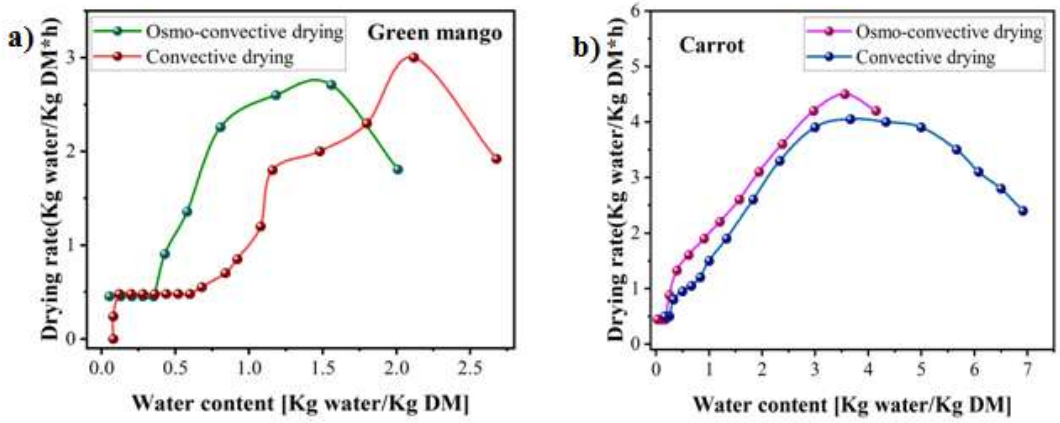


Figure 4: Osmo-convective and convective drying rate curve for (a) green mango and, (b) carot

- **Drying curve for convective and osmo-convective drying:** The drying curve of green mango for convective and osmo-convective drying are presented in Figure 5 (a). It shows that the water content in the sample decreases with the increase in the initial time period and slows down after a certain period of time and finally approached an almost constant value. For convective drying the water content reached a constant value of 0.08 Kg Water/Kg DM at 180min. On the other hand, in osmo-convective drying the water content was 0.053 Kg Water/Kg DM in 110min**. T**he drying curve of carrot for convective and osmo-convective drying are shown in Figure 5(b). It also displays a decrease in water content with the increase in the initial time period. After a certain time period, the moisture removal was found to slow down and finally became almost constant. For convective drying the water content reached a constant value of 0.166 Kg Water/Kg DM at 160min. Whereas, in osmo-convective drying the water content was 0.029 Kg

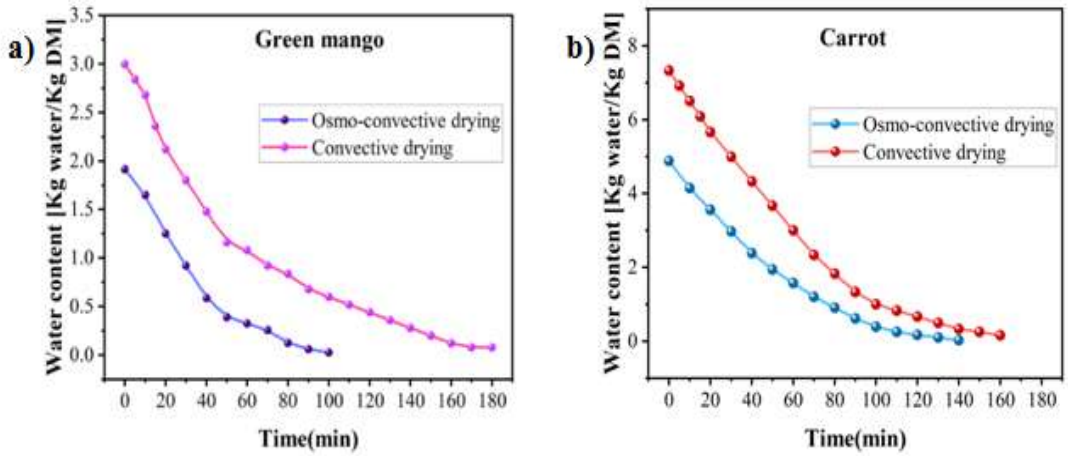


Figure 5: Osmo-convective and convective drying curve for(a) green mango and, (b) carrot Water/Kg DM in 140min.

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II. Nutrition value analysis: In general, the retention of ascorbic acid is used to gauge the overall nutritional quality of processed foods. Due to its high water solubility, sensitivity to heat, and oxidation state, this nutrient is quite prone to degradation[15]. The nutritional value of osmo-convective dried mango and carrot were evaluated by measuring different nutrient constituents viz. Fat, Crude Fiber, Protein, Carbohydrates and energy. According to USAD the nutritional quality of fresh mango and carrot were compared with the osmo-convective dried products. It is represented in Table 2. It has been shown that all the nutrients value of processed product remains almost unchanged or increased. Therefore, it could be of help to meet the normal vegetable diet. In fresh mango, the value of Fat and Crude Fiber was found to be 0.4 and 0.94 g/100g. Whereas, there is an increase of about 17.5% Fat, 18.1% of Crude Fiber in osmo-convective dried mango. Also, protein and carbohydrate content of the processed mango was increased by 2 which is 4.1 times greater than that of the fresh samples. Again, the energy content of the samples after osmotically dehydrated was 260 Kcal/100g, which is significantly higher than the same quantity of fresh mango (0.6 Kcal/100g).

Similarly, the nutritional quantity of the processed carrots was also increased than the fresh carrots. It has been observed that the carrots after drying contains 0.26 g/100 g of Fat and 1.94 g/100 g of Crude Fiber, which is 30 and 74% more than the fresh carrots. Additionally, the processed samples had 2.78 and 5.99 % increase in protein (2.50 g/100 g) and carbohydrates (59.9 g/100 g) respectively, compared to the fresh samples. The carrots in fresh condition had 0.41kcal/ 100g of energy. However, the energy in carrots after osmo-convective drying had increased to 252 Kcal/100 g. This results for both mangoes and carrots clearly indicates that osmo-convective drying is a useful technique for preservation without altering the quality and quantity of the nutrients.

Table 2: Nutritive value of fresh and osmo-convective dried mango and carrot

Sl no	**Nutrients**	**Fresh sample**		**Osmo-convective**	**dried sample**	**Unit**
		Mango	Carrot	Mango	Carrot	
1.	Fat	0.40	0.2	0.47	0.26	g/100g
2.	Crude Fiber	0.94	1.2	1.11	1.94	g/100g
3.	Protein	0.82	0.9	1.64	2.50	g/100g
4.	Carbohydrates	15	10	62.3	59.9	g/100g
5.	Energy	0.60	0.41	260	252	Kcal/100g

IV. CONCLUSION

Osmotic dehydration is a quick and efficient method for treating and preserving mangoes and carrots for long-term storage. In this research work, osmotic solution of salt and honey were used for green mangoes and carrots respectively, followed by drying in microwave assisted convective dryer. The quality and nutritional value of the food product were evaluated by various testing (Moisture, Fat, Crude Fiber, Protein, Carbohydrates and

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Energy) and experimental results. Both the convective and osmo-convective data of green mango and carrot from the experiment are used to plot the moisture% curve, drying rate curve, and drying curve. For mango, without osmotic dehydration, the sample is dried at 110°C for 180min, whereas in osmo-convective drying it was only for 110 min. For carrot, convective drying required 160 min whereas osmo-convective drying is completed within 140 min. Therefore, osmo-convective drying enhances the cost effectiveness by utilizing less energy than convective drying. Moreover, osmotically dried samples gets significant improvement in the nutritional value compared to the quality of the fresh samples of green mangoes and carrots. Overall, the osmo-convective drying using salt and honey solution is most suitable for commercial purposes to preserve mangoes and carrots during off-season. Therefore, this method could be applied to other vegetables and fruits also for extending their shelf life and preservation.

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EXPERIMENTAL ESTIMATION OF MINIMUM FLUIDIZATION VELOCITY FOR SILICA SAND BED AND ITS THEORETICAL VERIFICATION

Abstract

In this report experimental estimation of minimum fluidisation velocity, carryover velocity, and pressure drop across the experimental setup for silica sand of different sizes (0.0003m, 0.0004m, 0.0005m) has been done. An experimental setup consisting of two glass column in which one filled with silica sand of bed height 30cm has been used. The medium used for the fluidisation was air at ambient conditions .The pressure drop and air flow rates were measured using pressure gauges at inlet and outlet of the column and rota meter respectively. The velocity (Air flow rate/cross sectional area) of the air passed was slowly increased. The corresponding pressure gauge readings were noted. At a certain velocity, the bed height of 30 cm height was observed to be increasing. This velocity at which maximum pressure drop was obtained was noted as the minimum fluidization velocity. The velocity was further increased to up to the silica sand getting carried over to the next column. This velocity has been noted as carry over velocity. The experiment was repeated for above mentioned particle sizes to obtain the same parameters. Theoretical validations of the above parameters were done using four correlations to examine which correlation is more or less matching with the experimental results.

Keywords: Fluidization; Minimum fluidization velocity; Carry over velocity; Pressure drop.

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DRYING CONDUCT OF OSMO-CONVECTIVE DRYING OF DAUCUS CAROTA AND MANGIFERA INDICA: QUALITY ATTRIBUTES OF DEHYDRATED PRODUCTS

Abstract

Drying seasonal fruit and vegetables are essential for safe storage and preservation by reducing the moisture content to a certain level. In this study, green mangoes and carrots were treated with an osmotic solution and followed by drying in a micro oven-assisted convective dryer. The green mangoes sample was treated with 10 % (w/w) NaCl solution for 4 h, and carrot slices were osmotically dehydrated with 30 % honey (w/w) for 10 h. The moisture content was reduced after osmotic treatment was 5.2 and 5 % for green mangoes and carrots, respectively. Moreover, the behavior of convective and osmo-convective drying was investigated. Furthermore, the curve for moisture %, drying rate, and convective drying were plotted. The results show that the osmo-convective process reduced the time consumption for drying than regular convective drying at the same temperature. It was reduced to 70 and 20 min for green mangoes and carrots, respectively. Additionally, the fresh samples of carrots and green mangoes that were osmotically dried had much higher nutritional value. Altogether, osmotic dehydration followed by convective drying is a commercially acceptable process for the preservation of fruits and vegetables without altering the nutrition value.

Keywords: Convective drying, Osmotic dehydration, Carrots and mangoes, Micro oven assisted convective dryer, Nutrient retention

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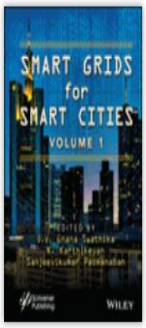
Chapter 3

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Kodada Durga Priyanka, Abitha Memala Wilson Duraisamy

Book Editor(s):O.V. Gnana Swathika, K. Karthikeyan, Sanjeevikumar Padmanaban

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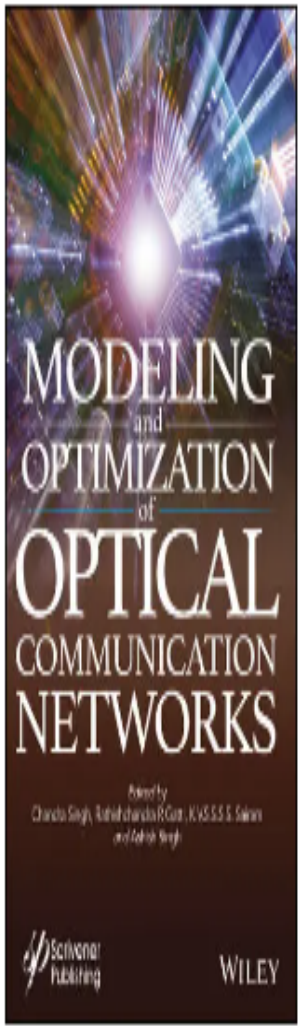
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Common Techniques and Applications of Multi-terminal High-voltage Converters

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Summary

In recent years, the conventional energy source is quickly being exhausted and the cost and need of energy are growing in the direction of achieving the worldwide necessities



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Chapter

Introduction to Computer Vision Aided Data Analytics in Healthcare Industry 4.0

By Ramakrishna Kolikipogu, D Ramya, Mujahid Siddiqui, Aaliyah Siddiqui, C Om Prakash

Book Healthcare Industry 4.0

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ABSTRACT

The entire world is transforming to Healthcare Industry 4.0, where the transition is happening in a completely digital form and the need for complete automation is in process. The entire ecosystem is shifting toward Healthcare 4.0, and multiple innovations are occurring in aspects of healthcare. Various emerging technologies, such as the Internet of Things, blockchain, artificial intelligence (AI), and cloud computing, are being implemented to make the process fully automated and see that the various services provided are improved in terms of quality and time. AI will be a powerful tool for Industry 4.0, which can be used extensively and play a significant role in unforeseen circumstances. Using this technology, complex health-related data analysis can provide the best possible treatment for the patient. Computer vision (CV) was beneficial during the pandemic, as it analyzed the symptoms using medical images like MRI reports and X-rays. Data-driven analytics encourage early disease detection and intervention while also aiding in the consolidation of institutions to deliver quicker, more accurate, and safer patient care. Data analytics in healthcare can help reduce treatment costs, foresee disease outbreaks, stop preventable illnesses, and improve patients' overall quality of care and life.

Implementing AI-Powered Chatbots in Agriculture for Optimization and Efficiency

Publisher: IEEE Cite This PDF

Abstract:

Agriculture is critical to the global economy, therefore the introduction of automation in this field is now an essential and rising topic internationally. Demands for food and labor are rising at an exponential rate, outpacing the capabilities of conventional farming practices. A new age of revolutionary change has been caused by the incorporation of Artificial Intelligence (AI) into agriculture. This study focuses on the development of an AI-powered Chatbot that is customized for the agricultural sector, offering assistance with crop recommendation and disease detection. The two machine learning models used to handle crop suggestions are Gaussian Naive Bayes (GNB) and Support Vector Machine (SVM). Using the VGG-16 transfer learning model, disease predictions are made. The models are evaluated thoroughly, and as a result, GNB and VGG-16 are chosen to be a part of the Chatbot's architecture. Without the need for professional knowledge, the Chatbot can help farmers select crops that are suited for cultivation and evaluate the health of their crops. The designed Chatbot is confirmed to be reliable and effective after extensive testing of its performance through various queries. By utilizing AI, we made a smart tool for effective crop management and harvesting.

Analysis of Modified Buck Boost Converter fed DC Motor drive

Publisher: IEEE

Cite This PDF

C. Bhuvaneswari ; N. Sathyaprakash ; W. Abitha Memala ; M. Pushpavalli **All Authors**

Abstract:
Power Electronic Converters have plenty of applications after the invention of Switched Mode Power Supplies. The Prominent Converters are Buck Converter, Boost Converter and Buck-Boost Converter. The Buck Boost Converter includes the advantages of Buck and the Boost Converter individually. This Paper Proposes a Single-Phase AC-AC buck boost Converter with Multiplier Stage to improve low input Voltage to a Higher Output Voltage. The Modified Buck-Boost Converter is simulated both in open loop and Closed loop System. The time domain Specifications are measured with PI Controller and Fuzzy Logic Controllers. The Steady state Error drastically decreases when the Converter is simulated with a Fuzzy Logic Controller. The Software analysis is done using MATLAB Simulink.

Published in: 2023 International Conference on Innovative Computing, Intelligent Communication and Smart Electrical Systems (ICSES)

Versatile Solar Pump Controller for Various Applications

Publisher: IEEE Cite This PDF

M. Pushpavalli ; R. Harikrishnan ; P. Sivagami ; C. Bhuvaneswari ; W. Abitha Memala ; V. Mee... **All Authors**

Abstract:

The agriculture industry is in a constant state of transformation, with ongoing upgrades in farming equipment, agricultural infrastructure, and production facilities. Solar panels offer versatile solutions with myriad applications in farming. However, the substantial investment made by both farmers and governments in Solar PV pumping systems is underutilized, as these systems operate for just 150 days annually, essentially half the year. To maximize the potential of solar photovoltaic systems, which generate electricity year-round during sunny hours, it is crucial for the controllers installed in these solar pumping systems to serve multiple purposes, catering to a variety of agricultural and other farmer needs. This single solar-powered product has the capability to operate a wide range of applications, including water pumping, a mobile application, soil conditioning sensors, an ultrasonic sensor, a Bluetooth module, a battery, and an Arduino Uno board.Such diversification has the potential to significantly boost agricultural productivity and, in turn, increase farmer incomes.The primary aim of this study is to create remotely accessible, multi-mode, cost-effective, simple, highly reliable, and environmentally friendly solar water pumping systems that offer financial benefits to Indian farmers year-round. Solar water pumps have the potential to greatly benefit Indian farmers by providing both a consistent water supply and an additional source of income.

Photovoltaic Powered Fuzzy Algorithm for IoT-Monitored Four Switch Induction Motor Drive

Publisher: IEEE

Cite This PDF

S. Jayaprakash ; T. Kanthimathi ; N. Rathika ; P. Sathyanathan ; C. Srinivasan **All Authors**

Abstract:

There has been a lot of focus on the potential benefits to the industry of combining Renewable Energy Sources (RES) with Internet of Things (IoT) technology. The conventional motor-driven control system often uses traditional power sources and has poor continuous tracking capabilities, which limits its energy economy and control accuracy. This research introduces a unique method for enhanced energy efficiency and control by integrating a fuzzy algorithm, a photovoltaic (PV) power source, IoT-monitored four-switch induction motor (IM) drive. A fuzzy algorithm is used to improve the motor drive system. According to input factors like torque, load conditions and speed, the fuzzy logic controller (FLC) modifies the motor driving settings. Because of the adaptive properties of the fuzzy algorithm, the IM may be controlled effectively, improving system performance. Additionally, the IoT monitoring feature allows for remote control and real-time data collecting, improving system performance and issue detection. MATLAB/Simulink is employed to demonstrate the obtained results of the developed system. The results of this research may be used in a variety of fields, including robots, electric cars, and industrial automation powered by renewable energy.

Experimental Evaluation of Learning Based River Path Sensing and Classification Using Digital Satellite Images

Publisher: IEEE

Cite This

PDF

S.D. Anitha Selvasofia ; S. Deepa Shri ; S.Meenakshi Sudarvizhi ; S.D. Sundarsingh Jebaseel... **All Authors**

2

Securing data in Wireless Sensor Network using Hybrid ECC + AES Cryptographic Approach

Publisher: IEEE

Cite This

PDF

S. Nirmalraj ; D. N. S. Ravikumar ; Krishnamoorthy ; Ramesh Babu ; Godwin Immanuel ; Pretii... All Authors

Satellite Image Based Animal Identification System Using Deep Learning Assisted Remote Sensing Strategy

Publisher: IEEE

Cite This PDF

A.S. Gowri ; Immanuel Yovan ; S.D. Sundarsingh Jebaseelan ; S.D. Anitha Selvasofia ; N. Na... All Authors

Performance Analysis of a Sensorless DC Motor Using Neuro Fuzzy Logic Control

Publisher: IEEE

Cite This PDF

G.T Sundar Rajan ; V. Sivachidambaranathan ; J. Barnabas Paul Glady ; Ramesh Babu ; Gan... **All Authors**

2 Cites in Papers

46 Full Text Views

Abstract

Document Sections

Introduction

Abstract:

This paper deals with the speed control of by using a NEURO FUZZY LOGIC controller without any loss of power; in fact energy is conserved during the regenerative period. The random and optimal results are obtained. This method is integrated approach for control and yields excellent results.

IoT Enhanced Optimization of Wind Energy Systems Using LCL Filter

Publisher: IEEE

Cite This PDF

V. Meenakshi ; V.Vijeya Kaveri ; A.Santhi Mary Antony ; S. Radhika ; M. Kavitha ; M. Pushpav... **All Authors**

Abstract:

Among the non-conventional electrical energy resources, it's far a great deal beneficiary and mandate to make use of wind power for the development of decentralized integrated power structures together with sun power, hydel energy and biomass and so on., Wind mills do not release emission which could pollute air or water and. Wind energy is recommended for a prolonged utilization whilst troubles like oil shortages and environmental effects and so on., arises inside the market. Doubly Fed Induction Generator machine (DFIG) is desired. Here this paper describes the several ways in which small wind turbines can benefit from IoT integration such as Remote monitoring and control, predictive maintenance optimization performance, energy management and grid integration, LCL filter design together with its mathematical expressions to validate the layout info each in analytical and experimental manner is discussed to control total harmonic distortion. LCL filter in grid side for that transfer function and the consequent frequency area approach the usage of Bode plot has been offered. The distortion current for LCL filter is shown inside the simulated consequences. It additionally gives the dynamic version of LCL filter in simulation the use of Simulink/MATLAB.

IoT Based Coal Mine Safety and health Monitoring System

Publisher: IEEE

Cite This PDF

V. Meenakshi ; S Radhika ; V.Vijeya Kaveri **All Authors**

Abstract:

There are many sectors that depend on coal, and it is often referred to as the "Black Diamond" by many. In order to meet India's ever-increasing electricity needs, coal mining has become a national priority However, this work is hazardous and could be fatal for those who perform it. The environment poses several challenges to coal miners, including high temperatures that cause excessive sweating and can have negative health effects as well as the emission of hazardous gases, to name a few. These elements make the workplace a dangerous place for employees to be, endangering their very lives. In this research, a data transmission platform called Think speak IoT is used as a medium to pass the data. The technology is used to monitor the different parameters of human health parameter are heart rate, sweat rate, and spo2 level. These sensors are all deemed one unit and are installed in coal mines. All sensor values are constantly transmitted to the think speak IoT platform for analysis. The developed system is primarily used to rescue employees' health conditions and to guarantee workers' safety. So that appropriate actions can be done whenever a potentially dangerous situation appears.

Implementation of Unidirectional Single Phase AC-DC-AC Three-Leg Three Level Converter

Publisher: IEEE

Cite This PDF

G.T Sundar Rajan ; W. Abitha Memala ; V. Sivachidambaranathan ; S. D Sundarsingh Jebase... **All Authors**

6
Full
Text Views

Abstract

Document Sections

Introduction

Abstract:
A unidirectional three level three leg converter is implemented. This converter consists of one unidirectional and two bidirectional neutral point clamped leg, connected between rectifier and inverter. With the same switching frequency, voltage stress and harmonics distortion are reduced..

Implementation of IoT for Fire Protection System in Unitary Air Conditioners

Publisher: IEEE Cite This PDF

F Sheryn ; M Pushpavalli ; P Sivagami ; P Abirami ; M Suriyapriya ; S Nilananthanna **All Authors**

Abstract:
With the increasing global temperatures and climate fluctuations, air conditioning has transitioned from a luxury to a necessity in daily life. In the Indian market, room air-conditioners dominate, offering a broad range of affordable products from various brands. While these systems contribute significantly to human comfort and productivity, the neglect of electrical and fire safety features poses a potential threat to both human safety and property. This paper addresses the critical issue of fire hazards in unitary air conditioners and proposes a solution through the implementation of a modified fire protection circuit. By enhancing the electrical and fire safety features of these systems, the aim is to mitigate the risk of fire incidents and safeguard human lives and property. Additionally, the paper explores the integration of Internet of Things (IoT) devices to alert occupants in real-time in the event of a potential fire, providing an extra layer of safety and responsiveness. Through this research, the proposed modifications seek to strike a balance between the increasing demand for air conditioning and the imperative need for robust fire safety measures. The paper aims to contribute to the ongoing discourse on sustainable and secure HVAC systems, fostering a safer environment for individuals and businesses alike.

A Comprehensive Study on Solar Wind Hybrid Power Generation System with Modified Luo Converter

Publisher: IEEE Cite This PDF

G.T Sundar Rajan ; M. Pushpavalli ; V. Sivachidambaranathan ; A. Ramesh Babu ; J. Barnab... **All Authors**

Mitigation of Power Quality Issues in Power System using Static Synchronous Compensator

Publisher: IEEE

Cite This PDF

Madake Rajendra Bhimraj ; D. Susitra **All Authors**

Abstract:

In the power system, voltage stability is considered as a performance measurement parameter. So that different types of faults occur in power systems like long duration, short duration faults short-duration there are voltage sag, voltage swell, and voltage interaction. So, to achieve voltage stability STATCOM is used. A 24-volt Static Synchronous Compensator (STATCOM) model to mitigate power quality problems in power systems is presented in this article. Voltage fluctuations and flicker are just a few of the power quality problems that can affect the power system and cause significant financial losses as well as harm to electrical equipment. The STATCOM is an adaptable AC transmission system (FACTS) component that can efficiently control voltage and enhance the system's power quality. The 24-volt model has a small, affordable design that works well for low-voltage uses. The STATCOM 24-volt model's effectiveness at reducing problems with power quality in a power system is evaluated in the research. The outcomes of the simulations show that the STATCOM can efficiently control voltage, and reduce flicker, thereby enhancing the system's total power quality. The findings also demonstrate that the 24-volt model is a practical choice for low-voltage uses, offering an affordable and effective remedy for problems with power quality in power systems.

Satellite Image Based Animal Identification System Using Deep Learning Assisted Remote Sensing Strategy

Publisher: IEEE Cite This PDF

A.S. Gowri ; Immanuel Yovan ; S.D. Sundarsingh Jebaseelan ; S.D. Anitha Selvasofia ; N. Na... **All Authors**

Strengthening Implementation Security for Quantum Cryptography in the Era of Quantum Computing by Bridging Theory and Practice

Publisher: IEEE Cite This PDF

J. Barnabas Paul Glady ; D.N.S. Ravikumar ; B. Padmanabhan ; D. Godwin Immanuel ; S D S... **All Authors**

Fuzzy based Hybrid Improvised High Utility Itemset Mining

Publisher: IEEE

Cite This PDF

J. Barnabas Paul Glady ; D.N.S Ravikumar ; D. Ramya ; B. Padmanabhan ; S D Sundarsingh ... **All Authors**

Abstract:

The High Utility Itemset(HUI) in a big transactional database is analysed utilising a variety of methodologies, algorithms, and procedures. This research is beneficial for highlighting the issues associated in High Utility Itemset Mining (HUIM), and the suggested solution Hybrid Improvised High Utility Itemset Mining with Fuzzy is offered based on these challenges. The transaction database is changed into the fuzzy transaction database at first. The fuzzy transaction database is used to build a Fuzzy Utility Pattern Tree. Then, the memory management strategy is used on the Fuzzy Utility Pattern Tree, which fixes the problems with poor spatial and temporal locality. LS- Hash is used to index the itemset in a fuzzy transaction database to cut down on the amount of memory it needs. It also cuts down on the number of times a transaction database has to go through sets of items that aren't used very often. So, the combination of memory management and LS-Hash-based indexing reduces the amount of memory needed, avoids unnecessary traversal of itemsets that aren't used often, and makes it easy to get the itemsets back, which improves the HUIM. The results of the experiments show that the proposed Hybrid Improvised High Utility Itemset Mining Using Fuzzy (HIHUIM - F) runs faster and uses less memory than other methods already in use for the special children dataset.

Design and Development of Motor Module for the Advancements in Smartlift

Publisher: IEEE

Cite This PDF

Abhay Verma ; M. Kavitha ; S. Kowsalya ; D. Susitra ; V. Senthil Nayagam ; V. Balasubramanian **All Authors**

Abstract:

Design and Development of Motor Module for the Advancements in Smart Lift" presents an innovative strategy aimed at enhancing accessibility within campus environments. The project centers on the creation of a smart standing lift system customized for campus staircases, with the objective of furnishing a secure and effortless vertical mobility solution for individuals facing mobility challenges. Through the incorporation of intelligent sensors and adaptive controls, the standing lift ensures intuitive operation and adaptability to varying user requirements. This paper delves into the design, implementation, and assessment of the smart standing lift, shedding light on its potential to enhance accessibility and streamline campus mobility for users.

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Lung tumor cell classification with lightweight mobileNetV2 and attention-based SCAM enhanced faster R-CNN

Original Paper | Published: 23 January 2024

Volume 15, pages 1381–1398, (2024) Cite this article

V. Nisha Jenipher & S. Radhika

An Extreme Learning Based Forest Fire Detection Using Satellite Images with Remote Sensing Norms

Publisher: IEEE

Cite This PDF

S.D. Anitha Selvasofia ; S. Deepa Shri ; S. Meenakshi Sudarvizhi ; S.D. Sundarsingh Jebasee... **All Authors**

Abstract:

When it comes to maintaining ecological and societal harmony, forests play a crucial role in the ecosystem. For a variety of reasons, forest fires pose the greatest threat to forests of this significance. The advent of satellite technology has made it possible to continuously monitor and suppress forest fires, which pose a significant hazard to humans and other living animals. When smoke is visible in the sky, it means that wildfires are burning in the forest. To prevent damages and other fire disasters with societal repercussions, fire detection is an essential component of fire alarm systems. It is crucial to predict the formation and behaviour characteristics of flames in order to battle forest fires, and accurate fire detection from visual situations is critical for avoiding large-scale fires. It is much easier to recognize the regions impacted by fires and their intensity using satellite photos acquired with improving technologies for this purpose. Learning based Remote Fire Detection (LBRFD) is a new deep learning method that has been developed to enhance fire detection accuracy. To test how well LBRFD works, it is cross-validated with the usual Convolutional Neural Network (CNN) model of learning. To train the satellite images to distinguish between fire and non-fire images, a new framework is created to define the framework's efficiency. Then, the region where the fire occurred in the satellite image is extracted using a local binary pattern, which decreases the number of false positives and this technique is called LBRFD.

Conferences > 2024 10th International Confe...

Generating an IOT Based Knowedgebase to Analyze The Microalgae Growth

Publisher: IEEE Cite This PDF

J Gayathri ; V Meenakshi ; C Malathi ; G Kanaga ; S Radhika ; V Vijeya Kaveri **All Authors**

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Autonomous Landing of Unmanned Aerial Vehicles: Hybrid Metaheuristic Aided Detection and Extended Kalman Filter for Localization

Published: 15 July 2024

Volume 137, pages 707–732, (2024) Cite this article

T. K. Mohamed Sameer & D. Susitra



A Study on AI-ML-Driven Optimizing Energy Distribution and Sustainable Agriculture for Environmental Conservation

J Barnabas Paul Glady, Sonia Maria D'Souza, A. Parvathi Priya, K. Amuthachenthiru, G. Vikram, S. Boopathi

Source Title: Harnessing High-Performance Computing and AI for Environmental Sustainability
Copyright: © 2024 | Pages: 27
DOI: 10.4018/979-8-3693-1794-5.ch001

OnDemand: (Individual Chapters) $37.50
Available
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Abstract

The chapter examines how machine learning (ML) and artificial intelligence (AI) could be used to solve environmental problems throughout the world. It emphasizes how crucial AI and ML are to optimizing energy distribution, including energy demand forecasting, improving smart grid performance, and incorporating renewable energy sources. The chapter also covers the use of AI and ML methods to sustainable agriculture, emphasizing predictive analytics for pest management, soil health monitoring, and precision farming. It highlights the effectiveness of resource use and encourages actions that are ecologically friendly. The chapter also covers ethical issues, societal ramifications, legal systems, and the synergies between energy and agricultural solutions. It imagines a day when advances led by AI and ML will be essential to a sustainable and environmentally balanced planet.

Chapter Preview

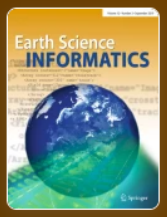
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Enhancing image processing performance with attention long short-term domain adversarial crossover orchard algorithm

RESEARCH | Published: 19 June 2024
(2024) Cite this article



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K. Venkatraman, A. Chandrasekar & S. Radhika

Access this article

Enhancing Dynamic Response and Zero Voltage Switching in Dual Active Bridge DC - DC Converters for Industrial Applications

Publisher: IEEE

Cite This PDF

Rameshbabu A ; Sundarrajan G T ; Barnabas Paul Glady J ; Pushpavalli M ; Sivachidambara... **All Authors**

Abstract:

This paper introduces a novel approach for incorporating a Dual Active Bridge (DAB) DC - to - DC converter into diverse industrial applications, aiming to attain a really effective DC - to - DC power conversion. Our study emphasizes the simulation and implementation of Sliding Mode Control (SMC) for the DAB DC - to - DC converter, with a focus on attaining zero voltage switching (ZVS) and enhancing dynamic response in voltage regulation. The DAB converter plays a crucial role in addressing environmental concerns and advocating the employing green energy sources, including wind and solar power. In contrast to conventional push-pull DC - to - DC converters, which are plagued by issues like hard switching, voltage spikes, and low efficiency, often necessitating the use of active clamp circuits, the DAB topology offers soft switching capabilities and galvanic isolation, resulting in significantly improved performance. Our paper thoroughly analyses the DAB DC - to - DC converter's behaviour under source disturbances using both open and closed-loop systems. To regulate the converter's output, we employ closed-loop control mechanisms using both Proportional-Integral (PI) and SMC controllers. We compare their performance using various voltage regulation indices, including steady - state error, rise, peak and settling times. The experimental findings from the SMC-controlled DAB DC - to - DC converter confirm the results obtained from simulations.

Design and Simulation of Battery Management System for Electric Vehicles

Publisher: IEEE Cite This PDF

G.T Sundar Rajan ; C. Bhuvaneswari ; V. Sivachidambaranathan ; A. Ramesh Babu ; J. Barna... **All Authors**

Abstract:

The Battery Management System (BMS) is a critical component in Electric Vehicles (EVs) that ensures the safe and optimal performance of the battery pack. Lead Acid Batteries state of Charge, Voltage, Current and the Charge capacity are Continuously Monitored by the system. The Proposed Work uses a Wireless Local Area Network. The total statistics Collected by the system are analyzed. The malfunction of the battery is monitored continuously and sudden charge & discharge voltage of battery bank and battery conditions are viewed with help of Internet of Things module. The temperature of the battery is continuously monitored and when it reaches the threshold, the battery output is suddenly cut off and a buzzer sound gives an alert. The entire work is simulated in Proteus and the software results are verified with Hardware Implementation.

Published in: 2024 International Conference on Recent Advances in Electrical, Electronics, Ubiquitous Communication, and Computational Intelligence (RAEEUCCI)

Concurrency and Computation
Practice and Experience

RESEARCH ARTICLE

WSO-T2FSM: War strategy optimization-based type-2 fuzzy-based starling murmuration for addressing the routing problem in mobile ad hoc network

E. Ahila Devi, A. Chandrasekar, S. Radhika

First published: 13 April 2023 | https://doi.org/10.1002/cpe.7684

Automatic Monitoring and Controlling of Wi-Fi Based Robotic Car

Publisher: IEEE

Cite This PDF

Shreyansh Singh ; Md Dilshad ; M. Pushpavalli ; P. Abirami ; M. Kavitha ; R. Harikrishnan **All Authors**

Abstract:

This project aims to design and implement a wifi based robotic car that can be monitored and controlled remotely using an Arduino NodeMCU, a camera, and various sensors. The car is equipped with a microcontroller (Arduino NodeMCU) that acts as the main control unit, a wifi module that provides connectivity to a remote device/computer, a camera for real-time image capture and analysis, and various sensors (such as ultrasonic, IR, etc.) for obstacle detection and avoidance. The remote device/computer can send commands to the car to control its movement and receive real-time data such as sensor readings, camera feed, etc. The project will demonstrate the capabilities of the combination of hardware and software components to create a fully functional, autonomous wifi based robotic car.

Published in: 2023 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI)

Quality of Service Factor based Unfailing Route Formation in Wireless Sensor Network

Publisher: IEEE Cite This PDF

S. Yuvarani ; A. Gayathri ; K.Jayasakthi Velmurugan ; V. Meenakshi ; S Sadhana ; C. Srinivas... **All Authors**

Abstract:
Nowadays, several analytical methods exist to make unfailing route formation. However, it is still challenging work because the wireless medium is unreliable. Sensor nodes are utilized for widespread distribution. Thus, security issues greatly affect wireless sensor networks (WSN). The Quality of Service Factor-based Unfailing Route (QFUR) Formation in WSN is introduced to solve these issues. In this approach, Quality of Service (QoS) factors like sensor node delay, packet drop, and residual energy is verified to determine whether the sensor node is normal. The value of the QoS factor is less than the threshold for that node to be a normal sensor node in the WSN. This approach is serious to notice and separate the compromised nodes from evading misinformation through the falsified data inserted by the opponent over compromised nodes. The Reinforcement Learning (RL) algorithm computes the reward value based on node energy utilization, hop count, dropped rate, and delay. The simulation outcomes demonstrate a lesser delay and lesser packet loss in the network. Furthermore, it improves the opponent node's detection and minimizes the false negative ratio in the WSN.

IoT Applications in Sports and Fitness: Enhancing Performance Monitoring and Training

Publisher: IEEE Cite This PDF

Ramakrishnan Raman ; Meenakshi Kaul ; R. Meenakshi ; S. Jayaprakash ; D. Rukmani Devi ;... **All Authors**

Conferences > 2023 Second International Con...

Real-Time Video Management System for Robotic Waste Sorting and Recycling Using IoT and Machine Learning

Publisher: IEEE Cite This PDF

Ramakrishnan Raman ; Chandrashekhar J Rawandale ; R. Meenakshi ; S. Jayaprakash ; R. ... All Authors

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Permutation feature importance-based fusion techniques for diabetes prediction

Focus | Published: 24 April 2023

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S. Nirmalraj, A. Santhi Mary Antony, P. Srideviponmalar, A. Sheryl Oliver, K. Jayasakthi Velmurugan, V. Elanangai & G. Nagarajan

Access this article

A Modified Three-Port DC-DC Converter with Improved Voltage Regulation for Electric Vehicles

Publisher: IEEE

Cite This PDF

C. Bhuvaneswari ; W. Abitha Memala ; M. Pushpavalli ; M. Kavitha **All Authors**

Abstract:
Electric Vehicles are booming nowadays because of their excellent performance compared to Fuel based Vehicles. A Modified three port DC-DC Converter has been presented for Electric Vehicles. The Proposed converter comprises Boost and SEPIC Converter which can be operated either by Photovoltaic Cell or Battery. The converter is simulated in an open loop and the ripple content is compared with the many other converter. The proposed converter outperforms the existing converter and is taken for further analysis in closed loop with source disturbance. Also, the time domain parameters have been compared in closed loop analysis. The Simulation analysis is given and it is validated with Hardware Implementation.

Published in: 2023 International Conference on Circuit Power and Computing Technologies (ICCPCT)

Creation of a Drowning Prevention System for Kids Learning in Pool using Computational Technology

Publisher: IEEE

Cite This PDF

M. Pushpavalli ; P. Abirami ; P. Sivagami ; M. Kavitha ; C. Bhuvaneswari ; W.Abitha Memala **All Authors**

Abstract:

Every year, several people drown at the deep end of swimming pools, including young kids, and the lifeguards are ill-prepared to handle these accidents. As a result, it becomes necessary to have a system that will recognize drowning victims and inform lifeguards through voice when such a risk exists. A surveillance system for the swimming pool has a specific function in keeping the area safe. The need for a method to stop newborn drowning is critical. The newborn drowning prevention system prototype was displayed. The project was created using the hardware and software of Android. Differential conductivity sensors are employed in this project to identify drowning incidents. At the earliest possible stage, in swimming pools. When youngsters drown in the swimming pool, their lives are saved. Convenience, cost savings, and a straightforward algorithm are advantages of the conductivity sensor-based demo system. This technology keeps an eye on crucial factors like an infant's movement and drowning state. This information is given to their parents via the GCM network. These important metrics can be measured, and a risky scenario can be communicated to the caregiver through an alarm triggering system to start the appropriate control measures.

Particle Swarm Optimization-Extreme Learning Machine Model Combined With the Gradient Boost Algorithm for Short-Term Wind Power Prediction

Publisher: IEEE

Cite This PDF

G. Ponkumar ; S. Jayaprakash ; P. Hemkumar **All Authors**

Abstract:

Accurate wind power assesses are fundamental to maximizing the use of wind power and defend a safe and reliable electricity grid. Gradient boosting algorithm with a limit learning machine optimized using particle swarm optimization (PSO-ELM), taking into account the inherent unpredictability and variability of wind power as well as the limitations of existing forecasting models. A Gradient Boost technique is then used to generate a large number of PSO-ELM weak predictors. Input weights and thresholds of each weak predictor, which each includes a unique hidden layer node. The results from each weak predictor are combined and weighed to get the final forecast result using a robust wind power forecast model. We use measured data from Turkish wind turbines to verify the efficacy of our suggested strategy. The findings demonstrate that the Gradient-PSO-ELM wind power prediction model has improved generalizability and accuracy than the Random forest.

Hybrid Grid Charging Station for Electric Vehicle Using IoT

Publisher: IEEE Cite This PDF

G.T Sundar Rajan ; V. Sivachidambaranathan ; A. Ramesh Babu ; A Santhi Mary Antony ; J. B... **All Authors**

2 Cites in Papers

76 Full Text Views

Abstract

Document Sections

I. Introduction

Abstract:

To increase the reliability of supply and focusing the remote area, Hybrid grid charging stations are used in electric vehicle (EV). The hybrid grid charging station using a boost converter with PV array is designed. This method is helpful for transportation systems. This method delivers the power to electric vehicle in a smart way and different tariff rates.

Photovoltaic System based Interleaved Converter for Grid System

Publisher: IEEE Cite This PDF

Kavitha M ; Jones Nirmal L ; Jenin Prabhu R ; Srinivasan P **All Authors**

Communication Device for Converting Text to Braille language for Visually Impaired People

Publisher: IEEE

Cite This PDF

M. Kavitha ; V. Meenakshi ; M. Pushpavalli ; S Amudha ; S Bharathi ; P Pavithra **All Authors**

Abstract:

The primary goal of this paper is to offer a comprehensive solution to the various communication issues that visually impaired people face daily. Technologies are constantly evolving, particularly in the area of contact via mobile phones, which is essential. The only part of the message application that the visually impaired can view is the tactile surface of the display. However, the system's quality is poor because blind people are unable to clearly recognize the text. As of now, impaired people can only use Braille technology for reading. By employing this Braille system, the proposed method makes it feasible for people who are blind to read messages and respond to them. Blind persons can use the mobile messaging programme in the same way as other users. For responding back a keypad is used, where the reply message is sent one-by-one by pressing each key. With the keypad options, the user is able to send information through GSM module a message.

Enhanced Electrical Wheel Chair based on Eye Blinking control

Publisher: IEEE Cite This PDF

Ch. Venkat Chowdary ; M. Madhusudan Rao ; S. Radhika ; V. Meenakshi **All Authors**

Abstract:

Wheelchair is an inevitable requirement for seriously impeded individuals to enable navigation. Driving a wheelchair is a drawn-out task for seriously incapacitated people, except if they utilize the tongue to control the joystick. All the while, visually impaired and paraplegic individuals manage two issues, which cause uncomfortable circumstance for them, i.e., headway and confinement. Various frameworks are being created to defeat the issues depicted above, permitting the end-client to perform safe developments and achieve some day to day existence of significant assignments. Our Automated wheelchair utilizes eye squint and head slant development to control the wheelchair. Likewise, we can give more freedom to the impaired individual by utilizing a similar head slant development to speak with the gadgets in a space for instance: a fan. This correspondence is finished utilizing a RF transmitter and beneficiary. Utilizing this, the individual have some control over different gadgets without any problem.

A New MPPT Controlling Mechanism based on Adaptive Mongoose Optimization (MO) Algorithm for Grid-PV Systems

Publisher: IEEE Cite This PDF

S. Marlin ; S. D. Sundarsingh Jebaseelan **All Authors**

30

T-Type Three Phase Inverter with Grid Connected System used in Renewable Energy Resources

Publisher: IEEE Cite This PDF

V. Meenakshi ; M. Kavitha ; A.Santhi Mary Antony ; V.Vijeya Kaveri ; S. Radhika ; D.Godwin I... **All Authors**

Abstract:

To improve the dynamic time response of the grid-connected boost converter and T-type three-phase inverters, this study reviews various models and simulates T-type three-phase inverters using closed loop and open loop systems connected to the grid. A common device in the power quality device family is the active filter. Voltage Source Inverters (VSIs) are used to build the active filter, while sliding mode controllers are used to produce the switching pulses. The active filter is employed to reduce the harmonic current. In order to determine the impact of an active filter using PID and SMC, the simulation results are shown. The simulation outcomes with a coupled system based on PID and hysteresis controllers are compared, together with the corresponding time-domain parameters and lowered voltage and current harmonics are presented. The results show that the Sliding Mode Controller (SMC) system has delivered superior response than PID controlled system.

New Topology of a Single DC source Nine-level Asymmetrical Multilevel Inverter for DC-AC Conversion

Publisher: IEEE Cite This PDF

Siva Asapu ; D. Susitra **All Authors**

Smart Meter Based on FPGA for Battery Monitoring

Publisher: IEEE Cite This PDF

L. Jenifer ; S. Radhika **All Authors**

Abstract:
Battery management system analysis and design for mobile device battery monitoring is a revolutionary approach that incorporates the capability the battery which contains the battery management system into the mobile devices and this paper mainly focused on monitoring the BMS using smart meter based FPGA in cellphone and it contains four components. (i) smart charging (ii) balancing the battery (iii) discharging (iv) performing the operation in safe manner. A charging algorithm is given that the features is combined the pulse charging and multistage charging for charging the lithium ion battery pack Charging circuit of current control to be achieved with high loop near stability the proportional integral control technique is provided. The simulation result is demonstrated for smart charging and the capacity of battery is determined. The performance is based on the evaluation of monitoring in various temperature and its characteristics, pulse performance, peukert equation and the cells expected operating life span is measured.

Elevating Security in Wireless Sensor Networks using ECC and AES Cryptographic Techniques

Publisher: IEEE Cite This PDF

D. S. Dayana ; R. Pandian ; A. Ramesh Babu ; S. Nirmalraj ; S. D. Sundarsingh Jebaseelan ; ... **All Authors**

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Graph Signal Estimation Based on Maximum Correntropy Criterion (The Work of A. Chandrasekar Was Supported by the MATRICS, SERB, India, Under Grant MTR/2021/000405)

Publisher: IEEE Cite This PDF

A. Chandrasekar ; S. Radhika **All Authors**

52 Full

Crypto Analysis with Modified Diffie–Hellman Key Exchange based Sensor Node Security Improvement in Wireless Sensor Networks

Publisher: IEEE Cite This PDF

J. Rangarajan ; K Suriyakrishnaan ; V. Meenakshi ; M. Tholkapiyan **All Authors**

e-Prime - Advances in Electrical Engineering, Electronics and Energy
Volume 5, September 2023, 100219

Design and implementation of a cost-efficient clamping capacitor boost converter for a hybrid renewable energy system for increased gain to fulfil demands

KMD Riyaz Ali [a], W. Abitha Memala [b]

Automatic Fertilized Vertical Irrigation Control and Management System

Publisher: IEEE Cite This PDF

Lalitha Sree Machavarapu ; Iswarya S ; Radhika S ; V. Meenakshi **All Authors**

Abstract:

Destiny agricultural generation, known as "agriculture four.0," is product of a number of important allowing technologies. Agriculture is an essential issue of every country's development, and it frequently requires the right quantity of fertilization, irrigation, and seasoning to provide an enough quantity of food goods. Fertilization systems have demonstrated effective in promoting plant increase, development, and large-yield crop manufacturing. The reason of this undertaking is to layout an automatic fertilized vertical irrigation management and control system for the improvement of soil vitamins and porosity via the timely application of fertilizer and water tiers needed to sell plant improvement. This automatic vertical farming system using sensors effectively assesses the requirements of plants and it detects the moisture content material and fertilizer content material in the soil. Thus the plants are provided with the required minerals and water so as to get greater yield together with reduction in time and cost.

ology

Enhanced Wireless Sensor Network Localization using Modified Firefly Optimization algorithm

Publisher: IEEE Cite This PDF

S D Sundarsingh Jebaseelan ; D Godwin Immanuel ; A Ramesh Babu ; N. Chidambararaj ; S ... **All Authors**

Title

Development of Energy Management System for Micro Grid Operation.

Authors

Jayaprakash, S.; Gopi, B.; Raj, Murugananth Gopal; Sujith, S.; Deepa, S.; Swapna, S.

ELSEVIER

Environmental Research

Volume 232, 1 September 2023, 116300



Impact of the combined effect of seawater exposure with wastewater and Fe_2O_3 nanoparticles on *Chlorella vulgaris* microalgae growth, lipid content, biochar, and bio-oil production

Suiyi Li [a], V. Meenakshi [f], S. Nithya [b] ✉, Sulaiman Ali Alharbi [c], Saleh H. Salmen [c], Rajasree Shanmuganathan [d], Li Zhang [a], Changlei Xia [a] ✉

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Intelligent Power Control Models for the IOT Wearable Devices in BAN Networks

Publisher: IEEE Cite This PDF

Arul P ; M. Meenakumari ; Saravanan. L ; Revathi N ; S Jayaprakash ; Subbiah Murugan **All Authors**

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An optimal model for enhancing network lifetime and cluster head selection using hybrid snake whale optimization

Published: 27 June 2023

Volume 16, pages 1959–1974, (2023) Cite this article

Duraimurugan Samiayya, S. Radhika & Chandrasekar A.

Grasshopper Optimized Artificial Neural Network For Robust Demand Side Management In Smart Grid

Publisher: IEEE

Cite This PDF

S. Sivarajan ; S. D. Sundarsingh Jebaseelan **All Authors**

Abstract:

Supplying electricity that is safe and dependable is crucial to the nation's security, economy, and healthcare. The smart grid, which revolutionizes the way electricity is produced, distributed, monitored, and controlled, integrates communication technology and sensors into power structures. There are a number of challenges that must be resolved before smart grid can truly be applied. The safety of the smart grid is a significant and stimulating job. This paper offers a recommendation for a secure demand-side management (DSM) engine for an Internet of Things (IoT)-enabled grid. The intended DSM sequence is in charge of upholding use of electricity that is as effective as feasible in accordance with objectives. The smart grid incursions are managed using a unique resilience design. The robust computer anticipates fraudulent individuals by the ML classification. Progressive vigor organization and connection regulatory managers are suggested to procedure power expertise and optimize power operation. The recommended strategy's success is assessed using the efficient simulate. The results of the investigation demonstrate that the suggested DSM engines is sufficiently effective to decrease the power consumption of the smart grid and less prone to intrusion.

Concurrency and Computation
Practice and Experience

RESEARCH ARTICLE

Hybrid support vector machine and K-nearest neighbor-based software testing for educational assistant

Lilly Ramesh, S. Radhika, S. Jothi

First published: 21 November 2022 | https://doi.org/10.1002/cpe.7433

Women Safety Night Patrolling IoT Robot

Publisher: IEEE

Cite This PDF

R. Mahalakshmi ; M. Kavitha ; B. Gopi ; S.Mohan Kumar **All Authors**

Abstract:

Ladies secuiity has emerged as one of the most important needs in our nation, taking into account what is happening in the metro metropolitan neighborhoods and other big urban locations. A simple safety gadget that aids victims in the event of unforeseen danger is essential in this era of cutting$\rightarrow$dge technology and smart devices. This study provides a detailed description of the design and implementation of a prototype for an electronic device that could, in the future, function as a safety wear. These days many women, young girls & mothers are seen vanishing from public spaces, streets, and public transit and they face physical and sexual abuse. Most lawsuits are routinely lodged on issues like abduction, intimidation, or assaults and these crimes are nsing day by day. To stop these crimes, an embedded system-based Women Safety Night Patrolling IoT Ro bot is designed for street surveillanoe to monitor a live update to the control room during nighttime. This also comes with a unique alarm feature that gets triggered when it receives an abnormal level of sound from the environment (these things don't happen quite usually). This night patrolling robot notifies society's people whenever a woman shouts for rescue. This prototype is predefined to patrol the street at night time. Two robots are installed for a road, and the primary purpose of this project is to ensure publicsafety in emergencies.

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Optimization of Energy and Security in Mobile Sensor Network Using Classification Based Signal Processing in Heterogeneous Network

Published: 17 August 2021

Volume 95, pages 153–160, (2023) Cite this article

S. Ramesh, S. Nirmalraj, S. Murugan, R. Manikandan & Fadi Al-Turjman

Interfacing a Flying Robot with OpenCV

Publisher: IEEE

Cite This PDF

P. Abirami ; K. R. Shanmuga Vadivu ; R. Hannah Lalitha ; M. Pushpavalli ; P. Sivagami ; R. Ha... **All Authors**

Abstract:

This research work is carried out to satisfy the requirements of developing industries. As per our today's requirements, safety plays a vital role in all industries. Also, a cost-effective system is required to maintain safety around our workplaces. By considering all the factors in mind, a flying robot system is made to instruct the employees to safeguard themselves by identifying near misses in the industries. The main aim of the work is to design a flying robot system with a camera to identify persons without safety equipment. So, every half an hour the images will be automatically captured by the surveillance drone and sent to the ground station which is operated by the OpenCV library for tracking objects like monitoring the crowd, detecting fire, and near misses to safeguard the employees from accidents. Here, a functional prototype is developed to achieve the goals and implement it in industrial applications.

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Closed-Loop Analysis of Multi-input KY Boost Converter Applying Fuzzy Logic Controller

Conference paper | First Online: 22 October 2022

pp 447–459 | Cite this conference paper

M. Pushpavalli, N. M. Jothi Swaroopan, R. Harikrishnan, P. Abirami, P. Sivagami, V. Geetha & M. Kavitha

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Kakuro Grid for Improving Photovoltaic Modules using Optimal Partial Shading

Publisher: IEEE Cite This PDF

Tulasi Rama Palleswari Yalla ; D. Susitra All Authors

Hybrid Energy Sources using Current Fed Inverter for High Gain in Single Phase to AC Loads

Publisher: IEEE Cite This PDF

Sekar K ; Jayaprakash S ; Hemalatha M ; Raja R **All Authors**

Abstract:

This article presents the hybrid Renewable Energy Sources (RES) like wind and Fuel Cell (FC) stack used for more efficiency and utilized the current fed inverter. The proposed system has two sources: a current-fed inverter (CFI) and a Proportional Integral (PI) controller controlling the switch. The main objective of the suggested inverter is to provide high voltage gain by two renewable energy sources and produce high voltage for AC loads. Two essential characteristics can achieve this CFI: switching boost inverter and impedance source. Further, the harmonics of the proposed system can be controlled by an LC filter employed nearer to the AC loads. The proposed method is validated by using MATLAB/Simulink software and analyzed through the Simulink waveforms. This THD indicates that the system is executing correctly, and IEEE standards limit THD to 5%. The method with enhanced performance analysis within the range is designed.

Power Quality Enhancement using Dynamic Voltage Restorer in Distributed Networks

Publisher: IEEE Cite This PDF

R. Raja ; L. Jones Nirmal ; P. K. Mani ; M. Kavitha **All Authors**


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Backdoor Attacks Prediction in IIoT Network using Optimal Double Mask Region Convolution Model

Nalini Subramanian, S. Nikkath Bushra, G. Shobana & S. Radhika

Published online: 06 Feb 2024

Cite this article https://doi.org/10.1080/03772063.2023.2230174 CrossMark Logo

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Acoustic Feedback Cancellation using the Variable Step Size Affine Projection Tanh Algorithm

Publisher: IEEE

Cite This PDF

Felix Albu ; Linh Tran ; S. Radhika ; A. Chandrasekar **All Authors**

Abstract:

In this paper, a new algorithm is proposed for the acoustic feedback cancellation for hearing aids. It is based on the affine projection tanh algorithm, combined with a modified practical variable step size and frequency shifting. A modified soft clipping stability detector that controls both the variable step sizes and the frequency shifting is used. It is shown that the proposed variable step size approach that considers the tanh nonlinearities applied to both the preprocessed error signal with the pre-whitening filter and the error signal is beneficial for faster recovery from howling. Dichotomous coordinate descent iterations reduce the numerical complexity of the algorithm. Our experiments indicate that the proposed algorithm outperforms competing methods for incoming speech and music signals.

Comparing the Performance Measures of Underwater Image Enhancement Through Improved CNN With Gaussian and Kalman Filter Method

Publisher: IEEE Cite This PDF

V. Rajesh ; S. Radhika ; S. Vishnu **All Authors**

Hybrid Energy Source Based Landsman Converter for AC/DC Microgrid

Publisher: IEEE Cite This PDF

M. Kavitha ; A. Santhi Mary Antony ; M. Pushpavalli ; V. Meenakshi ; Gunal N ; Logeshwaran J **All Authors**

Abstract:

The main objective of this study is to compare the SEPIC converter, which has a poor dynamic output voltage and more ripple content, with the proposed LANDSMAN converter, which has a better dynamic output voltage and less ripple content. The latter system has multiple reverse conversions in a single ac or dc grid. Furthermore, these two converters operations are compared for a resistive load by using MATLAB/Simulink and result is presented and also the operation of LANDSMAN converter with and without PI controller is simulated using MATLAB/Simulink. The proposed system has the potential to be implemented in various micro-grid applications, including rural electrification, remote area power supply, and emergency backup power systems. The hardware implementation of the Landsman converter using a hybrid energy source for AC/DC grid has been carried out.

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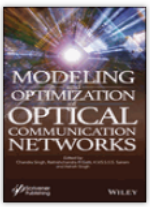
Chapter 1

Investigation on Optical Sensors for Heart Rate Monitoring

V. Vijeya Kaveri, V. Meenakshi, N. Kousika, A. Pushpalatha

Book Editor(s):Chandra Singh, Rathishchandra R. Gatti, K.V.S.S.S.S. Sairam, Ashish Singh

First published: 27 October 2023 | https://doi.org/10.1002/9781119839569.ch1



Modeling and Optimization of Optical Communication Networks

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RETRACTED ARTICLE: Performance evaluation of half bridge AC–AC resonant converter by using various load in domestic purpose of induction heating application

Original Research | Published: 26 July 2020

Volume 12, pages 7085–7093, (2021) Cite this article

V. Geetha & V. Sivachidambaranathan

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IoT-Based Magnetic Field Strength Monitoring for Industrial Applications

Publisher: IEEE Cite This PDF

Ramakrishnan Raman ; Meenakshi Kaul ; R. Meenakshi ; S. Jayaprakash ; Ramya. R ; C. Sri... **All Authors**

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An energy-efficient MANET relay node selection and routing using a fuzzy-based analytic hierarchy process

Published: 15 May 2023

Volume 83, pages 209–226, (2023) Cite this article

E. Ahila Devi ✉, S. Radhika & A. Chandrasekar

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Implementation of Multi-input (MI) KY Boost Converter for Hybrid Renewable Energy System

Conference paper | First Online: 02 July 2023

pp 757–773 | Cite this conference paper

M. Pushpavalli, R. Harikrishnan, P. Abirami & P. Sivagami

javascript:;

b

Evolution of Electric Vehicle-A Review

Publisher: IEEE

Cite This

PDF

R Harikrishnan ; P Sivagami ; M Pushpavalli ; G Rajesh ; P Abirami ; Mohan Ram **All Authors**

2
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330
Full
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Abstract

Document
Sections

I. Introduction

II. Types of Electric
Vehicles

III. Electric Motors

Abstract:
One of the sectors which play a vital role in causing air pollution is transport sector. The air pollution results in change in climate due to emission of greenhouse gases. Mostly urban regions contiibute to more emissions. The global warming has made us to look ahead towards electrification in road transport. Electrification of vehicles replace the internal combustion engines with motors driven by electrical energy. Electric vehicle implies to be promising step towards confronting urban sustainability. Electric mobility technology has a exponential growth, therefore it becomes essential to increase the study about the changes.

Proof

17 Influence of Lorentz Force on Cu-Water Nanoliquid Convective Thermal Transfer in a Porous Lid-Driven Cavity with Uniform and Linearly Heated Boundaries

L. Jino, A. Vanav Kumar, M. Berlin, Swapnali Doley, G. Saravanakumar, Ashwin Jacob, and H. A. Kumara Swamy

17.1 INTRODUCTION

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The exploration of the fluid flow in a porous matrix has various applications, such as chemical catalytic reactors, solidification of castings, crystal growth, drying of porous solids, dispersion of chemical contaminants, separation process in chemical industries, etc. The detailed pieces of information about the liquid flow in porous media are explored in some works of the literature [1–5]. Djebali et al. [6] focused on the fluid dynamics of a boundary layer during free convection over a heated plate. The significance of nanofluid motion in the medium of porous and its utilization is reviewed by Khanafer and Vafai [7]. The application of nanofluid in daily needs has increased due to its abnormal increase in thermal conductivity. Suspended nanoparticles and their properties play a pivotal role in the heat transfer advancement of nanofluids [8–11]. For instance, Sankar et al. [12,13] analyzed the energy transfer with the help of entropy generation plots for a convective nanofluid (alumina-based) flow within the annulus. It is noted that fluid friction irreversibility dominates for Rayleigh number above 10^5 during convection flow. Pushpa et al. [14] investigated the Cu-water nanofluid flow within a partially separated (using a thin baffle plate) annulus under buoyant convection and heat dissipation. It is found that heat transfer by water is more at a lower Rayleigh number and heat transfer by Cu-water nanofluid is more at a higher Rayleigh number.

Mahapatra et al. [15] discussed the buoyancy ratio effects with constant heat and non-uniform heat boundaries in an LDC under natural convection. Mahmoodi et al. [16] entertained the nanofluids, such as Al2O3/TiO2/CuO/Cu-water, to flow within a cavity due to free convection. It is noted that the heat transfer rate is higher in the case of using Cu-water nanofluid as a running fluid. Also, Ghalambaz et al. [17] addressed the natural convective effect in Ag-MgO-water-filled cavity. An augmentation in heat transfer is carried by conduction during the quantification of hybrid nanofluid at lower Rayleigh numbers, and convection is dominated for higher values of Rayleigh number. Sivasankaran et al. [18] did an investigation of heat transfer due to sinusoidally varying temperature boundary conditions under mixed convective MHD fluid flow in the LDC. Their study concluded that diminishing heat transfer takes place with advancing Hartmann and Richardson numbers. Studies relating to the magnetic field over the motion of fluid inside LDC were done by Kefayati

Proof

DOI: 10.1201/9781003299608-17

Chapter 6
Print ISBN: 978-81-19102-71-6, eBook ISBN: 978-81-19102-73-0

Design and Development of Autofeed Pneumatic Punching and Riveting Machine for New Age Industry

G. Arunkumar [a++*], J. Tison Antonio [a] and Velayutham Pon [a]

DOI: 10.9734/bpi/rader/v1/5530A

ABSTRACT

Sheet metals are more significant in automotive industry. However, sheet metals can't be straight away utilized, Operations like punching, blanking, twisting, and riveting are should be done on the sheet metal to make the required shape and size. New Age Industries like Automotive and Aerospace and Fabrication Industries, these manufacturing operations are mandatory. Mostly the industries involved in Fabrication works utilize these type of automatic machines. Generally small and medium scale enterprises utilize manual machines for sheet metal operations. Automatic machines required compressed air pressure 6 bar to work. The compressed air send through the cylinders to the chamber powered the cylinder out which thus incites the cylinder down. This empower the machine manufactures utilize various kinds of pneumatic cylinder, Values to perform various tasks. The compressed air flows to the lower part of the chamber which incites the cylinder upwards after completion of punching or riveting in the sheet metal. As a result, the metal is released from the tool and the following punch or rivet measure is made available. The pressing factor can be changed depending on the working material. This empowers the machine developers to utilize various kinds of punch or rivet apparatus which helps in bringing about a wide variety of automotive products.

Keywords: Sheet metal; autofeed; pneumatic punching; riveting machine; new age industries; setting time and operating time.

1. INTRODUCTION

In the manufacturing industry, punching or riveting is done with a press. The press is a traditional machine that is used to punch or rivet metal sheets. The required dimensions of the punch or rivet are completed using the press. And presses are used for mass production, which is the most efficient and quickest

[a] *Department of Mechanical Engineering, Sathyabama Institute of Science and Technology, Chennai, Tamil Nadu, India.*
[++] *Professor and Head;*
**Corresponding author: E-mail: garun55@gmail.com;*

School of Building and Environment
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3.4.6 Books and Book chapters published and papers presented in conferences – 2023-2024

S.No.	Name of the teacher	Title of the book/chapters published/Papers in Conferences	Title of the Paper
1.	Aparna K V.Sampathkumar	MAHSA International Sustainable Infrastructure Technology and Environment	Sustainable Urban Transport & Challenges for Hyderabad City
2.	Sampathkumar V Vanjinathan J	MAHSA International Sustainable Infrastructure Technology and Environment	Effectiveness of Bitumen with Thermocol Glue
3.	Nirmala R, Priyadharshini B Srinivasa Reddy M	MAHSA International Sustainable Infrastructure Technology and Environment	Effect of Ground Granulated Blast Furnace Slag (GGBS) Reinforced with Basalt Fibre to Analyse the Mechanical and Microstructural Properties of High Strength Concrete
4.	Priyadharshini B, Nirmala R Agalya S	MAHSA International Sustainable Infrastructure Technology and Environment	Performance Enhancement of Glass Fiber Reinforced Polymer Concrete Beams with Hooked End Steel Fiber
5.	S.Packialakshmi	2023 Third Global Conference on Recent Advances in Sustainable Materials (GC-RASM 2023)	Fabrication and application of cost-effective activated carbon in removing hexavalent chromium metal
6.	Aruna rani V.Sampathkumar	Recent Development in Multidisciplinary Science and Technological Fields	Emerging Technologies in automotive and mechanical sciences
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9.	R.Padmapriya A.JohnBosco	Sixth International conference on "Bioenergy, Environment & Sustainable Technologies	Study on Steel Fibre Reinforced Fly Ash (Class-

			F) Based Alkali Activated Geo-Polymer Concrete
10.	R.Padmapriya	Lecture notes in Civil Engineering	Feasibility Assessment on Electronic Waste (EW) as a Partial Reduction for Coarse Aggregate (CA) in Concrete
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14.	Nagamani Mohammad Suhail Meer Baskaran Anuradhha C Bhuvaneswari S Packialakshmi	International Conference on Data Science, Agents & Artificial Intelligence (ICDSAAI), IEEE Publisher, Pp 1-8	Identification of Groundwater Potential Zones Using Machine Learning Algorithms and Geospatial Techniques
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30.	Raji V R Packialakshmi	International Conference on Core Engineering and Technology, ICCET-2024 organized by the PERI Institute of Science and Technology Chennai, Tamil Nadu, India during	Water Melon Seed as a Potential Coagulant in Waste Water Purification
31.	Firdows M D Packialakshmi	International Conference on Core Engineering and Technology, ICCET-2024 organized by the PERI Institute of Science and Technology Chennai, Tamil Nadu, India during	Performance Evaluation of Fiber Reinforced Concrete (FRC) with Glass Fiber Reninforcement (GFRP) Rebars in Reinforced Concrete under the Marine Environment
32.	Firdows M D Packialakshmi	4th MAHSA International Sustainable Infrastructure Technology &Environment Conference 2024 organized MAHSA University Malaysia	Durability and Serviceability Assessment of GFRP rebars with Fiber Reinforced Concrete in an Aggressive Exposure Conditions

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in 6th International Conference on Bioenergy, Environment and Sustainable Technologies held during 18-20 October 2023 at Arunai Engineering College, Tiruvannamalai, Tamilnadu, India.

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Feasibility Assessment on Electronic Waste (EW) as a Partial Reduction for Coarse Aggregate (CA) in Concrete

Conference paper | First Online: 21 November 2023

pp 591–597 | Cite this conference paper

R. Padmapriya, J. S. Sudarsan, N. Sunmathi & Srihari Vedartham

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Abstract

Electronic waste consists of wrecked or undesirable substances with heavy metals that includes processers, electrical and electronic gadgets, and other microelectronic items rejected by their original users. The recycling of electronic waste becomes necessary because of it is available in huge quantities. Aluminium, bronze, gold, silver, resins, and ferrous metals are just a few of the valuable, reusable materials that can be found in waste that has been discarded. All across the world, discarded waste disposal is a routine occurrence. The usage of discarded waste materials is only a piece of the puzzle when it

CLIMATE INDUCED URBANIZATION IMPACT ON URBAN FLOOD HAZARD USING GIS AND REMOTE SENSING

Abstract

Flooding is one of the most common natural disasters that afflict people all over the world. It is a serious natural hazard in Velachery that arises every year. Floods in Velachery are distinguished for their unusually huge volume, widespread devastation, and frequency. Velachery suffers from a flood generated by Velachery Lake. The primary cause of flood in that area is the topographic condition, accelerated rate of deforestation, high intensity of rainfall, explosive increase of people, large amount of land use, and so on. Despite the fact that it is an age-old phenomenon in the Velachery lake, the level of destruction inflicted by the flood has expanded dramatically in recent years. It caused massive devastation and irreversible harm to the local inhabitants. It has a negative impact on human life and property, transportation and communication, and so on, resulting in massive economic losses each year. This article discusses the state's considerable economic losses as a result of flooding.

Floods are uncontrollable natural disasters that cause loss of life and property destruction. Flood water must be controlled so that it can be used for a variety of purposes. Remote sensing and GIS (Geographic Information System) techniques can be used to estimate the area and depth of flooding. This study will concentrate on the issue of field investigation in conjunction with GIS to recreate a flood event in order to estimate the flood volume and extent. According to field investigations, the Velachery neighbourhood of Chennai, India, is prone to catastrophic flooding. Through field inquiry in the Velachery area, this study

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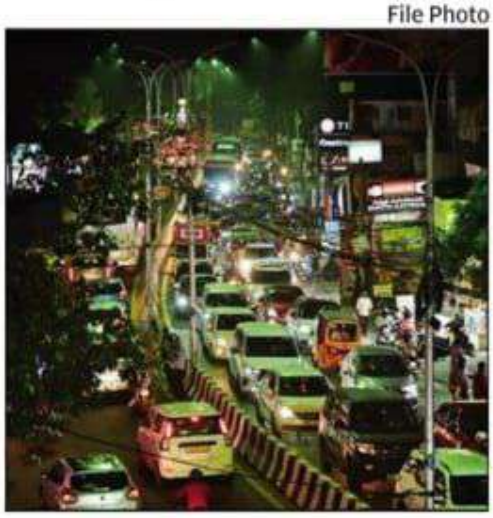
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Highways mulls elevated corridor on ECR; tenders for study called

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File Photo



STUDY TO BE READY BY JUNE

Chennai: The state govt is going to carry out a feasibility study to build a 14.6km-long, four-lane, elevated corridor from Thiruvanmiyur to Uthandi along the ECR. The study, which will be done at a cost of ₹52lakh, will be ready in June. The project was announced in the recent state budget.

More than a lakh vehicles ply between the Thiruvanmiyur and Uthandi on ECR, according to highways department data. The technical study will measure vehicle density, two-way traffic, traffic branching off from ECR and identify locations to provide down ramps along the proposed corridor. The department is planning a down-ramp at Akkarai junction.

"Since Akkarai is a major junction, where Kalaignar Karunanidhi Salai links OMR and ECR, the study will measure the traffic patterns and number of vehicles going to Uthandi or turn right to OMR," said a highways department official.

The corridor is proposed to start at LB Road-junction towards ECR. There was an earlier proposal to build an elevated corridor from Tidel Park junction, which never took off. "It was not feasible because of the elevated Thiruvanmiyur MRTS line," he added.

"But without expanding ECR at Thiruvanmiyur, they should not proceed with the elevated corridor. There are encroachments, and the road has narrowed," said Jayanthi P, an activist from Valmiki Nagar in Thiruvanmiyur. "The pillars of the elevated corridor will choke Thiruvanmiyur further."

"The expressway must not have multiple down ramps as it defeats the purpose," said Sampath Kumar, professor at the school of building and environment at Sathyabama Institute of Science and Technology.

The highways department has been widening ECR from four lanes to six lanes for almost two decades but only 75% of the Rs1,099 crore work is complete. They are yet to complete expansion at Injambakkam and are yet to start acquiring land in Thiruvanmiyur, as per 2023 data.

7

A Review on Prospects of with Nanomaterials in the Removal of Heavy Metals

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1. Introduction

Any metallic chemical element that is dangerous or poisonous at low concentrations and has a comparatively high density is referred to as a heavy metal. Mercury (Hg), cadmium (Cd), arsenic (As), chromium (Cr), thallium (Tl), and lead (Pb) are a few examples of heavy metals.

Some heavy metals display adverse health effects on living organisms and ecosystems when the concentration in the environment exceeds prescribed limit. They bioaccumulate in the food chain and end up in wastewater, calling for advanced techniques of remediation. Here, we review recently developed nanomaterials used to remove heavy metals in wastewater, with focus on synthesis, removal mechanisms and kinetics. Nanomaterial-based adsorbents include zero-valent, carbon-based nanomaterials and nanocomposites. Nanomaterial synthesis is done by co-precipitation, sol–gel, spinning, chemical vapour deposition, pyrolysis and sputtering. Removal mechanisms include chemical precipitation, adsorption, ion exchange, coagulation and membrane filtration.

2. Reasons behind the Significant Usage of Nanomaterials in Adsorption

Nano materials have gained significant attention in the field of adsorption due to their unique properties and high surface area-to-volume ratio, which make them highly effective for adsorbing various substances. Adsorption is the process where molecules or particles adhere to the surface of a solid material. Nanostructured materials offer several advantages for adsorption applications such as High Surface Area,Tailored Properties, Rapid Adsorption Kinetics and Regeneration.

Nano materials possess a large surface area per unit mass or volume, providing more active sites for adsorption compared to bulk materials. This characteristic enhances their adsorption capacity for gases, liquids, or contaminants. The properties of nano materials can be tailored or modified to optimize adsorption by adjusting their size, shape, surface chemistry, and pore structure. This tunability allows for selective adsorption of specific molecules or contaminants. Nanostructured materials often exhibit faster adsorption kinetics due to their smaller size and higher surface reactivity, leading to quicker removal of contaminants from the solution.

Identification of Groundwater Potential Zones Using Machine Learning Algorithms and Geospatial Techniques

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***Abstract*-In contemporary times, groundwater has emerged as the predominant source of irrigation in India, alongside serving as the principal provider of potable water in several regions. The rise in population has led to a surge in water consumption, thus leading to a decline in groundwater levels. Groundwater plays a pivotal role as a vital source that contributes significantly to the annual water supply. This research investigates various approaches to identify potential groundwater zones by employing geographic information systems (GIS) and remote sensing, while also including machine learning techniques. These methodologies provide a reliable means to map areas with high groundwater potential. The mapping of groundwater zones encompasses a wide spectrum of procedural variations. To effectively manage groundwater zones, it is imperative to consider multiple criteria, encompassing soil characteristics, drainage density, land utilization, precipitation patterns, land cover types, slope gradients, geological composition, geomorphological features, and contour variations. This paper examines the approaches employed in groundwater mapping, with a particular focus on the utilization of satellite remote sensing and other relevant data sources in the development of these methodologies. These tactics employ a combination of traditional and innovative approaches. Thematic layers are employed for the objectives of analyzing, mapping, and identifying groundwater potential. The evaluation of the significance and magnitude of each thematic layer is conducted in connection to the geographical location, zones of possible groundwater availability, and prevailing groundwater conditions. Maps of groundwater potential zones were generated by the use of machine learning algorithms. These maps were then classified into five distinct categories, which are as follows: very low, low, moderate, high, and very high.**

Keywords: Groundwater,recharge,psendo graphs, semi-arid, resistivity.

I. Introduction

Groundwater has served as the principal water source for numerous tropical regions over an extended period of time. The extraction of groundwater is not only a straightforward process, but it also benefits from a natural protection against the risks of pollution that surface water is susceptible to. Conversely, instances of over utilization of groundwater resources are quite infrequent. Due to a lack of comprehensive knowledge of the underlying principles of groundwater, the optimal utilization of available groundwater resources remains elusive. The management of groundwater is assuming a progressively vital function as a direct outcome of this situation. Groundwater recharge refers to the phenomenon in which water infiltrates from the unsaturated zone into the saturated zone, namely below the water table level. This infiltration leads to the subsequent flow of water, which is commonly referred to as groundwater flow. The restoration of the groundwater table to its initial level occurs through the infiltration of water into the saturated zone, followed by subsequent flow above the groundwater level. Recent research has indicated that the application of geographic information systems (GIS) and remote sensing methodologies can efficiently and economically generate valuable data pertaining to geomorphology, geology, land use, land cover, slope, lineament density, and other relevant variables. These data play a crucial role in identifying regions with potential for groundwater recharge. The provided data can be utilized to identify regions that exhibit the highest capacity for groundwater replenishment. In the context of decision-making pertaining to groundwater mapping, organization, and management with the goal of

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Chapter

Flexural Behaviour of Corrugated Web Beams Using Cold-Formed Steel Sections

December 2023
DOI: 10.1007/978-981-99-6175-7_24
In book: Emerging Trends in Composite Structures

Manoj Kumaar C. · S. T. Dhaarini · S. Rithish · A. Thirunavukarasu

Abstract

Cold-formed steel (CFS) is one of the most used materials in light weight steel structures in the past decade. Often, the structural requirements of beams in terms of shear resistance are compromised and still research innovations are carried out for better configurations for beams. One of the innovative solutions for strengthening the shear carrying capacity, corrugated web beams is preferred. By using different shapes of corrugation, the strength of the beam can be increased, and the structural performance can also be enhanced. The research work deals with the comparison of flexural behaviour among beams with flat web, rectangular corrugated web, trapezoidal corrugated web and by conducting the numerical simulation using ABAQUS software. The performance of the corrugated web beam is done under bending test using four-point loads with simply supported ends.

Chapter

Behavior of Double Layer Compound Cold-Formed Steel Columns

December 2023
DOI: 10.1007/978-981-99-6175-7_22
In book: Emerging Trends in Composite Structures

V. Hari Krishnan · Manoj Kumaar C.

Abstract

Cold-formed steel is widely used in the construction industry due to its lightweight properties, making it a cost-effective alternative to conventional construction methods. With a weight comparison, its lighter than regular steel, and a better weight-to-strength ratio (Senthilkumar et al. in Structures 44:487–502, 2022), and it is commonly used in load-bearing applications on prefabricated structures. Cold-formed steel is available in various thicknesses, ranging from 0.1 mm to 7.9 mm, allowing it to be selected according to specific structural requirements and aesthetic preferences. The material can be easily shaped either by cold rolling or press braking, to form unique shapes such as zeta, lipped z, and Sigma. In this study, a 2 mm thick cold-formed steel sheet was bent into a 100 mm × 50 mm × 8 mm c-lipped channel, which was then combined into a box column using welding face-to-face. The box column was then fitted with four different shapes, namely Zed section, rectangular, channel, and L angle, to form four different compound sections. The aim of the research was to determine the maximum load-carrying ability of these four compound steel columns (Babu and Selvan in Mater Today: Proc, pp 3069–3073, 2020) and their buckling behavior (Babu and Selvan in Mater Today: Proc, pp 3069–3073, 2020). This was achieved by designing and analyzing the different compound sections using ABAQUS finite element software(Kyprianou et al. in Proceedings of the 9th international conference on advances in steel structures, ICASS 2018. Hong Kong Institution of Steel Construction, 2020). The results were… Read more

Chapter

Investigation on Innovative Cold-Formed Steel Built-Up Columns Using Lipped and Unlipped Channels

December 2023
DOI: 10.1007/978-981-99-6175-7_14
In book: Emerging Trends in Composite Structures

V. A. Veera Vignaesh · S. T. Dhaarini · Manoj Kumaar C.

Abstract

Cold-formed steel (CFS) columns are broadly used in the construction industry for low-rise buildings because of their lightweight, easy installation, and erection. Back-to-back built-up CFS lipped channel sections and box sections are adopted in CFS structures. In this research, an innovative built-up column consisting of a total of 4-individual CFS channels, in which two are CFS lipped channels, which are arranged back-to-back and connected with the help of screw fasteners, while another two individual channels without lips are placed around the boundary of the back-to-back channel and connected with screw fasteners where flanges of both the channels intersect at specified spacing along the length of the column. Finite element (FE) models are modelled, and buckling analysis is performed through Abaqus 6.14 software by varying the height of the column, while the thickness of the section is constant. The height of four columns adopted as 300, 500, 1000, and 1500 mm, respectively, by varying the slenderness ration. These built-up columns are fabricated and buckling test was conducted. The analytical and experimental results are compared to identify the best performing section.

Investigation of Behavior of Cold Formed Steel Column with Complex Edge Stiffener and Edge Stiffened Web Openings

Logesh A.[1], Nirmala R[2], Priyadharshini B[3]

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Abstract:

Cold-Formed Steel (CFS) sections have grown in popularity due to their multiple advantageous characteristics, and with ongoing study on the different constraints of such members, their utility in the construction sector has grown significantly. CFS sections were widely used in structural and non-structural applications because they provide numerous benefits such as lightweight structures, high strength-to-weight ratios, increased stiffness due to enhanced sectional profiles, ease of installation and construction, and so on. Apart from this, the optimization of these CFS elements will allow for the construction of structures at very reasonable prices while also increasing load capacity, resulting in a stable and economical structure. Problem of buckling is existed when the ultimate load or the strength of the column before achieved of the cross-section yield. The different types of buckling, sensitivities to imperfections and uncertainties, related to the material properties of CFS. Moreover, Edge or double stiffeners are introduced where the stiffness is insufficient. To investigate the suitable method of strengthening the CFS. The main objective of the study is to analyse the strengthening method for CFS G-section column with edge stiffened holes sections with Catia Software. The results shows that the column with edge stiffened holes improves the stiffness of the column. The test results showed that for the case of CFS channel sections having edge-stiffened web openings, the compression resistance was higher than the plain channel sections. The G section column with edge stiffened three holes has low stiffness that can be used as a support member in buildings in seismic zones.

Keywords: Stiffness, Buckling, Compression resistance, Cold formed steel

Chapter 5

Nature's Fury: A Comprehensive Study of Disaster Phenomena in India

V Sampath Kumar[a], M.K.Soundarya[b], S.Arunkumar[c], Abinaya Ishwarya G K[d]

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Abstract

Disasters are serious disruptions to the functioning of a community that exceed its capacity to cope using its own resources. Disasters can be caused by natural, man-made and technological hazards, as well as various factors that influence the exposure and vulnerability of a community. Disasters can be caused by many different kinds of hazards and can have devastating impacts on people and communities. The frequency, complexity and severity of their impacts are likely to increase in the future due to factors such as climate change, displacement, conflict, rapid and unplanned urbanization, technological hazards and public health emergencies but disasters can be prevented. We can prevent the effects of hazards by helping communities to be prepared, reduce their risks and become more resilient.

Keywords: *Cyclones, Earthquakes, Floods, Droughts, Landslides.*

ISBN 978-819649235-9

Chapter 6

Contemporary Catastrophes: A Comprehensive Examination of Recent Global Disasters

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Abstract

In recent times, the world has witnessed a series of devastating disasters that have left indelible marks on communities across the globe. From unprecedented wildfires engulfing vast expanses of land, such as those in Australia and California, to the destructive force of hurricanes and typhoons wreaking havoc in regions like the Caribbean and Southeast Asia, the frequency and intensity of natural disasters have escalated. Concurrently, the ongoing challenges posed by the COVID-19 pandemic have compounded the impact of these disasters, amplifying the vulnerabilities of affected populations. The urgent need for coordinated international efforts in disaster preparedness, response, and recovery has

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Chapter 8

Emergency Response Legislation: Navigating the Disaster Management Act

V Sampath Kumar[a], Abinaya Ishwarya G K[b], M.K.Soundarya[c], S.Venugopal[d]

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Abstract

Disasters in India are more probable because of the expanding weaknesses identified with changing segment and financial conditions, unplanned urbanization, advancement inside high hazard zones, environmental change, topographical risks and pandemics. The administration of disasters in India is represented legitimately by the Disaster Management Act 2005 and the rules given by the National Disaster Management Authority under the DM Act 2005, which are explicitly portrayed in the resulting areas. India has several policies to deal with various disasters such as Earthquakes, Floods, Cyclones and Famines. However, several additional guidelines and a disaster-resilient infrastructure need to be created for effective disaster management in India.

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The 10.5km stretch from Thiruvanmiyur to Akkarai was to be made six lanes from four at a cost of ₹159 crore 17 years ago, but the highways department delayed land acquisition

MEMORY LANE

On completion, the project will make commuting a breeze for ECR residents

PROJECT HIGHLIGHTS

ECR to be expanded **from four-lane road to six-lane road** by state highways department

10.5 kms of the ECR from Thiruvanmiyur to Akkarai is to be made six-lane

Objective of the project: **To boost connectivity and reduce traffic clog-up** because the road connects Chennai, Mamallapuram and Puducherry

PROJECT COST

For only road expansion for the 10.5km stretch

₹159CR

Total cost including road expansion and land acquisition

₹1,099CR

Delay pushes up ECR widening cost sevenfold

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The cost of widening a 10.5-km stretch of East Coast Road (ECR) has gone up seven times in 17 years as the highways department has delayed land acquisition.

The original project cost of the Thiruvanmiyur-Akkarai six-lane project in 2006 was ₹159 crore; now it has shot up to about ₹1,100 crore. In fact, about ₹940 crore, which is 85% of the total project cost, would now go towards land acquisition. A decade back, the cost of land acquisition was ₹356 crore. As buildings have come up on land abutting ECR on both sides, the road expansion cost per kilometre is now ₹104.7 crore.



NO GROWTH: After cutting trees, there is no progress in work at Injambakkam

The latest deadline to convert the four-track ECR into a six-track highway is April 2025. But contractors doubt this will happen as they are yet to touch Thiruvanmiyur.

"It is not easy to acquire land for development projects in Thiruvanmiyur as the government has to pay market rate. It is difficult to get people to give up property in Thiruvanmiyur for road expansion," said Sampath Kumar, professor, Sathyabama Institute of Science and Technology.

"We have taken up the work in three parcels – Kottivakkam, Palavakkam and the Neelankarai-Injambakkam-Sholinganallur belt. Around 70% of the land acquisition for the expansion has been completed," said T Elango, chief engineer of the metro wing, highways department. "The delay is because of land acquisition. Many landowners took a lot of time to accept our compensation package and document verification."

Stretches from Injambakkam to Palavakkam have been cleared and trees cut. And stormwater drains have been laid in bits and pieces, wherever acquisition has been completed. "It is hard to complete the road expansion work in two years. We are experiencing payment issues too," said the contract supervisor.

Even on the expanded stretch, particularly in Palavakkam and Kottivakkam, encroachments have returned in the form of parked vehicles and street vendors. "What is the use of expansion when they cannot keep encroachments at bay," asked Jayanthi P, a resident and activist in Valmiki Nagar, Thiruvanmiyur.

Civic inconvenience caused by the delay has to be seen to be believed. Thiruvanmiyur is one of the most congested stretches, particularly between Marundeeswarar Temple and Thiruvanmiyur RTO, during peak hours. One entire lane near the bus depot has been taken over by hawkers, say activists. While cost overruns drain the exchequer and officials and engineers cite procedural and acquisition-related delays, residents and regular users of ECR silently suffer without pavements and without even four lanes.

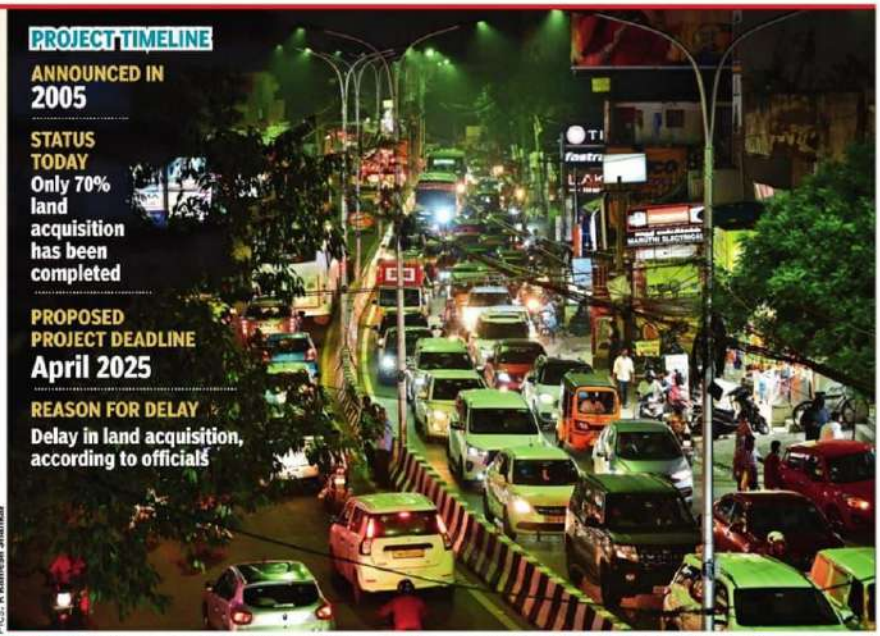


Photo: R Ramesh Shankar

SPEED UP! Traffic moves at a snail's pace during peak hours on the four-lane stretch in Thiruvanmiyur; only preliminary work for road expansion has been done in places such as Injambakkam

CURRENT PROGRESS

Locality	Distance taken up (m)	Land needed for acquisition (sqm)	Land acquired so far (sqm)	Cost (In ₹Cr)	Deadline for road expansion
Thiruvanmiyur	WORK NOT TAKEN UP SO FAR				
Kottivakkam	935	8,040	7,638	18.86	Apr 2024
Palavakkam	1,150	11,445	10,758	17.43	Dec 2023
Neelankarai	6,600	8,188	6,124	134.56	Apr 2025
Injambakkam		27,887	21,474		
Sholinganallur		20,642	13,417		

Source: State highways department



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Experimental Investigation on the Incorporation of Reed Plant Ash in Concrete

| Conference paper | First Online: 02 December 2023

| pp 603–611 | Cite this conference paper



Emerging Trends in Composite Structures

(ICC IDEA 2023)

P. Eshanthini, K. Sarayu & K. Srishanth

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Abstract

Reed plant (biological name: Desmostachya bipinnata) is an aggressive plant species with remarkable reproduction ability that allows it to grow more in less duration. High demand for natural resources, fast urbanization, and therefore, the disposal drawback developed opportunities to be used of this reed plant ash for construction. This study is about finding the new natural material to replace fine aggregate, as it is a chief material used for getting ready mortar, concrete and plays a significant role within the combine style. The concrete mix was modified by replacing a portion of the fine aggregate with reed plant ash at varying percentages of 0, 5, 10, and 15%. The mechanical properties, including compression and split tensile strength, were evaluated after curing periods of 7, 14, and 28 days. From this study, it is clear that utilization of reed plant ash in concrete mix offers a solution to the problem that arises from the accumulation of the excessive aggressive species in the site.

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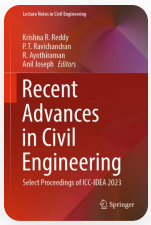
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Study on Groundwater Quality Status of Major Lakes in Tiruvallur District Using Water Quality Index

| Conference paper | First Online: 31 January 2024

| pp 453–459 | Cite this conference paper



Recent Advances in Civil Engineering

(ICC IDEA 2023)

P. Eshanthini, Natta Charan Raj & Srinivasa Sathyanarayana Reddy

Part of the book series: Lecture Notes in Civil Engineering ((LNCE,volume 398))

Included in the following conference series:
International Conference on Civil Engineering Innovative Development in Engineering Advances

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Abstract

Lakes in an area acting as an important inland water ecosystem, which provides many ecosystem services like fresh drinking water, water for irrigation, domestic purpose and industrial application. Tiruvallur is a fast-developing district of Tamil Nādu, giving it a special industrial and commercial important. The development, urbanization and various pollutant sources lead to deterioration of lake water quality. This study aims to assess the water quality in ten important lakes of Tiruvallur district and deriving the water quality index (WQI) using Weighted Arithmetic Mean (WAM) method. The examination of water quality was done by physiochemical and biological parameters which include pH value, presence of chlorine, hardness, nutrients, bacteria, algae and viruses. The quality of water was divided into three types, and they are excellent, good and poor. This study shows that with the exception parameters, most parameters used to assess water quality were up to National Standard body of India (BIS). The quality of water was ranged from excellent to too good for all the ten lakes in Tiruvallur district, which shows that the lake water is fit for human consumption, demographics, household demographics, residential location, and the built environment impact the frequency of walking trips.

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Sixth Edition

RAINWATER HARVESTING FOR SUSTAINABLE WATER MANAGEMENT

Abstract

The increasing demand for water to feed the ever-expanding population and the higher standard of living have led to a global problem of water scarcity. Groundwater is the main source of freshwater for the expanding domestic, agricultural, and industrial sectors of the country. As it becomes more necessary to battle climate change, conserving water has a definite impact on a sustainable environment. Rainwater harvesting is simple technique with relatively low storage and maintenance costs. This can significantly help to mitigate the negative effects of increasing water scarcity caused by declining groundwater levels, lessen urban flooding, and preserve water supply in water-scarce places. Rainwater harvesting is the process of collecting and storing rainwater before it disperses as surface runoff. A rainwater harvesting system typically collects and stores water that runs off a roof surface. Rainwater can be collected and stored on surface tanks, or it may be conveyed underground to recharge groundwater. Surface runoff harvesting is most suitable in hilly and urban areas. Groundwater recharge is favorable, if there are sufficient favorable strata available to hold water. It is the most effective and sustainable method of managing water and it also opens up a wide range of other economic opportunities that empower people at the grassroots level. Rainwater harvesting is crucial for global water management in the 21st century.

Key words: aquifer; groundwater; recharge; rainwater harvesting; water management

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ASSESSING THE CORROSION RESISTANCE OF BACTERIAL CONCRETE IN MARINE ENVIRONMENTS: A SEM ANALYSIS

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Abstract

Concrete is widely used as a structural material worldwide. However, cracks are inevitable and represent one of its inherent weaknesses. These cracks allow water and salts to seep through, initiating corrosion and reducing the lifespan of concrete structures. The high cost of repair and maintenance, coupled with the difficulty of identifying cracks in large, complex structures, underscored the need for a self-repairing material. Bacterial concrete emerges as a promising solution capable of remediating cracks and fissures in concrete. This technique is appealing because the mineral precipitation induced, specifically calcium carbonate, resulting from bacterial activity, is both pollution-free and natural. This paper explores the repair of artificial cracks in concrete structures using Bacillus subtilis bacteria and investigates the corrosion resistance of bacterial concrete under marine conditions through SEM analysis. A comparison with conventional concrete is also conducted. The mix design is based on IS-10262-2019 standards, initially prepared for moderate conditions. However, testing under extreme conditions will provide a better understanding of which type of concrete, bacterial or conventional, better resists corrosion.

Keywords- Bacillus subtilis, SEM analysis

1. Introduction

1.1 General

Concrete, as a structural material, received extensive use all over the world during the 20th and 21st centuries. The rapid development of ready-mixed concrete is one of the important signs of concrete technological progress and overall quality improvement. The most prominent problem associated with concrete is its higher probability of cracking caused by non-load factors due to its low tensile strength,

WATER MELON SEEDS AS A POTENTIAL COAGULANT IN WASTEWATER PURIFICATION

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Abstract

Now-a-days due to the increase of population, the demand of water has increased considerably resulting in the generation of scarcity of lake water. This research project investigates the potential of watermelon seed as a natural coagulant for water treatment. This is aimed at identifying watermelon seed as a possible replacement for alum and other synthetic polyelectrolytes in treating water. It was aimed at identifying watermelon seed as a possible replacement for alum and other synthetic polyelectrolytes in treating water. Results obtained showed that at dosage of 0.05g/L, pH of 7.0, the optimum time duration is 24 hours and the optimum removal of turbidity is obtained. The reduction in turbidity was below the world health organizations (WHO) recommended value of 5NTU, however the best colour removal was not up to the WHO recommendation value of 40NTU. The residue of the crushed watermelon seed is used as the coagulant which can be obtained using soxhlet extraction apparatus with n-hexane as the solvent. Several test were conducted to investigate the concentrations present in the water sample before and after the addition of coagulant into the water sample. Laboratory scale studies using jar test experiments were performed on medium turbid water to determine the effect of dosage, pH stirring time and speed on coagulation. This paper reports the potential of watermelon seed as a natural coagulant for water treatment. The results obtained show watermelon seed can be used as a natural coagulant for water treatment.

Keywords— Water treatment, Water melon, Ecofriendly, Natural method

PERFORMANCE EVALUATION OF FIBER REINFORCED CONCRETE (FRC) WITH GLASS FIBER RENINFORCEMENT (GFRP) REBARS IN REINFORCED CONCRETE UNDER THE MARINE ENVIRONMENT

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Abstract

Corrosion of the steel reinforcement in many concrete structures caused either repairs or replacement. Non-corrosive Reinforcing bars made of polymers with Glass fiber reinforcement (GFRP) for concrete construction have seen a significant uptick in their use over the past decade as a result of improved characteristics and cost-effectiveness. Because of its lower elastic modulus ,Fiber-reinforced concrete (FRC) is recommended to replace plain concrete in GFRP-reinforced structures in order to reduce the issue of excessive crack width and lesser bond strength caused by the use of GFRP bars as structural reinforcement. It has been demonstrated that the inclusion of fibers in concrete increases its resistance to cracking and bond between the concrete and rebars. In the present work, flexural strength and crack widths and bond strength of GFRP bars in FRC concrete was studied under the marine sea exposure conditions at 45 deg C temperature for 180 days. Maximum fracture widths, bond strength and flexural strength may be increased when FRC is applied to beams reinforced with GFRP reinforcing bars, the effects of which are now under study. In total, 36 nos of FRC beams/specimens reinforced with GFRP rebars (twisted and Sand-coated) were investigated. The specimens were subjected to three point loading and direct tension pull out test in accordance with ACI440.3R-04. The companion RC beams/specimens reinforced with GFRP rebars were also cast and tested to compare and quantify the effect of fibers added into the hybrid systems. With the addition of polypropylene fibers with a volume percentage of 1% improved the flexural strength and decreasing the cracks by 28-30% and increased the bond strength by 40% when compared to the plain concrete beam.

Keywords: Glass Fiber Reinforced Polymer Rebars (GFRP), Fiber Reinforced Concrete (FRC), PolyPropylene fiber, Flexural strength, Tensile Strength, Bond Strength, Slip, Crack width.

Durability and Serviceability Assessment of GFRP rebars with Fiber Reinforced Concrete in an Aggressive Exposure Conditions

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ABSTRACT

Large amount of concrete structures has been called for repair or replacement prompted by the corrosion of steel reinforcement which is a menacing problems to the existing Reinforced concrete structures and the global cost of corrosion repair is estimated to 3.4% of the global GDP every year. By using an available corrosion control practices, it is estimated that savings of between 15 and 35% of the cost of corrosion could be realized. Use on non-ferrous reinforcement in RC structures is one of the best corrosion control measures and it is a prudent solution to reduce the carbon foot print when compared to steel manufacturing. In the last decade, due to enhanced properties and lesser carbon emission and cost-effectiveness, there has been a rapid increase in using non-corrosive Glass fiber-reinforced polymers (GFRP) reinforcing bars for concrete structures. However, due to its brittle behavior and relatively low modulus of elasticity compared to steel reinforcement, the application of GFRP rebars also induces structural problems such as reduced structural ductility and serviceability. To mitigate the problem of excessive crack width arising from the use of GFRP bars as flexural reinforcement, Poly Propylene fibers were proposed in plain concrete beams. It is believed that this hybrid system (Fiber Reinforced Concrete + GFRP rebars) may eliminate the problems related to the corrosion of steel reinforcement while providing requisite strength, stiffness, and desired ductility, which are shortcomings of the GFRP reinforcing system in plain concrete.

In this study, two types of GFRP reinforcing bars (twisted and Sand-Coated) were exposed in various aggressive exposure conditions such as alkaline, Marine and conventional conditions for 180 days at 45 deg C temperature and tested (under direct tension, pullout test and two-point bending load) to observe the effects on durability and serviceability of hybrid system . A detailed experimental program was planned with two prime motives of examining durability of Glass fiber reinforced polymer (GFRP) rebars in three different exposures (encompassing alkaline as well as sea exposures), and serviceability of hybrid beams (GFRP rebar + FRC) in three different exposures. This study assesses the durability for different physio-mechanical properties of GFRP rebars post exposure to accelerated conditioning in seawater and alkaline condition. In total three different physio-mechanical properties were assessed, including: tensile strength, E-modulus, and lastly, bond strength. It was inferred that rebars with high moisture absorption resulted in poor durability, in that it affected mainly the tensile strength. Outcome of the tests manifests significant degradation in tensile strength (up to 33.55% for twisted and 21.00% for sand-coated) of GFRP rebars when exposed to alkaline solutions. Tensile strength reductions were observed up to 33.55% for twisted and 21.00% for sand-coated GFRP rebars when exposed to corrosive environment. Load v/s Deflection study and crack propagation plots of hybrid beams show larger values of deflection and wider cracks as compared to their steel reinforced counterparts. Durability evaluation shows significant degradation in flexural strength of GFRP reinforced beams exposed to both alkaline and corrosive exposure. Beams subjected to both saline and alkaline environmental conditions exhibit a reduction in both load and flexural capacities. Specifically, there is a decrease of 15% in load capacity for beams with twisted GFRP rebars and 10% for beams with sand-coated GFRP rebars respectively. Hybrid beams display smaller crack widths and spacing under service loads compared to plain concrete beams. The crack width reduction amounts to 10% for beams reinforced with twisted bars and 21% for beams reinforced with Sand-coated rebars. The addition of fibers with a volume fraction of 1.0% improved the flexural behavior by increasing the flexural strength bond strength and crack patterns by 25-30% when compared to the companion beam.

Keywords: Glass Fiber Reinforced Polymer Rebars (GFRP), Fiber Reinforced Concrete (FRC), Poly Propylene fiber, Bond strength, Flexural strength, Crack width.

BOOK CHAPTER ON

WOMEN IN CONTEMPORARY INDIA: ISSUES AND CHALLENGES



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WOMEN IN CONTEMPORARY INDIA: ISSUES AND CHALLENGES

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32	CYBERCRIME AGAINST WOMEN AND ITS PREVENTION Dr.R.VASANTHI	309-314
33	WOMEN ENTREPRENEURS – LEADING FROM THE FRONT N.Ramya, M.Amudha, S. Lokeshwari.	315-321
34	CYBERCRIME AGAINST WOMEN AND ITS PREVENTION MANOJ RAVICHANDRAN	322-326
35	LEGISLATION AND ADMINISTRATIVE ACTION IN INDEPENDENT INDIA Ms. M. SUWITHRA	327-338
36	AN EMPIRICAL STUDY OF EFFECT OF ORGANIZATIONAL POLITICS ON JOB SATISFACTION LEVEL OF WOMEN EMPLOYEES IN GUJARAT GOVERNMENT Ms. Heta Dave, Dr. Alpesh Nasit	339-348
37	CYBER CRIME AGAINST WOMEN AND THE PROTECTION UNDER INDIAN LAW K Sirisha	349-355
38	EMPOWERING WOMEN ACROSS BORDERS: A FEMINIST ANALYSIS OF JHUMPA LAHIRI'S FEMALE PROTAGONISTS IN *THE NAMESAKE* D. Balaji, Dr. M. Thenmozhi	356-367
39	FOSTERING GENDER EQUALITY IN FAMILY DYNAMICS: OVERCOMING OBSTACLES AND PROMOTING EMPOWERMENT FOR WOMEN G.Vaishnavi	368-375
40	PAY EQUITY MATTERS: PROBING THE CAUSES AND SOLUTIONS OF THE GENDER WAGE GAP DR. J. RANI, P.V. KRISHA SHREE, K. LOCHANA	376-386
41	A STUDY ON CAUSES AND MANAGEMENT OF WORK STRESS AMONG FEMALE EMPLOYEES OF HCL, CHENNAI DR. J. VIJAYA SHANTHI	387-395
42	AN EMPIRICAL STUDY ON MILLENNIAL'S BEHAVIOR TOWARDS THE PERCEPTION OF INVESTMENT AVENUES WITH REFERENCE TO CENTRAL ZONE OF GUJARAT STATE Ms. Hardika Rajubhai Jadav	396-410
43	ROLE OF EDUCATION IN WOMEN EMPOWERMENT Ms. K. ANUMITHRA, Ms. M. AMUDHA	411-418
44	ROLE OF EDUCATION IN WOMEN EMPOWERMENT Dr. S. Lakshmi	419-425
45	UNVEILING THE NEXUS OF SOCIAL MEDIA PLATFORMS AND AI IN PERPETUATING CYBER VIOLENCE AGAINST WOMEN: CHALLENGES, IMPLICATIONS, AND SOLUTIONS R. M. Saritha, N. Tejaswini, Dr S. Geetha	426-435
46	ROLE OF EDUCATION IN WOMEN EMPOWERMENT Dr Supriya Sharma	436-442
47	CYBER CRIMES AGAINST WOMEN AND CHILDREN Ms. Deepa Ms. S.Lokeshwari	443-446
48	WOMEN EMPLOYEE WELLNESS PROGRAM Dr.M.CHITRA	447-450
49	EMPOWERING SHE: A COMPREHENSIVE ANALYSIS OF LEGISLATION AND ADMINISTRATIVE ACTIONS FOR WOMEN IN INDEPENDENT INDIA Mrs.A.Maheswari, Dr.S.Geetha	451-464
50	BALANCED PARTICIPATION OF GENDER IN DECISION MAKING: INDIAN CONTEXT Dr. Suman Ramapati, Dr. Dhara Rathod	465-472
51	AN ANALYTICAL STUDY ON WOMEN EMPOWERMENT IN PERSPECTIVE OF INDIAN CONSTITUTION S.Anandítha , Dr.R.Jayam	473-481
52	WOMEN ENTREPRENEURSHIP AS APPARATUS OF WOMEN EMPOWERMENT IN INDIA Dr. SN Singh · Dr. Suman Ramapati	482-489
53	CYBER CRIME AGAINST WOMEN AND ITS PREVENTION S. ISHWARYA	490-499
54	LEGISLATION AND ADMINISTRATIVE ACTION FOR WOMEN IN INDEPENDENT INDIA	500-508

PAY EQUITY MATTERS: PROBING THE CAUSES AND SOLUTIONS OF THE GENDER WAGE GAP

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ABSTRACT

This abstract offers a comprehensive analysis of the ongoing gender wage gap, exploring its complex nature, underlying causes, and viable remedies. Women still make less money than men do, even in spite of progress made toward gender equality. Through a combination of case studies and literature reviews, this study reveals the complex underpinnings of the gender wage disparity.

An in-depth grasp of the major players, including societal norms, prejudice, and occupational segregation, is the first step in the exploration process. The article reveals the intersectionality that is inherent in this problem by examining a variety of industries, ethnicities, and educational levels. A special focus is placed on how parenthood affects the pay gap, taking into account the maternal penalty as well as how society views working moms.

In conclusion, this article offers a contemporary and intricate comprehension of the gender wage gap, presenting insights that surpass conventional narratives. Through a holistic understanding of interconnected factors, it aims to inform discussions, guide policy development, and inspire collective endeavors towards genuine gender equality in the workforce.

Key words: Gender- wage, discrimination, effects.

INTRODUCTION

The continuing gender pay disparity poses a serious challenge to the development of a fair and equitable society, undermining our commitment to real equality. "Pay Equity Matters: Probing the Causes and Solutions of the Gender Wage Gap" explores this diverse and long-standing topic in an effort to provide light on the various factors contributing to the pay gap between men and women. In order to create practical solutions that go beyond rhetoric, it is critical to comprehend the underlying reasons of the gender pay gap as civilizations develop and discussions about gender equality pick up steam.

"Pay Equity Matters" is a call to action more than just a discussion of economic injustice. Through an analysis of the structural problems that sustain salary differences as well as



SUSTAINABLE DEVELOPMENT : A MULTI- DIMENSIONAL PERSPECTIVE

Dr. Dilshad Shaik
Dr. N. Sofia

SUSTAINABLE DEVELOPMENT: A MULTI-DIMENSIONAL PERSPECTIVE

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Dr. Dilshad Shaik
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SHANLAX PUBLICATIONS

A STUDY ON CONSUMER'S EXPECTATION TOWARDS THE ATTRIBUTES AFFECTING WHITE GOODS MARKET

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Abstract

Retailing is one of the most aged businesses that anthropological evolution has been aware of and is concerned with the selling of goods and services to consumer end users. Retail business operates as a crossing point between the manufacturer and purchaser, develops the availability of goods and accessibility and elevates the competency of delivery in a financial system. The Indian retail industry has currently appeared as one of the most vibrant and rapid paced businesses as many players have begun to penetrate into the market. After Globalization, with reformed economic policies, India has entered into a new reality in Retailing. With an increase in GDP growth, India is one of the most promising and fastest-growing economies in the world. Perception of product attributes gives the first impression for consumers. Perception has a strong relation with consumer judgment of whether the product will satisfy their needs or not. Studying the consumer perception will help practitioners to understand consumers' acceptance of products. In recent years White Goods have been the subject of considerable research and development because they represent a significant proportion of the energy consumed in an average household. Attributes potentially influencing a consumer's decision entail design, performance, technological innovation, reliability, warranty, service and last but not least the initial purchase price. Therefore, the consumers are faced with a complex decision when trying to buy white goods. The purchase of white goods offers a complex and challenging field for investigating consumer behaviour. Thus, this study aims to discover and analyse the

A STUDY OF INDIAN STOCK MARKETINVESTING ON INITIAL PUBLIC OFFERING – CASE STUDY

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(Deemed to be University), Tamil Nadu.

Abstract

This article aims at providing a case study analysis of the Indian Stock Market's, Initial Public Offering (IPO), start of COVID period from April 2020 to March 2022. During this period more than 100 IPO's under the Public Issue-Book Building category were issued. While comparing the 2020 and 2021 IPO's, there exist stupendous increases of 504.5% in fund mobilization (The Economic Survey 2021-22). Investors are investing their hard earned money. Are they gaining or losing by investing in IPO's? Hence the author has done a detailed case study on the IPO's to find out the IPO's performance on listing day and it is observed from the analysis that in India Billions of fund is raised through IPO, some IPO's are giving good return whereas others are not. Investors investing in IPO's are facing huge losses. From the study, it is suggested that the Government of India, Ministry of Finance and Stock Exchange Board of India regulate the IPO markets, so that the investors will not lose their money.

Keywords: *IPO, Listing Price, Indian Stock Market, Fund Mobilization*

Introduction

India is the sixth largest economy in the world having $3.25 trillion GDP

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RELATIONSHIP BETWEEN MULTIPLE INTELLIGENCE AND INTEREST AMONG HIGH SCHOOL STUDENTS: A STUDY



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ABSTRACT:

Performance of the individual as a person, citizen, as worker and as a student largely depends upon the intelligence, he/she possesses. An intelligent person has the ability to adjust himself to the changing circumstances with ease, efficiency and speed. The Main purpose of this study is to know the multiple intelligence. The Multiple Intelligences Theory (MIT) was not originally conceived to be directly applied to educational settings (Gardner, 1983). However, Gardner has always declared himself convinced of its potential contribution to this field. It was his understanding that schools have traditionally assumed everyone can learn the same contents in the same way; therefore, they have not tried to associate learning experience to specific products in the life of the community to enhance a rich understanding of knowledge.

Keywords: *Multiple Intelligence, Interest, Education, School students, Pedagogy.*

INTRODUCTION:

Education comprises good thoughts in human being. It is the education which carries human being in the way of success. With education, human being learns to use brain for taking any decision. Educational person contributes for the development of society. Multiple intelligence pedagogy implies that teachers teaches and assess differently based on individual intellectual strengths and weakness. Teachers structure learning activities

EXPLORING THE ROLE OF MICRO FINANCE IN WOMEN EMPOWERMENT AND ENTREPRENEURIAL DEVELOPMENT A QUALITATIVE STUDY

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Abstract

Microfinance helps women to be empowered by increasing their courage and self esteem, enabling them to participate in the creation of different networks within their own communities. It also improves their decision-making capability in their household. Micro-finance appears to be a tool for emancipation and promotion of the status of women, with multiple objectives: - Give women a way to make money and help them become financially independent; - professionalize and sustain their business ventures; - raise their standing in the family. This study investigates how women's entrepreneurship development is impacted by microfinance services. For the study, both primary and secondary data were employed. A basic random selection method was used to choose 460 women from both rural and urban locations. Thus, the study's objective is to examine how microfinance contributes to women's empowerment and the growth of their businesses.

Keywords: *Empowering, Decision -Making, Entrepreneurial, Microfinance, Income.*

1.1 Introduction

Microfinance and micro-credit practices have become a popular means of local development. These practices target mainly women, who are invited to set up groups of their own called self Help Groups in order to obtain a social basis for raising assets and getting access to finance. The public views microfinance as strengthening the democratic fabric and having a significant positive impact on women's empowerment. By giving women access to financial services and opportunities that can raise their socioeconomic position, give them more decision-making power, and improve their general wellness, microfinance plays a vital role in the empowerment of women. Microfinance helps empower women in a number of ways, including financial inclusion, income production, asset accumulation, decision-making authority, access to education and healthcare, social mobility, and community involvement. Women are now able to save money, invest in sources of income, and manage their finances more skillfully because to their inclusion in the formal financial system. Women are able to generate income through microfinance.

Micro finance loans provide women with the capital they need to start or expand businesses, such as small-scale agricultural activities, handi crafts or trading ventures.

CORPORATE MANAGEMENT AND COMMUNICATION



Dr. Nilima Singh
Dr. V. Kandasamy
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Dr.M.S.Sibi

Dr.Prem latha Soundarraj

Dr.M. Vidya

Dr.Somnath Gurulingayya Kolgiri

Dr.T.Ilakkiya



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PREFACE

Multidisciplinary social exclusion research is an expansive scholarly endeavor that synergistically incorporates insights and methodologies from a diverse array of academic fields including sociology, psychology, economics, anthropology, and political science to scrutinize the complex phenomenon of social exclusion. This line of research seeks to uncover and comprehend the multidimensional aspects of social exclusion, which often manifests through disenfranchisement, marginalization, and the curtailing of access to fundamental societal resources and opportunities. As a result, individuals and communities are prevented from fully participating in the socio-economic, cultural, and political spheres of their societies. Through a multidisciplinary lens, researchers can dissect the nuanced dynamics of exclusion by considering an array of factors such as race, gender, class, and geography. This approach promotes a rich, textured understanding of social exclusion, encouraging the development of more inclusive, equitable, and harmonious societies. Furthermore, by fostering collaborations across disciplinary boundaries, this research cultivates innovative solutions and strategies that aspire to dismantle the pervasive barriers and inequalities that engender social exclusion, thereby fostering social cohesion and inclusivity. Social exclusion research is a critical field of study that delves into the multifaceted phenomena of social exclusion, encompassing aspects of marginalization, inequality, discrimination, and restricted access to resources and opportunities. This research area aims to unpack the underlying mechanisms and repercussions of exclusion, which may be orchestrated along the lines of socioeconomic status, race, gender, age, disability, or other distinctive markers that differentiate groups within a society. Through various methodological approaches, this research seeks to elucidate the complex interplay of structural, systemic, and individual factors that contribute to social exclusion. These might include policies, cultural norms, institutional practices, or economic conditions that inadvertently or purposefully isolate certain groups, preventing them from fully participating in societal activities and developments. Furthermore, social exclusion research is not just concerned with identifying and understanding the problem but also with finding viable solutions to mitigate its impacts. It often involves the formulation of policy recommendations, strategies, and interventions aimed at fostering social inclusion and cohesion. The ultimate goal is to promote an inclusive society where all members have equal opportunities to participate, contribute, and benefit from communal resources and advancements.

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CONTENTS

Sr. no.	Title name	Author name	Page no.
1.	**MEASURING SERVICE QUALITY IN M-COMMERCE CONTEXT: A CONCEPTUAL MODEL**	***Praveen Paul Jeyapaul, K. Rajamani, J. Prateeba Devi***	*1-7*
2.	**PERCEIVED E-SERVICE QUALITY: MEASUREMENT VALIDATION AND EFFECTS ON CONSUMER SATISFACTION AND WEB SITE LOYALTY**	***Praveen Paul Jeyapaul, P. Pathamuthu, S. Ajith Kumar***	*8-14*
3.	**BEHAVIOURAL ANALYSIS OF CONSUMER'S TOWARDS SELECTION OF MOBILE NETWORK SERVICE**	***Princy. A. S, Priyanka Jayaraj, M. Murali Krishnan***	*15-22*
4.	**CUSTOMER PERCEPTION ON GREEN BANKING PRACTICES IN PUBLIC SECTOR BANKS: AN EMPIRICAL STUDY**	***R. Blessie Pathmu, Poonam, K. Parveen Banu***	*23-30*
5.	**HIGHER EDUCATION SYSTEM PRACTICES FOR ENHANCEMENT OF EMPLOYABILITY –AN OVERVIEW**	***B. Bhavya, K. Santhanalaxmi, R. Sabitha***	*31-38*
6.	**ATTITUDE AND INTENTIONS TOWARDS SOCIAL ENTREPRENEURS AMONG COLLEGE STUDENTS**	***P.Felcy Judith, Jayesh Babli Mayekar, Soumya Mishra***	*39-44*
7.	**EFFECTIVENESS OF ENTREPRENEURSHIP TOWARDS SOCIAL MEDIA, EMPOWERMENT OF WOMEN AND CHALLENGES FACED BY THEM**	***Shishir kala, Ganesh Ramesh Teltumbade, C. R. Vijay***	*45-52*
8.	**ROLE OF ENTREPRENEURSHIP DEVELOPMENT PROGRAMMES IN DEVELOPING SMALL SCALE INDUSTRIES**	***N. Indhira, J. Edward, S. Rosy Felciya***	*53-59*
9.	**IMPACT OF SOCIAL ENTREPRENEURSHIP OF CORPORATES IN DEVELOPING THEIR BRANDS**	***Prem latha Soundarraj, V. C. Jeyaratha, P. Sankar***	*60-65*
10.	**CUSTOMER SATISFACTION AND SERVICE QUALITY TOWARDS REPURCHASE INTENTION IN ONLINE FASHION STORE**	***S. Anuradha, Shaikh Zeenath Hasan Ali, Aarti Deshpande***	*66-72*
11.	**THE APPLICATION OF BLOCKCHAIN TECHNOLOGY IN ENHANCING THE PAYMENT PROCESS THROUGH BANKING FOR EFFECTIVE MONITORING**	***S. Thandayuthapani, M. Padmapriya, Aravindharamanan. S***	*73-80*

12.	**COMPUTER MALWARE INFECTIONS AND THEIR PREVENTION ON COMPUTER USERS**	***Aashish A.Gadgil,*** ***S. Sekar,*** ***P. Thirumoorthy***	*81-85*
13.	**EDUCATIONAL ASPIRATIONS AND SOCIAL COMPETENCE RELATED TO EMOTIONAL INTELLIGENCE**	***Shabnam Siddiqui,*** ***Shivika Dutt,*** ***M. Murali Krishnan***	*86-92*
14.	**ASSESSMENT OF ACADEMIC STRESS AND COPING MECHANISM AMONG COLLEGE STUDENTS**	***A. Sivagami,*** ***R. Samundeeswari***	*93-98*
15.	**DEVELOPMENT OF MARKETING EFFECTIVENESS AND BUSINESS PERFORMANCE OF HOUSING FINANCE**	***S. Ramesh Babu,*** ***Ivan Kenny Raj L,*** ***T. Manoj Kumar***	*99-104*
16.	**IMPACT ON HUMAN RESOURCES MANAGEMENT PRACTICES ON EMPLOYEE SATISFACTION IN SELECT BANK**	***Mona Sinha,*** ***Rikhi Yadav,*** ***Sujit Kumar Mahapatro***	*105-111*
17.	**RELATIONSHIP BETWEEN ORGANISATIONAL EFFECTIVENESS, CLIMATE AND ITS PREDICTORS AMONG IT SECTOR**	***Susan Abraham,*** ***Shabnam Siddiqui,*** ***S. Chitra Devi***	*112-117*
18.	**IMPACT ON ONLINE IMPULSIVE BUYING BEHAVIOUR OF CONSUMERS IN FASHION INDUSTRY**	***Rathod Yuvrajsinh Kiritsinh.*** ***R. Ragu Prasadh,*** ***K. Latha***	*118-125*
19.	**EMPLOYEE ENGAGEMENT A REVIEW OF CURRENT RESEARCH AND ITS IMPLICATIONS. A THEORETICAL FRAMEWORK**	***B. Sakthimala,*** ***G. Deepalakshmi***	*126-133*
20.	**FACTORS INFLUENCING SELF-EFFICACY, STUDENT'S ATTITUDE TOWARDS EDUCATIONAL LOAN REPAYMENT**	***N. Saranya Devi***	*134-139*
21.	**PROSPECTS AND PROBLEMS IN MARKETING OF FOOD PRODUCTS; AN EMPIRICAL STUDY**	***M. Maheswaran,*** ***K.Priya***	*140-146*

MEASURING SERVICE QUALITY IN M-COMMERCE CONTEXT: A CONCEPTUAL MODEL

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ABSTRACT

In the rapidly growing world of mobile commerce (m-commerce), measuring service quality has become crucial for businesses to thrive in a competitive market. As customers increasingly rely on mobile devices for their purchasing needs, ensuring a high level of service quality is paramount to attract and retain customers. Measuring service quality in an m-commerce context requires a comprehensive approach that takes into account the unique characteristics and challenges of mobile platforms. One essential aspect is the ease of use and functionality of mobile applications or websites. Customers expect seamless navigation, fast loading times, and intuitive interfaces that allow them to browse products, make purchases, and track orders effortlessly. Any glitches or technical issues can significantly impact the perceived service quality and lead to customer dissatisfaction. Reliability and security are also critical factors in measuring service quality in m-commerce. Customers need assurance that their personal information, such as credit card details and contact information, is protected during transactions. Secure payment gateways, encryption technologies, and robust authentication mechanisms are essential for building trust and ensuring a positive customer experience. Furthermore, responsiveness and customer support play a vital role in assessing service quality in m-commerce. Mobile users often seek immediate assistance or have inquiries about products, delivery, or returns. Businesses must provide efficient and accessible customer support channels, such as live chat, email, or phone support, to address customer concerns promptly. Responsiveness and the ability to resolve issues quickly contribute to customer satisfaction and loyalty.

Keywords: Service Quality, M-commerce, Accuracy and Transparency and Website/App Performance.

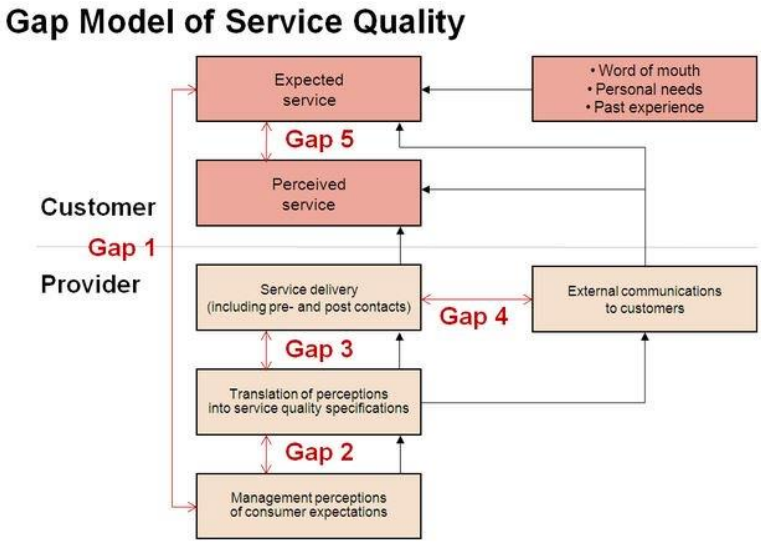
INTRODUCTION

The world has seen significant changes as a result of information technology (IT), notably in the industrial and service sectors. The majority of firms now rely on IT to manage their operations, create new goods, and enhance production-related gear, automation, and procedures. The function of the Internet, which is continually changing, is closely tied to IT. Nowadays, the internet is used for a variety of commercial operations, including the selling of products and services. The drawback of wired technology is its immobility, which prevents users from having the luxury of access at any time and from any location; wireless technologies, on the other hand, provide this benefit. Bamasoud (2010). Although they are not essential to improve mobility, mobile technologies may make consumers less inclined to travel. Additionally, customers may easily learn about a company's assets and services whenever and wherever they desire. Faqih, K. M. S. (2013). The term du jour is "m-commerce." Users of mobile devices are seen as a sizable pool of prospective clients due to this rapidly expanding trend. Studies on m-commerce services also tend to concentrate on giving users and customer's access to online purchases, such as electronic flight tickets and other forms of transportation. They also look at potential applications for peer-to-peer payments, bank services, and parking fee payment. By offering a high-quality service, it is anticipated that clients' happiness with m-commerce services may be attained.

THEORETICAL BACKGROUND

Service quality conceptualization refers to the process of defining and understanding the dimensions, components, and factors that contribute to the overall quality of a service experience. It involves identifying the key elements that customers consider important and evaluating how well a service provider meets or exceeds those expectations. Service quality can be conceptualized using various models and frameworks. Responsiveness relates to the willingness to help customers and provide prompt assistance. Delafrooz (2011). Assurance encompasses the competence, courtesy, and credibility of service providers. Empathy refers to the ability to understand and address customer needs and concerns. Tangibles involve the physical evidence and appearance associated with the service. Another conceptualization of service quality is the RATER model, which stands for reliability, assurance, tangibles, empathy, and responsiveness. This model aligns with the dimensions proposed by the SERVQUAL model, emphasizing similar aspects of service quality. Additionally, the concept of service quality can be explored through the lens of customer expectations and perceptions. Customers have certain expectations about the service they are about to receive, and their perceptions of the service quality are formed based on the extent to which those expectations are met or exceeded. The gap between customer expectations and perceptions serves as a measure of service quality. Overall, the conceptualization of service quality involves understanding the various dimensions and components that contribute to a customer's evaluation of the service experience. It provides a framework for service providers to identify areas for improvement, design strategies to enhance customer satisfaction, and deliver superior service that meets or exceeds customer expectations.

Figure: 01



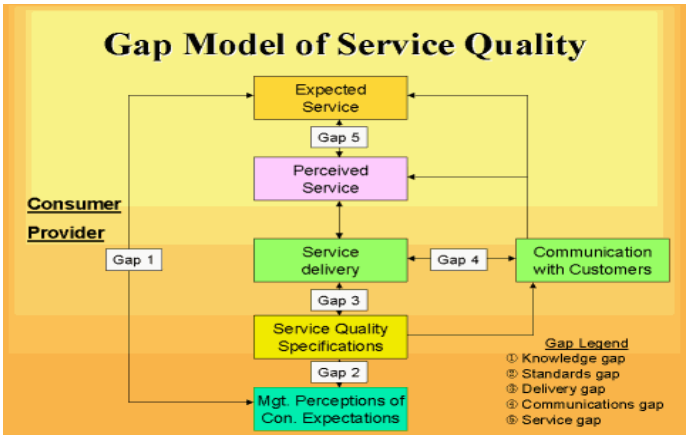
Source: https://www.google.com/url?-servqual-model-of-measuring-service-quality

CONCEPTUALIZATION OF SERVICE QUALITY

The process of identifying and comprehending the aspects, elements, and elements that affect the overall quality of a service experience is referred to as service quality conceptualization. It entails determining the crucial components that clients value highly and assessing how effectively a service provider meets or surpasses those standards. The discrepancy between client perceptions and expectations is used to gauge service quality. Understanding the many aspects and elements that go into a customer's appraisal of the service experience is essential to conceptualizing service quality. It gives service providers a framework to pinpoint areas for development, create plans to boost client happiness, and offer excellent service that satisfies or exceeds client expectations. The term "service quality conceptualization" is used to describe the process of identifying and analyzing the many aspects that make up a service's quality. Customers' priorities are determined, and the service's ability to meet or exceed those priorities is assessed. It is possible to conceptualize service quality

using a number of models and frameworks. Customers have preconceived notions about the quality of the service they will get, and their impressions of the service are created in relation to how well those notions are satisfied or surpassed. Bamasoud (2010). The quality of service may be gauged by looking at how closely actual experiences match customers' expectations. When trying to conceptualize service quality, it's important to break down all the factors that go into a client's opinion of the service they received. It gives a framework for businesses to analyze their services, come up with plans to make their customers happier, and provide top-notch care that goes above and beyond their expectations.

Figure: 02



Source: https://www.google.com/url

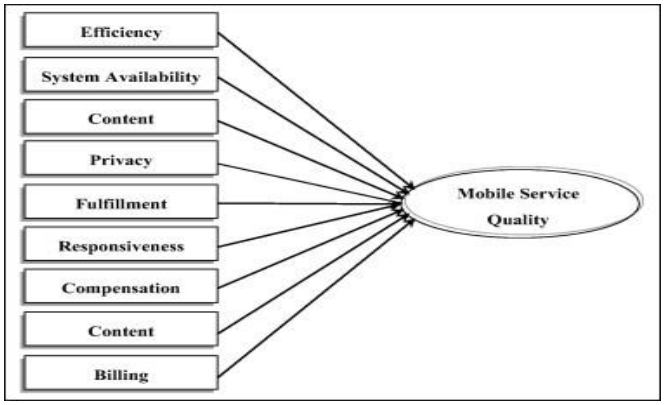
SERVICE QUALITY DIMENSIONS RELEVANT TO M-COMMERCE

The conceptual research model of service quality aims to provide a theoretical framework for understanding and analyzing the factors that influence service quality perceptions. This model helps researchers investigate the multidimensional nature of service quality and the relationships between various constructs. Researchers can use this conceptual research model to develop hypotheses, design surveys or interviews, collect data, and analyze the relationships among the various constructs. By testing and validating the model, researchers can gain insights into the specific factors that contribute to service quality and identify areas for improvement in service delivery processes. The model can also guide service providers in developing strategies to enhance service quality and customer satisfaction, ultimately leading to positive service outcomes. In the context of m-commerce (mobile commerce), service quality dimensions play a crucial role in shaping customers' perceptions and experiences. M-commerce refers to conducting business transactions, including purchasing goods and services, through mobile devices such as smartphones and tablets. Here are some key service quality dimensions relevant to m-commerce: The model typically incorporates the following components:

1. **Mobile Website/App Performance**: The performance of the mobile website or app is a critical dimension of service quality in m-commerce. Factors such as page load speed, ease of navigation, responsiveness, and overall usability contribute to customers' satisfaction and perception of the service quality.
2. **Security and Privacy**: Due to the sensitive nature of transactions conducted on mobile devices, the security and privacy dimension is paramount in m-commerce. Trustworthy security measures, secure payment gateways, and transparent privacy policies are essential for ensuring service quality in this aspect.
3. **Mobile Customer Support**: The availability and effectiveness of customer support services on mobile platforms are crucial for service quality. This includes features such as real-time chat, email support, helplines, or in-app assistance. Prompt and helpful customer support contributes to customer satisfaction and overall service quality perception.

4. **Personalization and Customization**: Tailoring the m-commerce experience to individual customer preferences and needs enhances service quality. Personalization features such as personalized recommendations, customized product/service offerings, and personalized promotions contribute to a more engaging and satisfactory user experience.
5. **Mobile Payment Convenience**: The ease and convenience of making mobile payments significantly impact service quality in m-commerce. Providing a variety of secure and seamless payment options, such as mobile wallets, digital payment platforms, and one-click payments, enhances customers' satisfaction and overall service quality perception.
6. **Information Accuracy and Transparency**: Customers rely on accurate and transparent information to make informed decisions in m-commerce. Ensuring accurate product descriptions, pricing, availability, and transparent terms and conditions contributes to service quality by establishing trust and reducing customer uncertainty.
7. **Seamless Cross**-Channel Experience: In a multi-channel environment where customers may switch between devices and platforms, providing a seamless experience across channels contributes to service quality. Ensuring continuity and consistency in the customer journey across mobile, web, and offline channels enhances the overall service quality perception.
8. **Service Quality Dimensions**: The model identifies specific dimensions that contribute to service quality. These dimensions can vary depending on the context but commonly include reliability, responsiveness, assurance, empathy, tangibles, and sometimes additional dimensions specific to the industry or service type being studied.
9. **Customer Expectations**: The model acknowledges that customers come into a service encounter with preconceived expectations about what constitutes good service. These expectations may be shaped by previous experiences, word-of-mouth, advertising, or other factors. Understanding and assessing customer expectations is essential for evaluating service quality.
10. **Service Delivery**: The model recognizes the process of service delivery, which encompasses all the activities and interactions that occur between the service provider and the customer. It includes factors such as employee behavior, communication, service design, technology, and the physical environment.
11. **Perceived Service Quality**: The central component of the model is the customer's perception of service quality. This construct reflects the customer's evaluation of the service experience based on the dimensions of service quality and their expectations. Perceived service quality is influenced by the alignment between customer expectations and the actual service received.
12. **Customer Satisfaction**: The model acknowledges that perceived service quality has a direct impact on customer satisfaction. When customers perceive high service quality, it enhances their satisfaction levels. Conversely, when service quality falls short of expectations, customer satisfaction may decline.
13. **Service Outcomes**: The model recognizes that service quality and customer satisfaction can have significant consequences for the service provider and the customer. Positive service outcomes, such as customer loyalty, positive word-of-mouth, repeat business, and increased profitability, are more likely when service quality and customer satisfaction are high.

Figure: 03



Source: https://www.google.com/url?sa=i&url=https%3A%2F%2Fwww.science

METHODOLOGY OF STUDY

Both primary and secondary sources were employed to get the data for this study. A questionnaire (Google form) that a group of respondents filled out is used to collect the fundamental information. To create the theoretical and analytical framework, the researcher also gathered secondary data from several books and other published materials, newspapers, journals, and websites. 250 participants in the study were randomly selected from an unlimited population. Convenient sampling, often referred to as availability sampling, is a technique for gathering information from subjects who are eager to participate in a study.

VARIOUS DIMENSIONS OF SERVICE QUALITY

In recent years, m-commerce has experienced remarkable growth and transformative trends. The widespread adoption of mobile devices has paved the way for increased mobile commerce activities. Mobile payments have become mainstream, with consumers embracing digital wallets and mobile banking apps for convenient and secure transactions. The rise of mobile shopping apps and optimized mobile websites has enhanced the mobile shopping experience, enabling users to browse, compare, and purchase products seamlessly. Personalization and AI-driven recommendations have become crucial in delivering tailored shopping experiences to mobile users. Chiu et al. (2005). Additionally, the integration of emerging technologies such as augmented reality (AR) and virtual reality (VR) has enriched the mobile shopping experience by allowing users to visualize products in real-world settings. Overall, m-commerce continues to evolve rapidly, empowering businesses to tap into the vast opportunities presented by the mobile-first consumer landscape. The service quality of online purchasing is evaluated on a number of different criteria, including security, responsiveness, credibility, and application of the content, accessibility, tangibles, ease of use, assurance, and attractiveness. Expected service quality and perceived service quality are assessed from the sample responses to determine the gap in service quality. Service quality is defined as the discrepancy between anticipated and perceived levels of quality. Utilizing Cronbach's Alpha, data reliability is evaluated prior to service quality evaluation.

Table 1: Service quality gap - Security

Security	Mean	N	Std. Deviation	Cronbach's Alpha	Z	Sig.
Perceived	3.23	250	1.116	0.699	17.112	0.000
Expected	3.09	250	1.039			

The most crucial aspect of using the internet safely is security, which is also one of the criteria used to assess the level of service. The Cronbach's alpha value is considerable (0.699), according to the reliability test. The information is trustworthy and is used to further interpretation. More than the anticipated Expected (3.09), the perceived service quality (3.23) is higher. It demonstrated that the service quality in the area of security is excellent for online buying. Z is 17.112. It demonstrates how important service quality is for security.

Table 2: Service quality gap - Reliability & Responsiveness

Reliability & Responsiveness	Mean	N	Std. Deviation	Cronbach's Alpha	Z	Sig.
Perceived	2.89	250	0.769	0.797	5.753	0.000
Expected	2.77	250	1.333			

For the service quality dimensions of responsiveness and dependability, the data's reliability is favourable. The beta factor is 0.797. The disparity in service quality is also seen favourably. More than the predicted service quality (2.77), the perceived service quality (2.89) is higher. It demonstrates that internet buying is trustworthy and responsive. The Z value is 5.753, and at the 1% level, it is significant. It demonstrates that the perceived level of service quality is quite high.Service quality directly impacts customer satisfaction in m-commerce. By understanding and measuring the key dimensions of service quality, businesses can identify areas that require improvement and address customer concerns promptly. Satisfied customers are more likely to make repeat purchases, recommend the m-commerce platform to others, and contribute to positive word-of-mouth, thus driving business growth. Bonera (2011). In the highly competitive m-commerce landscape, providing superior service quality can differentiate a business from its competitors. By assessing and benchmarking service quality against industry standards, companies can identify their strengths and weaknesses, implement strategic improvements, and gain a competitive edge. High-quality service fosters customer loyalty, which can be a valuable asset in a crowded marketplace. Bandura, A. (2006). Service quality is closely linked to trust and credibility in m-commerce. Customers need to feel confident about the security of their transactions, the reliability of the platform, and the responsiveness of customer support. Measuring service quality helps businesses identify and address any gaps or deficiencies in these areas, fostering trust and credibility among their customers. Satisfied customers are more likely to become repeat customers and brand advocates. Durndell & Haag (2002). By continuously monitoring and improving service quality in m-commerce, businesses can enhance customer retention rates and foster long-term loyalty. Positive experiences lead to positive word-of-mouth recommendations, which can further expand the customer base. Measuring service quality allows businesses to identify operational inefficiencies and bottlenecks in their m-commerce processes. By addressing these issues, companies can streamline their operations, reduce costs, and improve overall efficiency, leading to a more sustainable and profitable business model.

CONCLUSION

Mobile devices provide businesses with valuable data about customer preferences, location, and browsing behavior. By leveraging this information, businesses can tailor their marketing messages and offers to individual customers, increasing relevance and engagement. Celik, H. (2011). Personalization enhances the overall customer experience and positively impacts the perceived service quality. By considering these service quality dimensions in the context of m-commerce, businesses can strive to provide a positive and satisfactory mobile shopping experience. Emphasizing these dimensions helps enhance customer trust, loyalty, and positive word-of-mouth, leading to improved customer satisfaction and ultimately, business success in the mobile commerce landscape. Durndell & Haag (2002). Measuring service quality in the m-commerce context requires a holistic approach that considers ease of use, reliability, security, responsiveness, and personalized marketing efforts. By focusing on these aspects, businesses can deliver exceptional customer experiences and differentiate themselves in the competitive m-commerce landscape. Chiu et al. (2005). Constant monitoring, feedback analysis, and continuous improvement are essential to ensure sustained service quality and customer satisfaction in the dynamic world of m-commerce. Measuring service quality in m-commerce is essential for businesses to understand customer expectations, enhance customer satisfaction, gain a competitive advantage, build trust and credibility, foster customer loyalty, and optimize operational efficiency. It serves as a roadmap for delivering exceptional mobile commerce experiences and staying ahead in an increasingly digital and mobile-centric market.

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PERCEIVED E-SERVICE QUALITY: MEASUREMENT VALIDATION AND EFFECTS ON CONSUMER SATISFACTION AND WEB SITE LOYALTY

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ABSTRACT

Measurement validation in the context of consumer satisfaction and website loyalty refers to the process of assessing and confirming the reliability and validity of the measurement instruments or scales used to measure these constructs. Valid measurement instruments are essential for obtaining accurate and meaningful data that can be used to understand the relationship between consumer satisfaction, website loyalty, and e-service quality. When conducting research on consumer satisfaction and website loyalty, researchers often employ various measurement scales or questionnaires to collect data from participants. These scales typically include multiple items that assess different aspects of satisfaction and loyalty, such as overall satisfaction, satisfaction with specific website features or services, and intention to revisit or recommend the website. To ensure measurement validity, researchers undertake several validation procedures. High internal consistency indicates that the items in the scale are measuring the same construct consistently. Researchers also examine the construct validity of the measurement scales, which involves evaluating whether the scale items truly represent the construct being measured. Once the measurement scales are validated, researchers can analyze the effects of consumer satisfaction and website loyalty on e-service quality. Positive consumer satisfaction indicates that customers are content and fulfilled with their online service experience, while website loyalty reflects customers' intentions to revisit the website and their willingness to recommend it to others.

Keywords: Perceived E-Service Quality, Service Reliability, Responsiveness, Consumer Satisfaction And Web Site Loyalty

INTRODUCTION

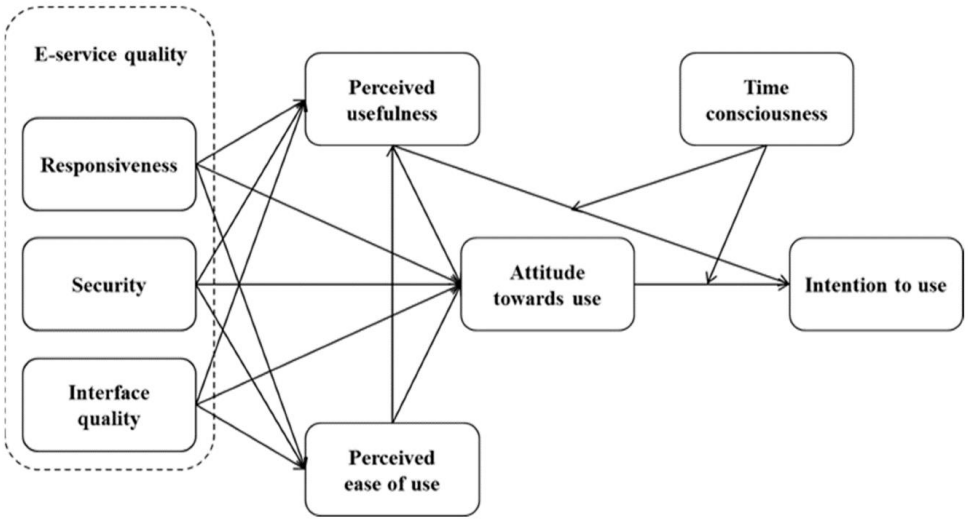
Recent technology advances are having an ever-increasing effect on government management. At a time when governments all around the globe are working to improve their citizens' access to cutting-edge services, the internet is more important than ever. Many problems that have been impacting locals have been brought to light by this phenomenon [7].It has to do with the citizen's experience using the available online governmental services. The relevance of e-service quality has lately piqued the interest of academics who are trying to figure out how to improve it. Providing exceptional e-services is a different beast than providing traditional public services, and it's also more challenging. The popularity of e-services is a major factor in the widespread acceptance of web-based services. Lee and Lin (2005) [9], a major reason many internet businesses fail is due to inadequate management of e-service quality. Since in-depth customer feedback and assessments of the quality of e-service provision in the hidden market are available, e-service quality may be differentiated. Electronic public services, especially the availability of multiple forms and services and the possibility of completing them online, may help people save time and money. [11]Customers are more likely to be pleased with public sector services as a result of technological advancements that enable for websites to be personalized to the point where service delivery may be customized to each individual's specific needs. Increasing the popularity of a service by fostering strong connections with its target audience, which in turn boosts retention and referral rates. Loyalty is defined as "post-use evaluation of how well a store or item meets or exceeds client desires.". Providing services

while maintaining quality has been found to improve government efficiency. In addition, it was shown that contentment correlated with loyalty, future purchases, and repeat visits. The current research acknowledged the use of four service quality factors to evaluate e-service quality and its effects on customer satisfaction: responsiveness, empathy, dependability, and trust.-When discussing taxes and electronic filing, "service" often means an online tax system that allows you to view your data online [6] It saves a lot of time and money compared to the old ways of doing things. Government agencies provide citizens the option of completing income tax returns and related announcements electronically using a system called "e-filing." The innovation adoption began around the middle of the year 2000, with the primary objective of helping public sector organisations increase their speed with which they provide services, as well as their efficiency and responsiveness. The program's primary objective was to strengthen the foundations of government agencies so that they could better serve the public [5].

BACKGROUND OF THE STUDY

The online retail sector transitioned from an early phase of concentrating on acquiring new consumers to the current stage of both maintaining and attracting clients. Instant online price comparisons, made possible by powerful search engines, have increased the importance of non-price competitive advantages like service quality in attracting and maintaining clients. Online businesses that provide superior customer service and foster a feeling of loyalty in their clients are what keep them coming back. Internet businesses must look at what current and future clients demand for service quality if they want to provide better services. Existing customers in the context of online commerce are people who have used the web to make purchases of goods and services. Potential clients for the whole Internet commerce sector are often people who have used the Internet to research desired goods and services but have never made a purchase via it (i.e., they prefer to make their purchases through conventional channels). These two consumer groups are referred to as "Internet purchasers" and "Internet non-purchasers" correspondingly for the sake of this research. The best course of action for Internet businesses is to maintain and enhance all aspects of service quality that meet the demands and preferences of both current and future clients. Making investment selections based on a company's business goals requires prioritizing different service features since both big and small internet businesses have limited resources. Different service providing tactics may be used to maintain current Internet consumers and draw in new ones if online businesses can identify the similarities and differences of the major service quality aspects as viewed by Internet buyers and Internet non-purchasers. Therefore, it is important to comprehend how both Internet buyers and non-buyers see service quality factors associated with online shopping.

Figure 01



E-SERVICE SATISFACTION AND INTENTIONS TO USE

E-Service satisfaction refers to the level of satisfaction that users experience when interacting with an online service or platform [5]. It encompasses their overall perception of the service quality, performance, usability, and the extent to which their needs and expectations are met. The concept of e-service satisfaction is particularly relevant in the context of online businesses, where customer satisfaction plays a crucial role in determining customer loyalty and intentions to use the service in the future. Intentions to use, on the other hand, refer to a user's likelihood or willingness to continue using an e-service or online platform in the future [10]. It is influenced by the user's satisfaction with the service, perceived usefulness, ease of use, and other factors that contribute to their overall experience. Positive e-service satisfaction often leads to higher intentions to use, while negative experiences or dissatisfaction can result in lower intentions to use or even abandonment of the service.

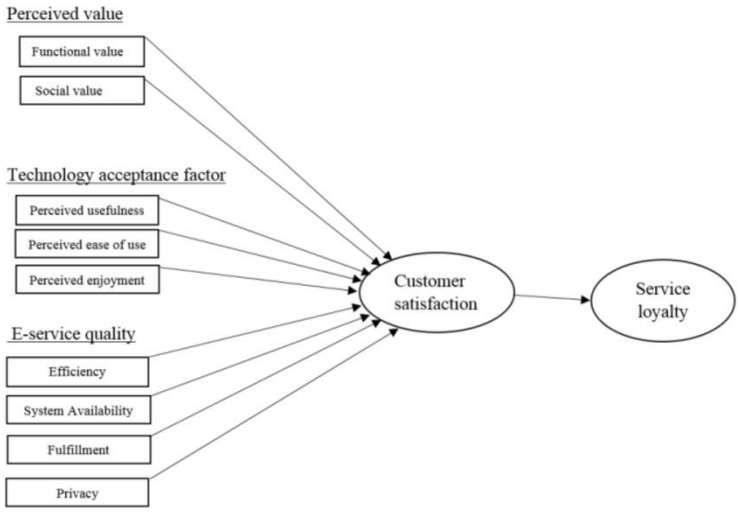
Various factors can influence e-service satisfaction and intentions to use. These factors include:

1. **Service quality**: The overall quality of the e-service, including reliability, responsiveness, assurance, tangibles, and empathy, significantly impacts user satisfaction and intentions to use.
2. **Usability**: The ease of use, navigation, clarity of instructions, and simplicity of the e-service interface are essential for user satisfaction and intentions to use.
3. **Personalization**: The level of personalization and customization options available in the e-service can enhance user satisfaction and increase intentions to use.
4. **Communication and support**: Effective communication channels, prompt customer support, and responsive feedback mechanisms contribute to user satisfaction and intentions to use.
5. **Security and Privacy**: User trust in the e-service is crucial. Robust security measures, transparent privacy policies, and protection of personal information contribute to user satisfaction and intentions to use.
6. **Performance and Reliability**: The speed, availability, and consistent performance of the e-service influence user satisfaction and intentions to use.
7. **Value Proposition**: The perceived value and benefits offered by the e-service compared to alternatives impact user satisfaction and intentions to use.
8. **Social Influence**: Recommendations, reviews, and positive word-of-mouth from friends, family, or other users can influence user satisfaction and intentions to use.

PERCEIVED E-SERVICE QUALITY AND E-CUSTOMER SATISFACTION

Perceived e-service quality refers to the customers' subjective evaluation of the overall quality of an online service or platform. It encompasses various dimensions such as reliability, responsiveness, assurance, tangibles, and empathy. Perceived e-service quality directly impacts e-customer satisfaction. When customers perceive the online service to be reliable, responsive, and secure, it enhances their overall satisfaction.[8] Assurance, which includes trustworthiness, credibility, and expertise of the online service provider, also contributes to customer satisfaction. Tangibles refer to the appearance, design, and functionality of the online platform, and when customers find them visually appealing and user-friendly, it positively influences their satisfaction. Additionally, empathy, which refers to the level of personal attention, care, and understanding shown by the online service provider, plays a role in customer satisfaction. Meeting or exceeding customer expectations is crucial for enhancing e-customer satisfaction.[1] If the online service fulfills customers' needs, provides value, and offers a seamless and pleasant experience, it leads to higher satisfaction levels. On the other hand, if the e-service falls short in terms of performance, usability, or meeting customer expectations, it can result in lower satisfaction levels.[3]. To improve e-customer satisfaction, businesses should focus on enhancing perceived e-service quality. This can be achieved by investing in reliable and robust technology infrastructure, providing responsive customer support, ensuring secure transactions and data privacy, optimizing the user interface for ease of use, and delivering personalized experiences.

Figure: 02



RESEARCH PROBLEM

Any business's ability to succeed will depend on the quality of its services and how well customers received them. Customers will provide a bad review of the business if the services are not up to par. Based on how the consumer feels about the service they received, customer satisfaction will be determined [2].Every consumer will see the company's promises as having a consistent degree of trust, which will result in the customer having a favourable opinion before making a purchase. The true impression of the service will be determined by how people behave after consuming the goods or services. Blind promises will attract transient clients rather than devoted ones.[5] The retention of customers should be the marketer's primary focus rather than huge profit margins. Marketers must be more aware of consumers' expectations if they want to keep them as clients. Customers often focus on various elements, thus it is important to comprehend all of these factors in order to increase prospective consumer numbers [11].Due to the development of contemporary technology, and numerous devices' features are now being combined into a single unit, backed by telecom companies with reliable internet connections. Because of these factors, more individuals from all across our nation have begun to depend on them, and this growing market penetration has forced them to do consumer research.

RESEARCH PURPOSE

In light of this, the majority of these studies are classified as both descriptive and explanatory. The five dimensions of e-service quality—reliability, responsiveness, trust, and empathy—relate to customer satisfaction. Thus, how purpose of use is mediated by trust, responsiveness, and enjoyment.[6] One of the most crucial strategic and successful quality management practices nowadays is the monitoring of customer satisfaction. It also demonstrates the anticipated performance of service providers. When a service meets the expectations of the consumer, customer satisfaction increases.[14]

ANALYSIS AND INTERPRETATION OF DATA

Relationship between the nature of the respondents and their opinion towards web loyalty

It is an attempt to study the relationship between the nature of the respondents and their opinion on the *web* loyalty. For which, the age of the employees are considered as important characters influencing their behaviour. It is discussed one by one in detail as below.

Table 1: Age of the respondents and their opinion on the web site loyalty

Factors	Age group	N	Mean Rank	Chi-Square value (df-2) / Sig.
Service reliability	Young	101	124.68	0.263 / 0.779
	Middle	80	122.34	
	Old	69	120.36	
Responsiveness	Young	101	121.98	0.021 / 0.814
	Middle	80	129.19	
	Old	69	126.37	
Personalization and customization	Young	101	125.25	0.331 / 0.764
	Middle	80	123.09	
	Old	69	128.66	
User experience and interface design	Young	101	125.64	0.137 / 0.856
	Middle	80	128.71	
	Old	69	121.58	
Service quality consistency	Young	101	121.26	0.912 / 0.634
	Middle	80	128.59	
	Old	69	128.12	
Social proof and reputation	Young	101	119.06	3.369 / 0.172
	Middle	80	124.30	
	Old	69	136.31	
	Total	250		

The result from the above table shows that young age respondents have preferred more service reliability (124.68) .The middle aged respondents like responsiveness (129.19) and User experience and interface design (128.71), Service quality consistency (128.59) as good opinion on web loyalty. The old aged respondents opined that social proof and reputation (136.31) and Personalization and customization (128.66). According to the Kruskal-Wallis test, that there is no age difference in respondents' opinions regarding the various forms of web loyalty.

DISCUSSION

1. **Service Reliability**: The consistency and dependability of the website's performance and service delivery play a crucial role in building customer loyalty. Reliability entails ensuring that the website is accessible, functions properly, and delivers services as promised. Reliability issues, such as frequent downtime or slow loading times, can negatively impact website loyalty.
2. **Responsiveness:** Customers value websites that are responsive to their needs and provide timely assistance. Prompt and helpful responses to customer inquiries, complaints, or support requests contribute to positive customer experiences and increased loyalty. Responsiveness also includes factors such as quick order processing, efficient checkout processes, and effective communication throughout the customer journey.
3. **Personalization and Customization**: Websites that offer personalized experiences and tailored recommendations based on customer preferences and behaviors tend to foster higher levels of loyalty. Customization features, such as personalized product suggestions or account settings, create a sense of exclusivity and make customers feel valued, increasing their loyalty to the website.
4. **User Experience and Interface Design**: The overall user experience and user interface design greatly influence website loyalty. A user-friendly interface, intuitive navigation, clear information presentation, and visually appealing design enhance customer satisfaction and encourage repeat visits. Conversely, a complicated or confusing interface can frustrate users and lead to decreased loyalty.
5. **Service Quality Consistency**: Consistency in delivering high-quality services is vital for website loyalty. Customers expect the same level of quality and experience every time they interact with the website. Any decline in service quality or inconsistency can erode loyalty and drive customers to seek alternatives.
6. **Trust and Security**: Trustworthiness and data security are critical factors influencing website loyalty. Customers need to feel confident that their personal information is protected and that transactions

conducted on the website are secure. Implementing robust security measures and transparent privacy policies helps build trust and foster loyalty.

7. **Value Proposition**: The perceived value offered by the website in terms of products, services, pricing, promotions, or additional benefits plays a significant role in customer loyalty. Websites that provide unique value propositions, such as competitive prices, exclusive offers, or superior product/service quality, are more likely to attract and retain loyal customers.
8. **Social Proof and Reputation**: Positive online reviews, testimonials, and recommendations from other customers can influence website loyalty. Customers often rely on social proof to make decisions, and a website with a strong reputation and positive feedback from others is more likely to inspire loyalty.
9. **Continuous Improvement and Innovation**: Websites that consistently improve their services, introduce new features, and stay ahead of competitors through innovation are more likely to retain loyal customers. Regular updates, new functionalities, and enhanced user experiences demonstrate a commitment to providing an excellent service, which contributes to loyalty.

MANAGERIAL IMPLICATIONS

Businesses need to discover a number of crucial success characteristics if they want to surpass their rivals. Among them, client retention and satisfaction are crucial for the existence of the business.[6] Therefore, the company's top priority is to increase client pleasure and loyalty. The consumer must navigate via the online portal to complete the transaction in an e-business setting. As a result, website design is crucial to the company's ability to survive. To increase the customer's perceived value of browsing the website, the company has designed a well-organized, readable, and user-friendly website.[9] Only websites that are both informative and user-friendly will result in greater consumer satisfaction. Consumer happiness is the foundation of consumer loyalty. Evidently, the look and feel of websites affects client loyalty and eventually determines a company's success or failure.[1].

CONCLUSION

Positive outcomes for the quality of e-services might result from satisfied and loyal customers. They may also spread the word about the site favourable, which would increase its visibility and traffic. Repeated use of the website and subsequent purchases or participations are further signs of consumer loyalty. [3]. The website may learn from its users' frequent interactions, adapt to their tastes, and deliver an even higher-quality e-service in response to their demands and preferences. Because of the good associations they have formed with the website, pleased and devoted clients are more tolerant of occasional service outages. [11].Forgiveness like this may help keep customers coming back and lessen the blow to an e-service's reputation for excellence. In conclusion, measurement validation assures the validity and reliability of measurement scales used to evaluate customer happiness and brand advocacy. Customer satisfaction and loyalty are important to the profitability and reputation of an online business since they lead to things like favourable reviews, referrals, repeat business, and even forgiveness from dissatisfied customers. Organisations should work on boosting these aspects of their e-services and regularly monitor and adjust to customer input in order to raise satisfaction and adoption rates. Businesses may encourage pleasant user experiences, promote customer loyalty, and push continuing use of their e-services by offering high-quality services, giving outstanding customer support, assuring user-friendly interfaces, and protecting data security.[14]

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BEHAVIOURAL ANALYSIS OF CONSUMER'S TOWARDS SELECTION OF MOBILE NETWORK SERVICE

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ABSTRACT

Behavioral analysis of mobile network services involves the systematic examination of user interactions, preferences, and activities within the mobile network environment. The analysis aimse to gain insights into how individuals engage with various aspects of the service, ranging from communication patterns and data usage to application preferences and device usage habits. By collecting and analyzing large volumes of user data, including call records, text messages, app usage, location information, and more, mobile network service providers can create comprehensive profiles of user behavior. This behavioral analysis has several key objectives. Firstly, it helps service providers understand customer needs and preferences, allowing them to tailor their offerings to better suit user demands. Secondly, it enables the identification of usage trends, peak activity periods, and network congestion points, leading to optimized resource allocation and improved service quality. Thirdly, behavioral analysis can contribute to the development of personalized marketing strategies, as insights gained from user behavior can guide targeted promotional efforts. However, the analysis of user behavior also raises important ethical and privacy considerations. Striking the right balance between data collection for analysis and safeguarding user privacy is essential. Mobile network service providers must implement robust data protection measures, including anonymization and user consent mechanisms, to ensure that sensitive information is handled responsibly. In conclusion, behavioral analysis of mobile network services empowers providers to enhance their offerings, optimize network performance, and develop tailored marketing strategies. Through the responsible and ethical application of data analysis techniques, providers can better understand user behavior while respecting individual privacy rights.

Keywords: Mobile Network Service, Network Virtualization, Connectivity, Marketing and Promotions

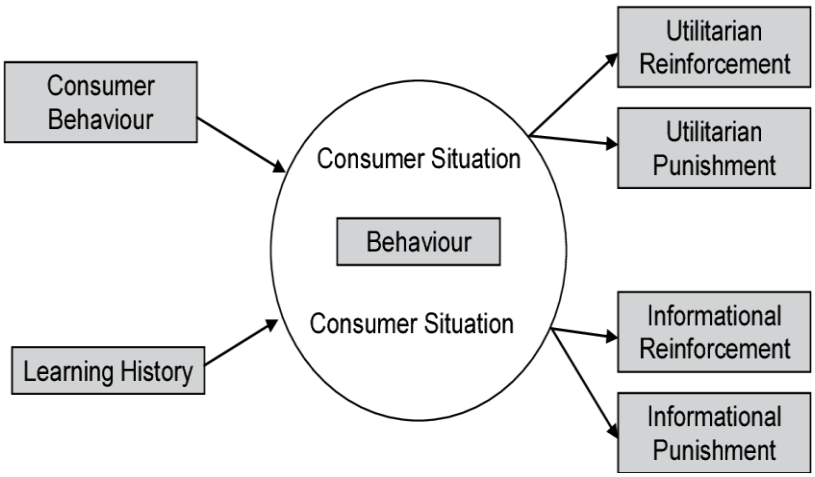
INTRODUCTION

In recent times, there has been a significant surge in mobile commerce both domestically and internationally, leading to an increase in consumers' consumption through mobile terminal networks. Hence, this research aims to investigate consumer behaviour within the mobile Internet context, with the intention of providing valuable insights for scholars and researchers in the field. In recent years, there has been a notable surge in the growth of China's mobile business sector, as well as its collaboration with foreign entities [9].This growth is mostly attributed to the increasing number of wireless Internet users, who have witnessed a significant rise in the utilisation of mobile phones, handheld computers, and other similar devices for accessing the internet. The advent of 3G applications has contributed to the ongoing innovation of mobile business applications. The significance of doing research on consumer behaviour and business model innovation within the mobile Internet environment cannot be overstated, particularly in relation to the promotion of the mobile e-commerce application model.[5] The paper addressed several topics related to consumer behaviour in the mobile Internet environment, including the decision-making process, factors influencing consumer behaviour, and the consumer behaviour model. Subsequently, a comparative analysis of the consumer behaviour characteristics between these two environments is conducted. This analysis serves as the foundation for constructing a model that specifically addresses consumer behaviour in the mobile Internet environment.

THEORETICAL BACKGROUND

The Mobile Phone Network service has garnered global recognition as a significant instrument for the socio-economic advancement of a nation. Given the widespread reliance on mobile phones for communication, banking, internet access, and other activities, it is evident that mobile phone service providers are implementing diverse features and technologies in order to attract customers. The service suppliers face the problem of identifying the key characteristics that impact client preference. [8]Customers typically seek to purchase products that possess multiple features that align with their specific needs. As the level of importance placed on quality perception increases, customers are exhibiting heightened levels of discernment, increased expectations, reduced tolerance, and are being contacted by several service providers with comparable value propositions. The primary objective of service providers is to enhance client satisfaction and establish enduring customer relationships. In contemporary times, mobile phones are experiencing a gradual decline in cost, rendering them more accessible and inexpensive to individuals. Concurrently, service providers are actively launching novel schemes, offers, and technological advancements within their services.[11]

Figure: 01

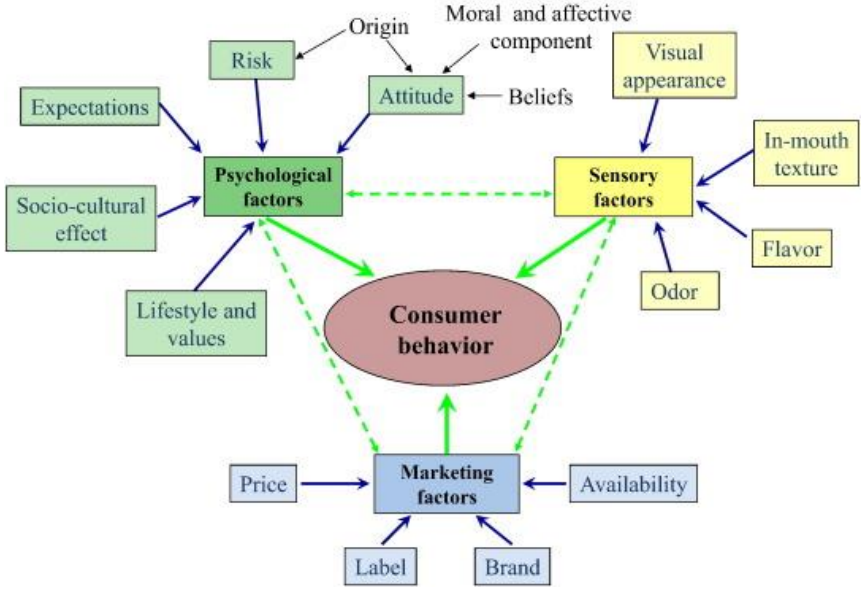


THE CONSUMER BEHAVIOR IN TRADITIONAL MARKET ENVIRONMENT

Consumption is an economic phenomenon wherein individuals fulfil their wishes by acquiring consumer goods. It encompasses various aspects, such as the determinants of consumer demand, the methods employed by consumers to fulfil their consumption demands, and the factors that influence consumer decision-making.[6] Consumption can be categorized into two main types: productive consumption and non-productive consumption. Productive consumption include consumption related to producing activities, while non-productive consumption includes spending in areas unrelated to production. In the study of consumption, consumer behaviour often focuses on the consumption patterns and choices made in daily life. Consumers possess both a limited and comprehensive comprehension. In a broader sense, it encompasses the actions undertaken by consumers to acquire, utilize, and dispose of consumer goods, as well as the decision-making processes preceding these actions. This broader perspective also encompasses the acquisition of consumer income and the intricate series of processes involved. The behaviour of consumers in a typical market setting is shaped by several psychological factors, such as individual personality traits, preferences, motives, and emotions. Additionally, the external environment, which encompasses elements like social culture and marketing efforts, also plays a significant role in influencing consumer behaviour. [12]In the realm of academia, numerous academics have undertaken the task of investigating the principles governing consumer purchasing in conventional market settings. These investigations have encompassed various theoretical frameworks, including customary theory, information processing theory, risk reduction theory, marginal utility theory, and other theories pertaining to consumer buying behaviour. These theoretical perspectives offer valuable insights and can be effectively employed in the analysis of consumer purchasing patterns. Elucidate the purchasing behaviour of consumers. Scholars have extensively conducted research on the consumer behaviour model and have proposed several representative models, including the general model of consumer buying behaviour, the stimulus-

response model by Kotler, and the Nicosia model. These patterns have the potential to elucidate the causal relationship between either all or specific variables in consumer purchasing behaviour, as perceived from a particular perspective. Enterprises must adhere to the fundamental principles of consumer behaviour, known as AIDMA, during the marketing process. This entails utilizing advertising messages to capture the attention of consumers, generate their interest, cater to their needs and desires, establish a lasting impression in their minds, and ultimately prompt them to make a purchase. The purchasing decision-making process of customers can vary in complexity, as it is influenced by factors such as consumer preferences for specific goods, pricing considerations, personal capabilities, and prevailing economic situations. In a broader context, the consumer's decision-making process encompasses five distinct stages: problem recognition, information acquisition, appraisal of alternatives, purchase, and post-purchase evaluation.

Figure: 02

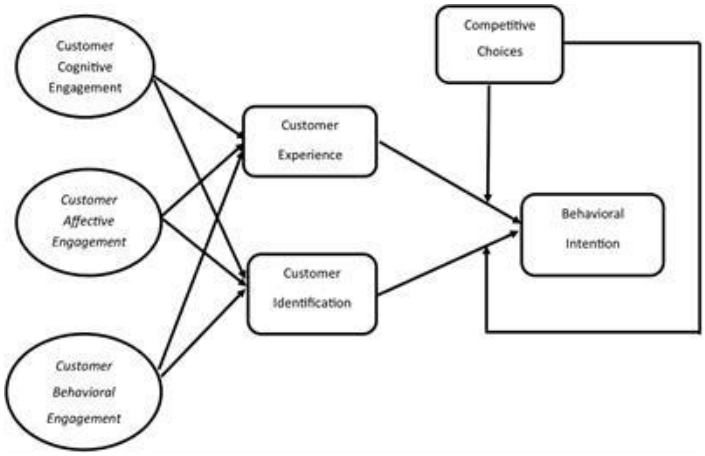


MOBILE PHONE NETWORK SERVICES IN INDIA

The mobile phone network services sector in India is characterized by intense competition and rapid evolution. The nation possesses an expansive consumer market characterized by a steadily increasing population of individuals utilizing mobile phones. India is home to numerous prominent network service providers that offer a comprehensive array of services to meet the varied demands of clients. These service providers offer phone calling, data services, texting, and a range of value-added services to their subscribers.[7] The affordability of mobile network services is identified as a significant determinant influencing consumer behaviour in India. Service providers have implemented cost-effective plans and packages in order to enhance the accessibility of their services to a broader demographic. The proliferation of cost-effective smartphones and accessible data plans has resulted in a notable surge in the utilisation of mobile internet, facilitating users' access to a wide range of online services and applications. In recent years, there has been a significant transformation in the mobile network services sector due to the implementation of 4G networks and the continuous introduction of 5G technologies. Reliance Jio emerged as a significant market disruptor with its provision of cost-effective data plans and complimentary voice call services, resulting in heightened competition and a consequential alteration in consumer inclinations. The factors of network coverage and quality continue to be crucial concerns for consumers in the Indian market. Given the expansive geographical scope of the nation, consumers possess an expectation for network coverage that is dependable, particularly in urban locales as well as remote and rural locations. Service providers are consistently extending their network infrastructure in order to improve coverage and provide higher data speeds in response to the growing demand. The availability of supplementary services and features constitutes an additional determinant of consumer behaviour. Service providers offer a range of plans that are customized to cater to specific customer demographics.[6] These plans encompass alternatives

such as data-heavy plans, family plans, and unlimited calling options. Value-added services, such as the provision of video streaming, music subscriptions, and mobile wallets, are being implemented as a means to augment and enrich the overall consumer experience. Furthermore, the influence of consumer views and recommendations is of considerable importance in shaping decision-making processes. The influence of positive word-of-mouth referrals and social media on consumer decisions is significant, resulting in market share fluctuations across network service providers. In the dynamic landscape of the Indian mobile network services industry, consumers are displaying a growing inclination towards achieving a harmonious equilibrium among factors such as cost-effectiveness, network performance, and supplementary offerings. In order to maintain competitiveness within this dynamic environment, it is imperative for providers to remain cognizant of the evolving demands and preferences of consumers.

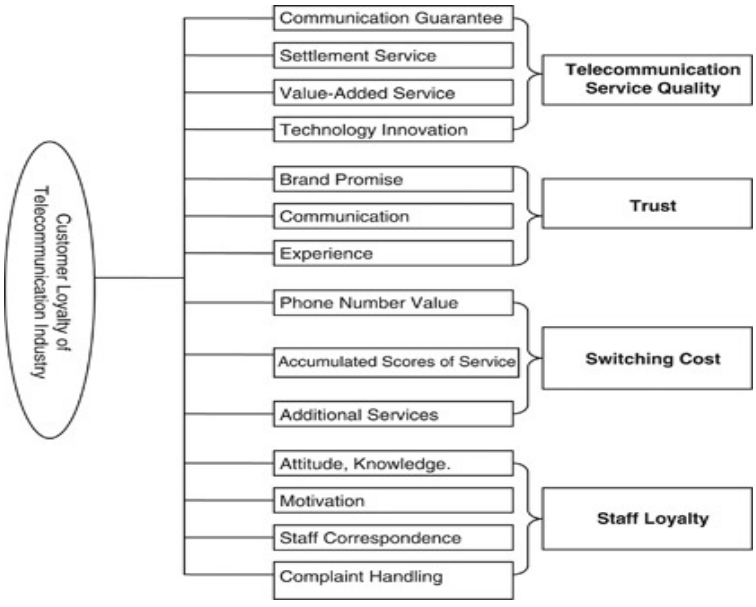
Figure: 03



EMERGING TRENDS IN MOBILE PHONE NETWORK SERVICES IN INDIA

Mobile phone network services in India are witnessing several emerging trends that are reshaping the industry. These trends are driven by technological advancements, changing consumer preferences, and the increasing need for connectivity.

Figure: 04



The Emerging Trends in mobile phone Network Services in India:

1. **5G Technology**: The deployment of 5G technology is one of the most significant trends in the mobile network services sector. Service providers are gradually rolling out 5G networks in select cities, lower latency, and improved network capacity. The advent of 5G is expected to revolutionize mobile connectivity, enabling new applications such as Internet of Things (IoT), augmented reality (AR), and virtual reality (VR).
2. **Internet of Things (IoT):** With the proliferation of connected devices, IoT is gaining traction in India. Mobile network services are playing a crucial role in supporting IoT applications by providing reliable connectivity to a wide range of devices, including smart homes, wearable's, and industrial sensors. Service providers are focusing on developing IoT-specific plans and solutions to cater to this emerging market.
3. **Digital Payments and Financial Services**: Mobile phones are increasingly becoming a means for financial transactions in India. Mobile network service providers are collaborating with banks and payment service providers to offer mobile banking, digital wallets, and contactless payment solutions. These services are driving the adoption of cashless transactions and transforming the way people manage their finances.
4. **Content Streaming and OTT Services**: The demand for online content streaming and Over-The-Top (OTT) services has seen tremendous growth in India. Mobile network service providers are partnering with content providers to offer bundled services, data packs, and exclusive content subscriptions. This trend reflects the changing consumption patterns of users who prefer to stream movies, TV shows, and music on their mobile devices.
5. **Network Virtualization and Cloud Services**: To enhance network efficiency and scalability, service providers are adopting network virtualization and cloud technologies. Virtualized network functions and cloud-based services enable faster deployment of new services, efficient resource allocation, and cost optimization. This trend allows network providers to deliver innovative services with increased agility and flexibility.
6. **Focus on Rural Connectivity**: With a significant population residing in rural areas, there is a growing emphasis on expanding network coverage and connectivity in these regions. Mobile network service providers are investing in infrastructure development to extend coverage to remote areas, offering affordable plans and services tailored to rural consumers' needs.
7. **Enhanced Customer Experience**: Customer experience is a key focus area for mobile network service providers. They are leveraging technology to improve customer service, enhance self-service options, and provide personalized offers and recommendations. Chabot's, AI-powered support systems, and digital touch points are being used to offer seamless and convenient customer interactions.

Factors that Influence Consumers' behavior when selecting a Mobile Network Service

1. The selection of mobile network services is significantly influenced by consumer behaviour. Gaining insight into the various determinants that impact consumers' decision-making process can assist service providers in customizing their offerings and devising marketing tactics that more effectively cater to customers' demands. Several significant elements influence consumers' behaviour when they are in the process of selecting a mobile network service.
2. **Coverage and Network Quality**: Consumers prioritize reliable network coverage and high-quality service. They consider factors such as signal strength, call clarity, data speed, and availability of network coverage in their area. Positive experiences with a particular network provider's coverage and network performance can greatly influence their choice.
3. **Pricing and Value for Money**: Consumers evaluate the pricing structure, plans, and packages offered by mobile network service providers. They seek competitive pricing, transparent billing, and value for money in terms of the services and features included in their subscription. Consumers compare prices, benefits, and discounts across different providers before making a decision.

4. **Reputation and Trust**: Consumers often rely on the reputation and trustworthiness of a mobile network service provider. They consider factors such as the provider's brand image, customer reviews, ratings, and recommendations from friends or family. A positive reputation for reliable service and customer support can influence their decision.
5. **Service and Support**: Consumers value good customer service and support when selecting a mobile network service. Factors such as responsive customer care, ease of problem resolution, and availability of support channels (e.g., phone, chat, email) contribute to their overall satisfaction. Positive experiences with customer service can create a sense of trust and loyalty towards a particular provider.
6. **Device Compatibility**: Consumers consider the compatibility of their mobile devices with the network services offered. They check if the network supports their preferred smartphone models, operating systems, and features such as 5G connectivity or specific apps. The availability of seamless device integration and support can affect their choice.
7. **Additional Services and Features**: Consumers may look for additional services and features provided by a mobile network service. These may include data plans, international roaming options, family or shared plans, entertainment offerings, rewards programs, or bundled services (e.g., combining mobile, TV, and internet services). The availability and attractiveness of these extra offerings can influence consumer decisions.
8. **Personal Recommendations and Influences**: Consumers often seek recommendations and opinions from friends, family, or online communities. Word-of-mouth referrals and social media influence can shape their perception of different mobile network providers. Positive reviews and personal experiences shared by others can sway their decision-making process.
9. **Marketing and Promotions**: Effective marketing campaigns, advertisements, and promotional offers can catch the attention of consumers. Creative messaging, targeted advertising, and exclusive promotions may influence consumers to consider or switch to a particular mobile network service.

Objectives of the study

1. To identify the behavioral analysis of consumers' towards selection of mobile network service
2. To understand factors that influence consumers' behavior towards mobile network service.

RESEARCH METHODOLOGY

The study is an empirical research and is based on survey method. Samples of 200 customers were collected using simple random sampling method. Primary data were collected directly from the customers by using a questionnaire with the help of interview schedule. The relevant secondary data is has been collected from the periodicals. The Collected data was then coded, calculated and analyzed using the statistical tools.

ANALYSIS, FINDINGS AND DISCUSSION

Accepting mobile phones offers a multitude of benefits across various aspects of modern life. From personal convenience to business efficiency, the advantages are substantial. Firstly, mobile phones provide unparalleled connectivity, allowing individuals to stay in touch with family, friends, and colleagues no matter their location [9].This fosters better communication and helps maintain relationships. Secondly, mobile phones offer access to a wealth of information through the internet. Users can instantly obtain news updates, research topics of interest, and access educational resources, contributing to continuous learning and awareness. In the business realm, accepting mobile phones can enhance productivity and communication. Employees can remain reachable even when away from their desks, facilitating swift decision-making and collaboration. Moreover, mobile phones enable businesses to tap into the growing market of mobile commerce, expanding their reach and customer base. Mobile phones also play a crucial role in emergency situations. They serve as lifelines during crises, allowing individuals to call for help, receive emergency alerts, and access vital information.[15]. Furthermore, the integration of various technologies into mobile phones, such as GPS and cameras, simplifies tasks like navigation and documentation. This versatility has transformed mobile phones into powerful tools for creativity, organization, and problem-solving. However, it's important to note that accepting mobile phones also requires

addressing challenges like privacy concerns, digital security, and the potential for addiction. Striking a balance between the benefits and drawbacks is crucial to fully harness the advantages of mobile phone acceptance in today's interconnected world.

Table 1: Benefits of accepting mobile phone

Benefits	Mean	Std. Deviation	Mean Rank
Network Quality	3.27	1.159	5.43
Pricing and Value for Money	3.50	1.315	6.00
Reputation and Trust	3.46	1.168	5.95
Service and Support	3.31	1.104	5.58
Device Compatibility	2.92	1.185	4.54
Additional Services and Features	2.98	1.447	4.99
Personal Recommendations	3.06	1.161	4.88
Marketing	3.26	1.116	5.35
Promotions	3.57	1.132	6.21
Coverage	3.53	1.256	6.08

The result shows that the respondents prefer the advertisement mostly for knowing the offer and discounts announced through the advertisement (6.21), and they feel the advertisements are reaching them easily through their mobile (6.08) and instant awareness is possible through the mobile advertisements (6.00). Fourthly, the respondents feel that advertisement do not disturb them (5.95), followed by the social media marketing (5.58) and getting information about the goods and services through the advertising (5.43) are preferred most.

Table 2: Friedman Test

N	200
Chi-Square	85.561
Df	9
Sig.	0.000

According to the Friedman ranking, the Chi-Square value (85.561) obtained for a degree of freedom of 9 is statistically significant at a significance level of 1% ($p < 0.001$). The findings suggest that the promotional content and discounts featured in mobile advertising have a greater appeal to individuals.

CONCLUSION

It is imperative to acknowledge that customer preferences and behaviour may exhibit variability contingent upon individual needs, demography, geographical location, and market rivalry [12].It is imperative for service providers to engage in market research, acquire customer insights, and consistently adjust their tactics in order to effectively respond to evolving consumer expectations. The present study highlights the influential patterns in mobile phone network services in India that are actively impacting the trajectory of the business[13].Service providers are strategically adjusting their operations in response to the changing needs and preferences of consumers. This includes the provision of sophisticated connectivity solutions, the incorporation of value-added services, and the enhancement of the overall customer experience [5].The ongoing evolution of technology is anticipated to bring forth additional improvements and innovations in the mobile network services environment in India.

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CUSTOMER PERCEPTION ON GREEN BANKING PRACTICES IN PUBLIC SECTOR BANKS: AN EMPIRICAL STUDY

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ABSTRACT

The term "green banking" has only been used in the financial industry during the previous two decades. Since banks use so much paper for their everyday operations, it is in their best interest to encourage the public to choose eco-friendly alternatives. In a developing economy like India's, banks have more influence on the populace than does the government. Banks are seen as an accessible entry point for influencing the people to adopt eco-friendly lifestyles. This research thus aims to assess the efficiency of state-owned banks by comparing them to private institutions that have also adopted green banking practices. The survey's participants are a random sample of bank customers. The research primarily focuses on the chosen public sector banks' efforts to incorporate green banking practices. This research examines the top tier of public sector banks to see how well those institutions are doing in terms of implementing green banking strategies.

Keywords: Customer Perception, Green Banking Practices, Green credit card and Public Sector Banks

INTRODUCTION

When compared to other financial systems, "green banking" has a comparatively high sustainability rating. Green banking is preferred by many clients nowadays since it is better for the environment and saves them valuable time in their busy schedules. According to a poll of the banking industry, 58% of bank clients think about the institution's effect on society and the environment while making financial decisions. Investing in renewable energy and associated initiatives is possible via green banking. These initiatives are focused on cutting down on carbon emissions and the processes that produce them. The green banking idea is used to promote eco-friendly goods and the actions that enable them succeed. Customers in the banking industry are increasingly making the switch to "green banking" in recent years. Green bonds issued by commercial banks in 2020 were estimated to be worth around $9.83 billion. This figure is in contrast to the 2017 bond prices of the top five denominations. China ranked second worldwide in terms of the sustainability of the green bonds to which they were referred. This hypothesis can assist the financial system become more sustainable, which will improve people's quality of life. According to this school of thought, banks should place a premium on risk and opportunity management that takes into account environmental and social governance. Sustainable, ethical, and legally sound investments are what the banking industry should priorities. According to this hypothesis, in order to ensure the long-term viability of the banking system, financial institutions should use trend banking for their clientele. Banks may utilize the green banking system to assist their clients in using renewable energy and other environmentally friendly practices. That's why it makes sense for banks to promote environmental responsibility in order to boost client loyalty.

Figure: 01

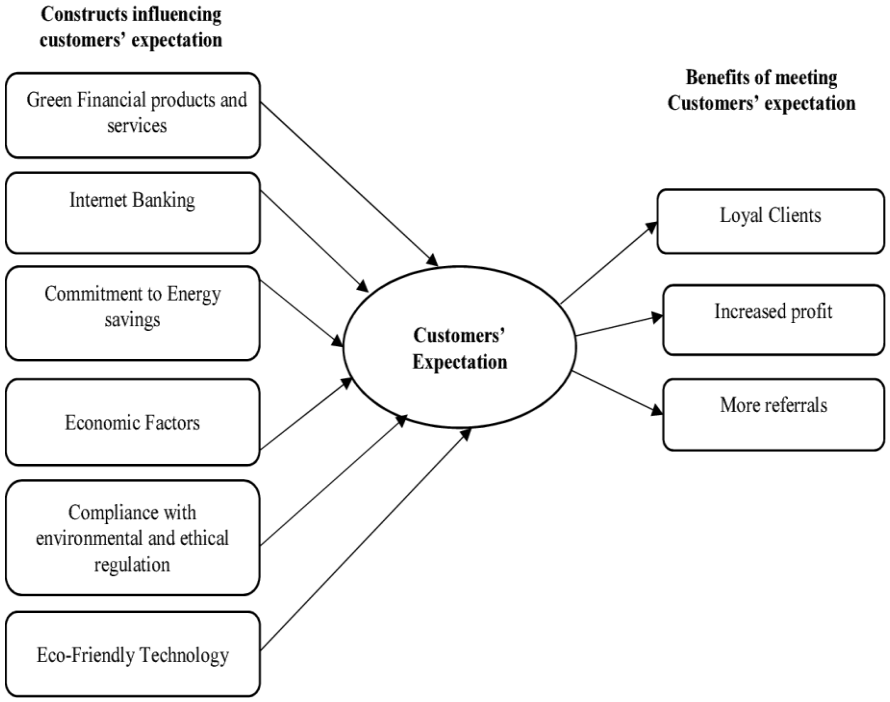


Fig. 1. Conceptual Framework

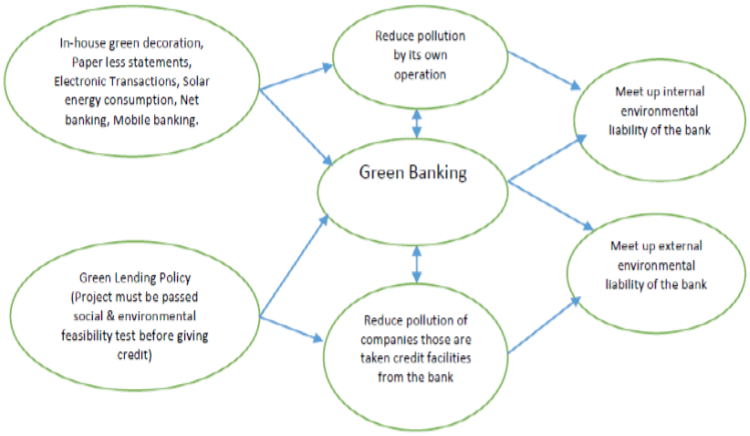
1. **Environmental Awareness**: Customers today are more environmentally conscious and concerned about the impact of their actions, including their financial choices. Green banking practices, such as offering eco-friendly loans for renewable energy projects or supporting environmentally friendly businesses, can resonate positively with environmentally conscious customers.
2. **Brand Reputation**: Banks that actively promote and practice green banking initiatives often enjoy a positive reputation in the market. Customers may prefer to associate with a bank that aligns with their values and actively contributes to sustainability efforts.
3. **Trust and Loyalty:** Banks that adopt green practices are likely to gain the trust and loyalty of customers who prioritize sustainability. When customers perceive that a bank is genuinely committed to environmentally responsible actions, they may be more inclined to maintain long-term relationships with that institution.
4. **Transparency and Communication**: Clear communication of green initiatives is essential to win the trust of customers. Banks that provide transparent information about their green policies, practices, and the environmental impact of their operations can build a stronger bond with their customers.
5. **Financial Incentives**: Customers may be more motivated to engage in green banking practices if they see financial benefits such as lower interest rates on eco-friendly loans or better terms for green investments.
6. **Community Impact**: Green banking practices can extend beyond individual customers and impact the broader community. Customers may appreciate banks that actively support local environmental projects, conservation efforts, or community-based sustainable initiatives.
7. **Technology and Convenience**: Customers expect a seamless and convenient banking experience. Banks that incorporate digital solutions for green initiatives, such as paperless transactions and eco-friendly digital products, can be appealing to environmentally conscious customers.

8. **Employee Values**: Customers may consider a bank's internal practices and employee values when evaluating green banking efforts. A workforce that is committed to sustainability can enhance the perception of the bank's dedication to green practices. It is important to note that customer perceptions can vary based on demographic factors, regional differences, and individual preferences. Conducting customer surveys and feedback collection can provide specific insights into the perceptions of green banking practices for a particular bank.

THEORETICAL BACKGROUND

The term "green banking" refers to an initiative to reduce the negative effects of banking on the environment by encouraging more sustainable practices. This may be done in a variety of ways, such as switching to internet banking from visiting a physical bank, creating commercial deposits and money market accounts online instead of at a traditional bank, etc. By finding and seizing opportunities that benefit consumers, "green banking" aims to provide market-based solutions to environmental concerns including climate change, deforestation, air quality issues, and biodiversity loss. Banks should support pollution-fighting initiatives and environmentally friendly technologies to help cut down on carbon emissions from the outside world. While the banking industry as a whole isn't usually thought of as polluting, modern banking operations are so large that they leave a sizable carbon footprint due to things like excessive paper use, nonexistent green building standards, and heavy reliance on artificial lighting and cooling. Financial institutions need to build a sustainable business model and implement technologies, processes, and products that significantly reduce their carbon footprint.

Figure: 02

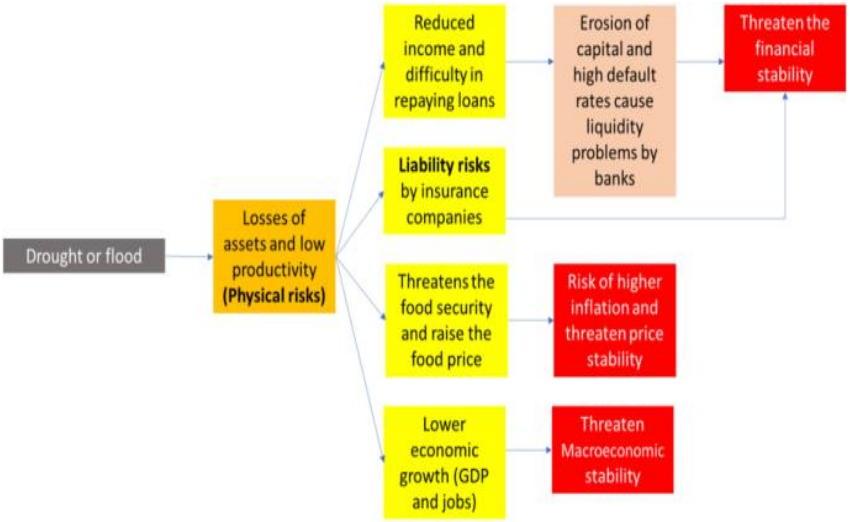


SUSTAINABLE BANKING IN THE INDIAN CONTEXT

In recent years, "green banking," also known as "sustainable banking" or "ethical banking," has become more popular in India's financial sector. Customers, regulators, and investors are increasingly worried about the effect financial institutions have on the environment and society as environmental concerns grow. Indian financial institutions have been implementing green banking practices in response to these rising concerns. Green banking in India refers to the activity of considering environmental and social concerns while making financial decisions. There has been a shift in the banking industry towards a greater emphasis on green initiatives, responsible investing, and renewable energy. They're doing their part for the environment by promoting cashless transactions, going digital, and cutting down on paper use. Indian financial institutions are not only implementing green policies internally, but also encouraging their clients to do the same. They provide green loans and other green financial solutions to help finance green initiatives and enterprises. By doing so, banks not only appease their environmentally sensitive clientele, but also significantly contribute to India's movement towards a greener and more sustainable economic system. The Reserve Bank of India (RBI) and other authorities have issued several rules and measures to encourage eco-friendly banking. As a result of the RBI's initiatives, banks are more aware of and committed to green banking concepts such as sustainable financing and environmental risk management integration. Green banking is only starting to gain traction in India, but it has

the potential to revolutionize the banking industry by encouraging a more eco-friendly and ethical approach to money management. More and more Indian banks are likely to invest in sustainable practices for a greener future in response to rising demand for green banking goods and services as consumers become more conscious of the effect of their financial decisions on the environment.

Figure: 03



A ROADMAP FOR GREEN BANKING PRACTICES

A roadmap for green banking practices outlines the strategic steps and initiatives that a financial institution can take to integrate environmental sustainability into its operations. Below is a general outline of the roadmap for implementing green banking practices:

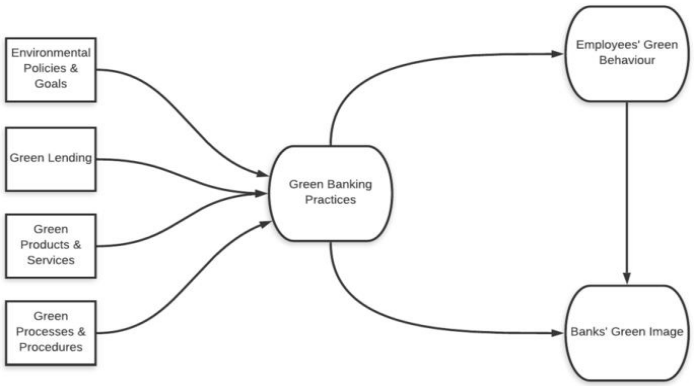
1. **Environmental Policy and Commitment**: Develop a clear and comprehensive environmental policy that reflects the bank's commitment to sustainability. The policy should set specific goals and targets for reducing the bank's environmental impact and supporting sustainable initiatives.
2. **Green Governance Structure**: Establish a dedicated green governance structure within the bank, such as a sustainability committee, to oversee and drive the implementation of green banking practices throughout the organization.
3. **Environmental Risk Assessment**: An environmental risk assessment to identify and understand potential environmental risks associated with the bank's operations, investments, and clients. Develop risk management strategies to address these risks effectively.
4. **Internal Green Initiatives**: Implement environmentally friendly practices within the bank's operations. This includes promoting energy efficiency, waste reduction, paperless transactions, and adopting sustainable technologies.
5. **Green Products and Services**: Green financial products and services, such as eco-friendly loans, green bonds, and investments in renewable energy projects can be developed. These products should contribute to sustainable development and support environmentally responsible initiatives.
6. **Green Financing and Investments**: Integrate environmental criteria into the bank's financing and investment decisions. Prioritize funding for projects that align with sustainability goals, such as renewable energy, clean technologies, and environmentally friendly businesses.
7. **Promoting Environmental Awareness**: Launch awareness campaigns to educate employees, customers, and stakeholders about the importance of environmental sustainability and the bank's green initiatives.

8. **Engaging Stakeholders**: Collaborate with customers, investors, and community partners to promote sustainable practices and initiatives. Engage stakeholders in discussions on sustainable finance and gather feedback to improve green banking efforts.
9. **Reporting and Transparency**: Publish regular reports on the bank's environmental performance and progress toward green banking goals.
10. **Continuous Enhancement**: Continuously review and improve green banking practices based on feedback, emerging trends, and technological advancements. Stay updated with evolving environmental standards and regulations.
11. **Incentivizing Green Behavior**: Offer incentives to customers and employees who actively participate in green initiatives or choose environmentally friendly options. This can encourage further adoption of sustainable practices. By following this roadmap, banks can align their operations with environmental sustainability, mitigate environmental risks, and contribute positively to society and the planet. Green banking practices not only demonstrate corporate responsibility but also create opportunities for banks to attract environmentally conscious customers and investors while fostering a greener and more sustainable economy.

GREEN BANKING PRACTICES IN ENVIRONMENTAL PERFORMANCE

A bank's environmental performance are closely interconnected, reflecting the institution's commitment to sustainability and responsible environmental practices. Green banking refers to the adoption of environmentally friendly and socially responsible policies and practices in a bank's operations, products, and services. Supporting sustainable growth via environmental and social issues is the goal of this approach. A bank's environmental performance measures how effectively it manages its impact on the environment. This includes evaluating the bank's internal operations, such as energy consumption, waste management, and carbon emissions. Additionally, a critical aspect of a bank's environmental performance lies in the financing and investments it undertakes. Banks with strong environmental performance actively fund and promote projects that contribute to environmental conservation, renewable energy, and eco-friendly initiatives. By incorporating green banking practices, banks can reduce their ecological footprint and minimize negative environmental impacts. For instance, transitioning to paperless banking, optimizing energy usage, and adopting eco-friendly technologies can significantly improve a bank's environmental performance. Moreover, when banks actively support and finance sustainable projects, they facilitate the growth of a greener economy while positively influencing their customers and stakeholders. Green banking practices not only enhance a bank's reputation but also attract environmentally conscious customers, who seek financial institutions aligned with their values. As the global focus on environmental sustainability intensifies, the importance of green banking and a bank's environmental performance will continue to grow. Customers, investors, and regulators are increasingly considering these aspects when evaluating a bank's overall performance and social responsibility. Embracing green banking practices and excelling in environmental performance can position a bank as a leader in sustainability, fostering long-term customer loyalty and contributing to a more sustainable future.

Figure: 03



RESEARCH METHODOLOGY

Total sample respondents from the study area is 300 who have been selected using the convenient sampling method. To rank the various perception towards green banking practices Kendall's Coefficient of Concordance was used.

ANALYSIS AND FINDINGS

The demographic nature of the employees of the banks will have an impact on their perception towards the green banking practices. In this study, the age, designation and the level of experience of the employees are considered as demographic factors. The distribution of the respondents based on their nature is presented as below.

Table 1: Demographic nature of the respondents

Nature		Number of respondents	Percent
Age group	Less than 25 years	82	27.33
	25 to 45 years	155	51.67
	More than 45 years	63	21.00
Designation	Chief manager	12	4.00
	Branch manager	60	20.00
	Deputy manager	57	19.00
	Assistant manager	58	19.33
	Assistant cadre	113	37.67
Level of experience	Less than 3 years	31	10.33
	3 to 5 years	129	43.00
	More than 5 years	140	46.67
Total		300	100.0

Source: Primary data

It is inferred from the table 1 that (51.6%) respondents belong to middle age, the sample respondents (37.67 %) are Assistant cadre and (46.67 %) respondents have more than 5 years

PERCEPTION TOWARDS GREEN BANKING PRACTICES

Green home equity loans, Green Commercial Building loans, Green Car loans, Green Fiscal fund and Green credit Cards are the major categories into which respondents' views on their banks' green practices fall. A 5-point Likert scale is used to gauge how people feel about three eco-friendly habits. Table 2 shows the final outcome.

Table 2: **Perception towards green banking Practices in Public sector banks**

Factors	Mean	Std. Deviation	Mean Rank
Green home equity loans	4.19	1.262	3.72
Green Commercial Building loans	3.62	0.717	3.85
Green Car loans	3.57	0.756	3.72
Green credit Cards	3.23	1.038	3.96
Green Fiscal fund	2.31	1.521	2.01

The Table 1 reveals that the Green credit Cards are mostly preferred by the respondents for green banking Practices (3.96). Secondly, they preferred for the Green Commercial Building loans (3.85). Green Car loans and Green home equity loans (3.72). Green Fiscal fund is also found as a reason (2.01). The significance of the ranking given by the respondents tested with the help of Kendall’s W test. The result is given below.

Table 3: Kendall's Coefficient of Concordance

N	300
Kendall's W	0.272
Chi-Square	509.759
df	4
Asymp. Sig.	0.000

The results of the test are shown in Table 3. The Chi-Square statistic for 4 degrees of freedom is 509.759. At the 1% level (0.0000), this is quite substantial. The significance of the order in which the goals were ranked becomes clear from the outcome. "Green banking" describes financial institution programmes that encourage ecologically responsible spending and saving. Green finance is a cutting-edge strategy for ensuring the planet's long-term viability. If banks want to boost economic development, they need to take the initiative. Banks face fierce competition in the global market, where circumstances are continually shifting due to environmental factors. By incorporating environmental concerns into their lending operations, banks may recoup their investment and make polluting businesses more eco-friendly. Customers are beginning to doubt the reliability of fossil fuels as an energy source, which has contributed to the fast expansion of green banks as an attractive alternative to traditional banking institutions. If the public continues to see fossil fuels negatively, investors may stop funding the business, forcing its demise and hastening the transition to renewable energy sources.

DISCUSSION

Understanding the benefits and drawbacks of a green financial system is a major outcome of this study. The vast majority of banking clients now feel that green banking is the most environmentally-friendly option.[6]. Customers are encouraged to participate in green banking via the provision of subsidies and other incentives. Green banking is viewed as a sustainable banking system that is good for the environment by cutting down on paper consumption and protecting forests. Benefits of green banking include the ability to conduct cashless transactions and get efficient service from banks at all hours [4]. Customer satisfaction in the banking industry is directly proportional to the professionalism of bank management and the efficiency with which customers' needs are met. With green banking, clients never have to worry about excessive wait times for help or troubleshooting during financial transactions. The time has come for India to take whatever governmental steps and initiatives are necessary to boost green banking. Banks should take environmental and ecological considerations as part of their lending principle in a rapidly evolving market economy where globalization of markets has increased competition, the use of appropriate technologies.[13]. To achieve sustainable development, the banking and financial sector must be mobilized. India's banks have been slow to embrace environmentally friendly practices known as "green banking," but doing so is urgently necessary to ensure the country's long-term prosperity.

CONCLUSION

Businesses may be hurt by public scrutiny, violent conflict, or consumer boycotts in today's fast-paced, competitive market economy. Banks and other financial organizations' ability to recoup their investments might be affected.[7] They are counted on to play a constructive role in incorporating environmental and ecological challenges into banking principles, which will compel businesses to invest in environmental safeguards, appropriate technologies, and management structures. Sincere implementation of green finance will create a formidable ex ante barrier for polluting businesses traversing other institutional regulatory frameworks. Despite their centrality to India's burgeoning economy, financial institutions there are making very little efforts in this direction.[2] The banking and financial industry need to think about the environment and sustainability. Banks in India are lagging behind on the green banking front. In India, no banks or other financial organisations use the equator records system. They all refuse to sign the UNEP Financial Initiative Declaration. India has to make some serious changes if it is serious about adhering to the suggestions on equator values, which call for the adoption of ecologically friendly approaches to finance activities rather than monetary means. The researchers behind the survey set out to capture the thoughts of Indian consumers [4].The report shows that consumers are welcoming green banking services with open arms. The adoption of environmentally friendly banking technology has minimal obstacles. This research sheds insight on such difficulties. This research has also looked at the many advantages of green services based on technology. As a result, this research has valuable implications for policymakers. Taking into account the results of this research will aid in demonstrating the high quality of the service provided to customers [5].

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HIGHER EDUCATION SYSTEM PRACTICES FOR ENHANCEMENT OF EMPLOYABILITY –AN OVERVIEW

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ABSTRACT

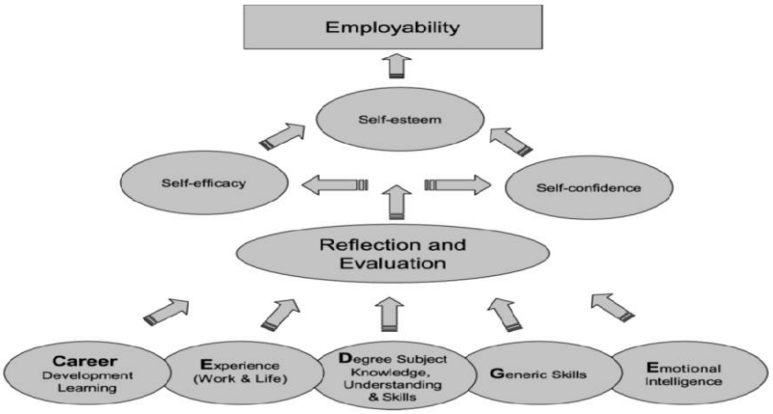
The enhancement of employability has become a key priority for higher education systems worldwide. Institutions are continually adopting various practices to better prepare their students for the job market. One of the primary approaches is integrating experiential learning opportunities, such as internships, co-op programs, and industry projects, to bridge the gap between academic knowledge and practical skills. Technological literacy and digital skills are also being emphasized to align graduates with the demands of the modern workplace. Furthermore, universities are strengthening their ties with industries to ensure that their curricula remain relevant and up-to-date, reflecting the current needs of the job market. By adopting these practices, higher education systems aim to produce job-ready graduates who are equipped with a well-rounded skill set and can make a meaningful contribution to the workforce and society. The research aims to delve into the various strategies employed by higher education institutions to enhance the employability of their graduates, evaluating the impact of these practices on students' job readiness and their ability to meet the demands of today's dynamic workforce.

Keywords: Higher Education System, Enhancement of Employability, Technology Integration And Innovative Pedagogies

INTRODUCTION

There can be no long-term social or economic progress without the foundations of quality higher education and the training of highly skilled and marketable graduates. Long-term social welfare may benefit from graduate education that conforms to global norms. High-quality, student-centered education, as well as the constant modification of course materials and pedagogical approaches to meet the changing demands of the labour market, are now essential features of today's HEIs. Management at these HEIs is guided by antiquated internal standards and quality assurance systems, none of which have been updated to reflect current situations or national best practices. Documentation and document flow are typically the only areas where quality assurance is a concern. Centralization management issues persist in today's educational system. There were obvious conflicts in the education reform, such as antiquated regulations guiding the educational system. However, higher education institutions (HEIs) aren't always keen on receiving a neutral evaluation of their performance. A separate poll was conducted to acquire a more accurate image of the graduates' employability, and this information was used to form a more objective evaluation of the quality of the education provided. These days, commercial developments move at a pace never seen before. Companies in today's fast-paced economy simply do not have the luxury of spending months or even years training fresh college grads. New hires must have more than just a degree to impress their employers. The business world is looking to universities for "corporate ready products" (CRP). It is crucial that universities integrate theory and practice. Colleges need to prioritize five best practices—innovative pedagogies, faculty engagement, student engagement, corporate connectedness, and international student exchange or study abroad programs—to help students acquire the skills they'll need in the modern workplace. The current curriculum and classroom teaching are insufficient to produce the technocrats or leaders of today and tomorrow.

Figure: 01



RESEARCH CONTEXT

A graduate's employability is indicative of the quality of their higher education institution and the level of competition and demand they will face in the job market. The study's authors also sought to define employment so as to examine it from a gender perspective. There is now a discrepancy between the education system and the requirements of the market and the workforce. Employers control the labour market by setting wage rates and other conditions, and they also determine the demand for graduates of higher education institutions.

INNOVATIVE PEDAGOGIES IN HIGHER EDUCATION

Innovative pedagogies in higher education refer to the adoption of new and creative teaching approaches that go beyond traditional lecture-based methods. These pedagogies aim to enhance student engagement, critical thinking, problem-solving abilities, and overall learning outcomes. Several innovative pedagogies have gained popularity in recent years, and some of the key ones include:

1. **Active Learning**: Active learning involves shifting the focus from passive listening to active participation. It includes techniques such as group discussions, case studies, debates, role-plays, and hands-on activities.
2. **Flipped Classroom**: In a flipped classroom, the traditional lecture and homework components are reversed. Students are assigned pre-recorded lectures or readings to review outside of class, and class time is then used for discussions, problem-solving, and interactive activities. This allows for more personalized attention and better utilization of face-to-face time.
3. **Project-Based Learning (PBL)**: PBL involves students working on real-world projects that require them to apply their knowledge and skills to solve authentic problems. This approach fosters critical thinking, collaboration, and creativity while preparing students for practical challenges in their future careers.
4. **Problem-Based Learning (PBL)**: Similar to PBL, problem-based learning centers around solving complex, real-life problems. Students work collaboratively to analyze issues, gather information, and propose solutions. This method encourages self-directed learning and helps students develop problem-solving and analytical skills.
5. **Technology Integration**: Incorporating technology, such as multimedia resources, online simulations, virtual labs, and educational apps, can enhance the learning experience. Technology integration enables active and self-paced learning while catering to various learning styles.
6. **Service-Learning**: Academic coursework and volunteer work are brought together in service-learning. By taking part in community initiatives that are directly related to their coursework, students are able to obtain real-world experience, cultivate empathy, and comprehend the relevance of their academic studies.

7. **Peer Instruction**: Peer instruction involves students teaching and learning from each other through discussions and collaborative activities. This approach encourages active peer engagement, promotes critical thinking, and helps clarify misunderstandings in a supportive environment.
8. **Personalized Learning**: Personalized learning tailors the educational experience to individual student needs, preferences, and pace. By using adaptive learning technologies and flexible content delivery, students can progress through the material at their own speed, focusing on areas where they need more support. As higher education continues to evolve, educators and institutions are continuously exploring and implementing these and other cutting-edge teaching methods to enhance the overall learning experience.

Figure: 02



LITERATURE REVIEW

The study argued that finding such a definition requires first understanding how various stakeholders see employability. There also needs to be a better understanding of what each stakeholder means by "employability" when they use the term. This is because most disagreements extend far beyond the meaning of the term itself, into discussions about whether and how employability should be fostered, and who exactly is responsible for providing for this need. The sector's accountability and measurement problems will persist unless the ambiguity around the definition of employability and the role of HEIs in attaining it is resolved. It evolved from two conference abstracts presented by the author. The purpose of this article is not to propose a definition of employability, but rather to investigate how various stakeholders define the term, who bears responsibility for improving graduates' employability, and what can be done to achieve these goals in the context of higher education.

THE EMPLOYABILITY SKILLS GAP IN HIGHER EDUCATION

The disparity between the skills and competencies that students acquire during their academic journey and the skills demanded by employers in the job market. While higher education institutions play a crucial role in imparting knowledge and academic expertise, there is often a disconnect between the theoretical knowledge gained in classrooms and the practical skills required by employers. Several factors contribute to this gap. Firstly, traditional education systems may focus more on theoretical knowledge and academic achievements, with limited emphasis on hands-on learning and real-world application. This can lead to graduates lacking the practical skills and work experience necessary to excel in their chosen professions. Secondly, the fast-paced nature of the job market and the evolving demands of industries create a constant need for new and relevant skill sets. Higher education curricula might struggle to keep up with these rapid changes, resulting in outdated skill offerings that may not align with current job requirements. Thirdly, the lack of collaboration between educational institutions and employers can hinder the development of programs that cater to industry needs. When universities and colleges are not attuned to the demands of the job market, students may graduate without

the skills that employers are seeking. To address the employability skills gap in higher education, universities and colleges are increasingly integrating practical training, internships, and industry partnerships into their curricula. Experiential learning opportunities and co-op programs help students gain valuable work experience and develop relevant skills while still in college.

TESTING FOR EMPLOYMENT PROMPTNESS

Because there is no generally accepted definition of employability, many methods have been proposed for gauging it. The European Council, for instance, uses an 82% employment rate for those aged 20 to 34 three years following graduation as a benchmark for graduate employability. Similarly, in the United Kingdom, higher education institutions are frequently evaluated in relation to employment rates for recent graduates (DBIS, 2015). This sort of metric is unrefined and flawed in four different ways. First, it places responsibility for increasing citizens' knowledge and skills (termed "employability") on higher education institutions without considering the external elements that may influence an individual's employability and without taking into account the relative and dual dimensions of employability. Both domestic employment and globalization depend heavily on a variety of external circumstances. In order to help students succeed in their home country and beyond, it is essential to have a firm grasp of both the host and global contexts. Second, the employment rate of students has been utilised as a surrogate for marketability. However, employability and employment are two quite different things. Gainful employment is the only metric included in employment statistics. A graduate's employability is a broader indicator of their professional viability. The ability to adapt and thrive in the modern job market is a process, not a static collection of traits or an end goal. Employability is not only a result; it's how a job-seeking student interacts with the many players in the labour market and the choices they make in the workplace. Thirdly, the belief that higher education will improve career prospects is implicit in the emphasis on student employment rates. According to the results of a recent study conducted in England, college graduates had a lower employment rate than those who did not complete their education but immediately entered the workforce. This indicates that a degree course may have a little impact on a graduate's ability to secure employment but a substantial impact on the graduate's performance while employed. One might be qualified for work yet still be jobless or underemployed. Compensation, benefits, and the job's perceived prestige among recent grads are all factors. Fourthly, there is a lack of clarity on who is accountable for student employability, despite the fact that job prospects are a major motivator for students to enroll in higher education. A fundamental premise behind the idea of graduate employability is that higher education should prepare students for the workforce.

Figure: 03



HIGHER EDUCATION AND EMPLOYABILITY- A REVIEW

Gaining a college degree is critical to improving one's chances of finding gainful employment.. This review aims to explore the relationship between higher education and employability, focusing on the challenges and

strategies to enhance graduates' job readiness. Several studies have highlighted the employability skills gap in higher education. Graduates often face challenges in transitioning from academia to the workforce due to a mismatch between the skills they possess and those demanded by employers. While higher education equips students with theoretical knowledge, practical skills, such as communication, problem-solving, and teamwork, are equally crucial for professional success. These initiatives provide students with opportunities to gain practical work experience, apply classroom knowledge in real-world settings, and develop relevant skills valued by employers. Another important aspect is the role of digital literacy and technology in employability. As the job market becomes increasingly technology-driven, higher education must integrate digital skills into curricula to prepare graduates for the demands of modern workplaces. Moreover, soft skills are gaining prominence in employability discussions. Employers seek candidates who possess strong communication, adaptability, and critical thinking skills. Therefore, higher education institutions are placing greater emphasis on nurturing these soft skills through interactive teaching methods and collaborative learning environments. Furthermore, industry-academia partnerships are essential for aligning higher education with workforce needs. Regular engagement with employers helps identify skill gaps and design targeted training programs that enhance graduates' employability and job prospects.Employers placed a premium on candidates who possessed great reading, numeracy, and communication abilities. They were looking for employees who would be dependable and excited to work, therefore attitude played a role in their recruiting selections. In the first five years on the job, employers are prepared to put money into their workers to assist them develop more sophisticated skills linked to their jobs. There were a lot of entry-level jobs posted, but few businesses that would recruit a young individual without those requirements. The findings suggest that low levels of language, reading, and numeracy competency are a significant barrier to entry for young people in the employment market. It also seemed to indicate that companies considered it the state's responsibility to ensure that all citizens have access to and opportunities to improve their basic skills. However, businesses were prepared to invest in training programmes that helped workers develop technical and interpersonal competencies. Furthermore, they were certain that career development should be viewed as a continuing educational process that includes the development of employable skills. Employers value employees who have strong communication, interpersonal, teamwork, problem-solving, resource-management, leadership, conflict-management, taking the initiative, listening, problem-solving, flexibility, openness to change, team-building, self-awareness, and an understanding of leadership styles skills. Graduates in today's economically dynamic world need to be adaptable in order to keep up with the ever-evolving demands of companies and the market. The most crucial component in ensuring that college grads are ready to take on these issues appears to be the employability skills and attributes they acquire during their time in school. It is unnecessary to expressly educate student’s employability skills because they are acquired organically during their training and education. Production technology and industrial electronics majors at a Malaysian technical institution were found to have developed somewhat marketable abilities throughout their time there. Graduates are competitive in the modern job market, especially in technological and employability-oriented fields. A candidate's ability to get along with coworkers, to be trustworthy, and to present oneself professionally to clients are just as important to an employer as the candidate's educational background. Careful upbringing at home is the first step in cultivating a child with marketable talents. However, parents cannot be the only source of such instruction for their children.

RESEARCH OBJECTIVES AND PROBLEM

In today's rapidly evolving job market, the employability of graduates has become a critical concern for higher education institutions worldwide. As industries embrace technological advancements and globalization, employers increasingly seek candidates with not only academic qualifications but also relevant skills and competencies. However, there is a growing gap between the skills possessed by graduates and the skills demanded by the job market. This discrepancy raises questions about the effectiveness of current higher education system practices in adequately preparing students for successful career transitions. Understanding the challenges faced by graduates in their employability journey and identifying the practices that contribute significantly to bridging the skills gap are of paramount importance. The research aims to delve into the various strategies employed by higher education institutions to enhance the employability of their graduates, evaluating the impact of these practices on students' job readiness and their ability to meet the demands of today's dynamic workforce. By investigating the effectiveness of different approaches, this study seeks to provide valuable

insights and recommendations to improve the alignment between higher education and the labor market, ultimately fostering greater graduate employability and economic prosperity.

METHODOLOGY

Studies in higher education, vocation training, sociology, and the economics of education were analyzed because of their frequent focus on job-readiness. Relevant articles were sourced through a search of bibliographic databases including Google Scholar, EBSCO, and Science Direct. Publications from 2010 to 2021 were prioritized in the search. Boolean searches were used to perform a systematic search for a variety of phrases related to employability and the interests of several important stakeholders (including students, faculty, administrators, employers, and policymakers). For the second phase of the research, we looked at online materials, reports, and position papers released by influential groups. The documents (both print and digital) reviewed were released after 2010. Since documentary analysis is a methodical approach to studying or evaluating documents for the purposes of eliciting meaning, gaining understanding, and developing empirical knowledge; it was employed. In qualitative research, document analysis has been used to provide in-depth accounts of a phenomenon or programme. It can aid the researcher in gaining comprehension of the issue at hand and providing new avenues of inquiry. Relevant documents reporting perspectives of these stakeholders were located and selected for evaluation using search phrases linked with employability and the four important stakeholders on the Google search engine. Through this analysis, we were able to learn how various stakeholders defined employability, who should take responsibility for it, and what measures should be taken to improve it.

ANALYSIS AND DISCUSSION

PRACTICES FOR ENHANCEMENT OF EMPLOYABILITY

To equip the students to meet the current and future needs and maintain the pace with industry, the colleges needs to focus on five best practices namely, innovative pedagogies, faculty engagement, student engagement, corporate connectedness and international student exchange or study abroad programmes. The result is given in the following table.

Table 1: Practices for Enhancement of Employability

Factors	Mean	SD	F	P
Innovative Pedagogies	21.7157	2.51190	1.721	0.157
Faculty Engagement	19.7421	2.40533		
Student Engagement	20.7852	2.16321		
Corporate Connectedness	19.3265	2.23182		
International student exchange	19.7124	2.74194		
Technology Integration	20.3210	2.93509		

Innovative Pedagogies is higher (21.7157) than other practices. Student engagement are also plays a vital role in practices for enhancement of employability (20.8000). The calculated F value (1.721) is insignificant (0.157). From the result of ANOVA, it is cleared that the practices for enhancement of employability is high in all. The article revealed that higher education institutions (HEIs), students, governments, and businesses all have diverse views on the topic of graduate employability and the parties accountable for ensuring it. When compared to what the government touts as important for graduate employability, the skills and knowledge that actual companies value greatly fall short. Employers value soft skills and attitudes more than the government does, despite the fact that the government prioritizes the development and validation of knowledge and practical abilities.

DISCUSSION

Faculty Engagement: In today's competitive business world, keeping up with the latest information is essential. In order to raise educational standards, it is crucial to incorporate knowledge production. To be an excellent educator, one must dedicate themselves to lifelong study within their own discipline. Colleges should place a premium on faculty research since it is crucial to the growth of qualified academics, which in turn benefits businesses, industries, students, and local communities. The benefits of faculty involvement for students can be

substantial. Professors who network with outside stakeholders and organisations (nonprofits, government, or commercial organisations) not only improve their own research, but also incorporate their results into the classroom. Students benefit from this because they learn skills they can use and receive exposure to real-world situations. (Students Engagement): All students should be given the opportunity to engage in an internship programme as part of the corporate mentoring programme (CMP). As a result, students will have the chance to gain practical experience in the business world while also learning about the inner workings and best practices of a variety of firms. Students that are actively engaged in their education will have access to faculty mentors and authentic research opportunities. Students who participate in research projects obtain practical, analytical, and critical thinking abilities that will serve them well in college, the workplace, and society at large. Research abilities, such as hypothesis development, data analysis, and effective written and spoken communication, are also much improved. This makes them more prepared for their first professional role.(Student Exchange and Study Abroad Programme International) Participating in a student exchange programme is a great way for colleges and universities to broaden their students' horizons, since they may spend a semester studying alongside students from a variety of countries. Preparing recent college grads to be effective leaders and technocrats in multinational corporations is a priority. Institutes need to take a more comprehensive approach to preparing "ready-professionals" and global managers/technocrats for the workforce. Therefore, it is crucial for universities in India to update their curricula to reflect the needs of modern business.

CONCLUSION

In conclusion, higher education has a significant impact on graduates' employability. To bridge the skills gap and enhance job readiness, institutions must focus on experiential learning, digital literacy, soft skill development, and industry collaborations. By addressing these aspects, higher education can better prepare graduates for successful careers and contribute to a more skilled and competitive workforce. Furthermore, institutions are working to enhance soft skills such as communication, critical thinking, problem-solving, and adaptability, as these are highly valued by employers across various industries. Incorporating technology and digital literacy into the curriculum is also essential to prepare students for the demands of a digitally driven workplace. To bridge the employability skills gap effectively, higher education institutions, employers, and policymakers must collaborate closely. Regular dialogue between academia and industry can help identify skill gaps, update curricula, and develop targeted training programs. By aligning educational offerings with workforce needs, higher education can better equip graduates with the skills and competencies needed to succeed in the job market and contribute to the overall economic growth and prosperity.

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ATTITUDE AND INTENTIONS TOWARDS SOCIAL ENTREPRENEURS AMONG COLLEGE STUDENTS

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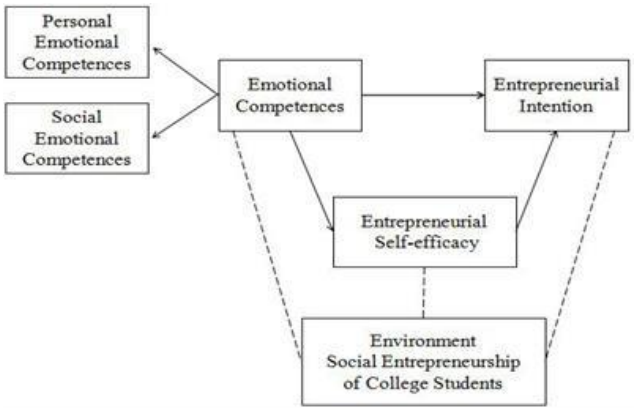
ABSTRACT

Social entrepreneurship has gained significant attention in recent years, particularly among college students. The attitude and intentions towards social entrepreneurs among this demographic are generally positive and encouraging. College students are increasingly recognizing the potential of social entrepreneurship to address pressing social and environmental challenges while creating sustainable solutions. They view social entrepreneurs as individuals who possess a unique blend of business acumen and a deep commitment to making a positive impact on society. One of the reasons for this positive attitude is the growing awareness of global issues and the desire to actively contribute to their resolution. College students are often exposed to various social and environmental problems through their coursework, extracurricular activities, and engagement with diverse communities. As a result, they appreciate the innovative and compassionate approach that social entrepreneurs bring to the table. They see social entrepreneurship as an avenue to transform their passion for social change into tangible action, leading to a more equitable and sustainable world. Moreover, college students also value the potential career opportunities that social entrepreneurship presents.

Keywords: Awareness ,Attitude, Intentions Social, College Students And Entrepreneurs**.**

INTRODUCTION

Building a country from the ground up is what entrepreneurship is all about. The public's view of entrepreneurs has shifted in recent years. They have begun to understand the immense potential that an entrepreneur has and how it may be used for the common good. The world of entrepreneurship is seeing a lot of new developments recently. One of them is social entrepreneurship[3]. Building a country from the ground up is what entrepreneurship is all about. The public's view of entrepreneurs has shifted in recent years. They have begun to understand the immense potential that an entrepreneur has and how it may be used for the common good. The world of entrepreneurship is seeing a lot of new developments recently. One of them is social entrepreneurship. One way of looking at it is as a solution to society's unfulfilled wants. An entrepreneur's personality is defined by a number of distinguishing traits. A person's originality, ingenuity, strong work ethic, tolerance for risk, aptitude for organisation, etc. are all crucial to an entrepreneur's success [9]. The notion of social entrepreneurship emerges when these traits are combined with a desire to solve social issues or address social needs. Learning about new technologies is likewise seen as crucial to the economy's development. The goal is to introduce pupils to technical concepts via the use of laboratory exercises. Therefore, education in technology and entrepreneurship serves as the foundation for national development. In wealthier nations, students with a background in technological education might find new work opportunities via entrepreneurship and self-employment, while in underdeveloped countries, these paths may help students make ends meet [13].There is an urgent need to foster an entrepreneurial mindset among those studying technology in order to accomplish three objectives. Students have a greater drive to start their own businesses, and it is important for them to acquire the knowledge and abilities necessary to create a successful enterprise.



CONTEXT FOR THE RESEARCH

The core problems of social enterprise were also addressed. Future social entrepreneurs were shown to benefit greatly from receiving coaching and training, since the business owners had to deal with a number of obstacles during launch[13]. The researcher noted that social entrepreneurship requires a supportive governmental framework, funding, effective coordination and communication, and public acknowledgement. An in-depth look at the relationship between social entrepreneurship and social sustainability was conducted by Namita Rajput and Parul Chopra in 2014. After researching the issues encountered by social entrepreneurs via a case study of many successful social businesses in India, they concluded that a lack of government support and an inadequate supply of trained workers were the most pressing issues in the field. They also suggested a straightforward paradigm for social entrepreneurship's assessment and comprehension of a problem's social, environmental, and economic elements.[5] The research also covered the topic of funding options for such endeavours. Lack of sufficient entrepreneurship education, lack of financial help, lack of competent staff, etc. were all addressed in the report as some of the significant obstacles social entrepreneurs confront. The author recommended that social companies use relationships with other nonprofits to grow.

Social entrepreneurs hold significant importance: An overview

1. **Inspiration and Role Models**: Social entrepreneurs serve as inspirational figures for college students. Their innovative ideas, determination, and commitment to creating positive social change inspire and motivate students to think beyond traditional career paths. By showcasing real-world examples of individuals making a meaningful impact, social entrepreneurs become role models who challenge and encourage students to pursue their own entrepreneurial endeavors.
2. **Addressing Global Challenges**: College students today are acutely aware of the social, economic, and environmental challenges facing the world. Social entrepreneurs offer practical and sustainable solutions to these challenges. By engaging with social entrepreneurs, students gain exposure to innovative approaches and learn about the potential of business models that prioritize social and environmental impact. This knowledge equips them to think critically and creatively about problem-solving, empowering them to contribute to addressing pressing global issues.
3. **Skill Development**: Social entrepreneurship provides a unique platform for college students to develop a wide range of skills. Through involvement in social entrepreneurial initiatives, students can enhance their leadership, teamwork, problem-solving, and communication abilities. They gain practical experience in project management, resource mobilization, and strategic planning. These skills are invaluable not only for future entrepreneurial endeavors but also for their overall personal and professional development.
4. **Networking and Collaboration**: Social entrepreneurs often operate within extensive networks of partners, stakeholders, and supporters. By engaging with social entrepreneurs, college students have opportunities to network and collaborate with like-minded individuals, including fellow students, professionals, and experts. These connections can lead to mentorship, internship opportunities, and

even potential co-founders for future ventures. The networking aspect of social entrepreneurship enhances students' exposure to diverse perspectives, ideas, and resources.

5. **Values Alignment and Purposeful Careers**: College students increasingly seek purposeful careers that align with their values and make a positive impact. Social entrepreneurship offers a pathway to combine personal passion with professional pursuits. By supporting and engaging with social entrepreneurs, students can explore how their skills and interests intersect with social and environmental issues, helping them shape a career that reflects their values and allows them to contribute meaningfully to society.
6. **Empowerment and Agency**: Social entrepreneurship empowers college students by demonstrating that they have the ability to effect change, irrespective of their age or experience. By recognizing their potential to make a difference, students develop a sense of agency and become active participants in social change processes. This empowerment fosters a sense of responsibility and encourages them to take initiative, solve problems, and become leaders in their communities.

REVIEW OF LITERATURE

Maalu (2012)[5] surveyed students at Nairobi's public secondary schools to learn their thoughts on entrepreneurship as a profession. According to the results, most pupils in Nairobi's public secondary schools saw entrepreneurship as an appealing career option. Even though most of them were interested in starting their own businesses after they graduated, it became clear that there were various obstacles standing in the way of their actually doing so. Students cited lack of capital, fierce rivalry, and a lack of business acumen as the most significant obstacles they faced. For students who have a high level of entrepreneurial desire but are on the fence about actually pursuing self-employment, a "trigger event" might be the last push they need to take the plunge. Following completion of this research, the author maintains that entrepreneurship education remains very important for enabling entrepreneurship. Ahmed et al. (2010),[2] there seems to be no substantial association between age, gender, or entrepreneurial background and aspirations to start a business, therefore it's hard to tell entrepreneurs from non-entrepreneurs. However, aspirations of entrepreneurialism were affected by factors such as one's family history and educational background. Because of their greater familiarity with the industry and market, students in higher-level courses are more likely to pursue entrepreneurship.

IMPORTANCE OF THE RESEARCH

There were many change-making businesspeople in India who wished to make a difference in their communities. The youth of today need to be optimistic about their future. Young people's perspectives on entrepreneurship are always worth hearing.[7] The mindset of young people towards entrepreneurship has been the subject of several research. In this research, we want to define social entrepreneurship and investigate how college students feel about engaging in such endeavors.

RESEARCH PROBLEM AND OBJECTIVES OF THE STUDY

The purpose of this study is to get insight into how college students see social entrepreneurship. What are the attitudes and intentions of college students towards social entrepreneurs, and what factors influence their perceptions and motivations in engaging with social entrepreneurship? This research problem seeks to understand the specific attitudes and intentions that college students hold towards social entrepreneurs and explore the underlying factors that shape their perceptions and motivations.[2] By investigating these aspects, the study aims to contribute to a better understanding of the college student population's receptiveness to social entrepreneurship and identify potential drivers and barriers to their engagement in this field.[14]

Potential research questions that can be derived from this problem include:

1. What are the motivations and intentions of college students in pursuing social entrepreneurship as a career or engaging in social entrepreneurial activities?
2. How do personal values, educational background, and exposure to social issues influence college students' attitudes and intentions towards social entrepreneurs?

3. What are the perceived benefits and challenges associated with social entrepreneurship as perceived by college students?
4. How does awareness and knowledge about social entrepreneurship influence college students' attitudes and intentions towards social entrepreneurs?
5. What role does social media and digital connectivity play in shaping college students' perceptions and motivations towards social entrepreneurs?

Addressing these research questions can provide insights into the mindset of college students regarding social entrepreneurs and social entrepreneurship. [6].The findings can help educators, policymakers, and organizations working in the field of social entrepreneurship to develop targeted strategies and initiatives to foster a positive attitude and encourage active participation among college students in this domain.

RESEARCH METHODOLOGY

The study's overarching objective was to device college students' interest in engaging social entrepreneurship. The study's intended participants were a subset of college freshmen with the goal of gauging their interest in and potential for engaging in social entrepreneurship.[2] The students in the sample came from a wide range of Indian institutions. The sample included 250 seniors in their final year of college. The researchers in this study utilised a combination of a literature review and a questionnaire to get their information.

Analysis and Interpretation -Entrepreneurial intention

1. Awareness level

Increasing students' understanding of the importance of seizing entrepreneurial opportunities is a crucial step towards inspiring more young people to do the same. Knowledge of the business's viability, fundamentals, risks, and promotional advantages are all part of that awareness. The degree of self-awareness may vary from creature to creature.

Table 1: Awareness of the respondents

Demographic variables		N	Mean	Std. Deviation	Result	Sig.
Gender	Boys	134	19.8321	3.48956	-2.118 (Z)	0.029
	Girls	116	17.1497	3.21688		
Income group	Low	75	17.2195	4.92311	1.173(F)	0.309
	Middle	103	21.4812	3.39885		
	High	72	18.3391	4.73313		
Degree level	UG	160	20.3232	3.22651	0.919(Z)	0.345
	PG	90	20.9880	5.23350		
Stream	Arts	90	21.2143	5.21560	2.629 (F)	0.065
	Science	110	19.9375	5.62541		
	Engineering	50	21.3012	3.45687		
Total		250	18.3460	4.43625		

***Source**: Primary data*

Male students are more likely to see the potential for themselves as entrepreneurs (19.8321) than female students (17.1497; p-0.0290.050). The Z score is less than -1.96 (-2.118) indicates that the male students are more aware than female. According to the respondents' household income, students from middle-income families had the highest levels of education and awareness (21.4812). F value of 1.1173 shows statistically significant difference (p=0.309). The pupils' levels of knowledge did not vary noticeably with their families' mean yearly income, as shown by the results. According to the data, post graduate students had a much higher degree of awareness (20.9880) than their undergraduate counterparts (20.3232). The Z test, however, indicates that this difference is not statistically significant (p=-0.345). The level of knowledge among students might vary from one major to another. Therefore, the research takes into account the participant's chosen field of study (the arts, the sciences, or engineering). The data shows that science programme students have a much greater level of awareness than students in other majors (5.62541). However, the analysis of variance did not find a statistically significant difference. F = 2.629. Students' levels of awareness do not considerably vary with their chosen field of study, it seems. Social entrepreneurship is a solid foundation that may be used for many social good causes. It

has the potential to spur economic expansion by generating new jobs and investment. The study's results provide educational institutions with important considerations on student trends and entrepreneurial activity. The study's authors stated that students' entrepreneurial aspirations would benefit greatly from the implementation of awareness courses and the encouragement of their actual practice throughout their college years. It's possible that this study may provide useful information for people working to reduce youth unemployment. Researchers need to conduct more longitudinal studies that examine students' attitudes towards entrepreneurship since these might shift from one situation to the next and over the course of a person's lifetime. Ultimately, the same model might be used to other developing situations to further confirm the applicability of the results.It is hypothesised that students' levels of entrepreneurship awareness will correlate with their entrepreneurial aspirations. Therefore, the connection between knowing and wanting is investigated.

Table 2: Entrepreneurial awareness and intension

Factors	N	Mean	Std. Deviation
Awareness	250	17.4750	3.12575
Intention	250	18.5240	4.82369

According to the descriptive data, the average level of knowledge is 17.4750, with a standard deviation of 3.12575. The average amount of planning is 18.5240 hours, whereas the SD is 4.82369.

DISCUSSION

In recent years, India has given social entrepreneurship a lot of attention and funding. The current survey found that among college students, there was a generally optimistic outlook towards the idea of launching a social enterprise. They believed that social entrepreneurship may be a useful tool for doing well in the world. Although many students saw the social benefits of social entrepreneurship and were interested in the field, few had the drive to actually launch their own venture. There was a modest connection between social entrepreneurship interests and traits including being proactive, having an entrepreneurial mindset, feeling in control of one's behaviour, and having a college degree in entrepreneurship. As a result, we know that students' aversion to taking risks is a significant barrier. These results stress the importance of inspiring and directing young people interested in starting firms with a social mission. This research suggests that schools should help those students who want to become social entrepreneurs get started in the field. As a worldwide phenomenon that shows promise and significance, social entrepreneurship is deserving of serious academic study. To help students become more aware of entrepreneurship, develop a positive outlook on the behaviour, and strengthen their sense of agency, colleges should become involved early on in the process of providing entrepreneurship education. Colleges and universities need to provide more events, programmes, and seminars that encourage and prepare students to start and run their own businesses. They need to have the barriers that prevent them from engaging in social entrepreneurship removed. Students that come up with original proposals should have their efforts recognized and rewarded by their classmates, instructors, and parents.

CONCLUSION

The rise of social media and digital connectivity has played a significant role in shaping the attitudes and intentions of college students towards social entrepreneurship. Social media platforms provide a platform for sharing inspiring stories and success narratives of social entrepreneurs from around the world. This exposure to real-life examples of social impact amplifies the appeal and credibility of social entrepreneurship as a viable and effective path towards addressing societal challenges. Many students are keen to pursue meaningful and fulfilling careers that align with their personal values and goals. Social entrepreneurship offers an avenue for individuals to combine their entrepreneurial spirit with their desire to create positive social change. This fusion of purpose and profit appeals to college students who aspire to make a difference while also achieving professional success. In summary, college students generally exhibit a positive attitude towards social entrepreneurs and their intentions to engage with social entrepreneurship are strong. They recognize the power of social entrepreneurship to drive meaningful change and are eager to be part of this movement. With their enthusiasm, skills, and innovative thinking, college students are poised to become the next generation of social entrepreneurs, shaping a more sustainable and inclusive future. Social entrepreneurs hold immense importance among college students as sources of inspiration, providers of practical solutions, and catalysts for skill

development and purposeful careers. Engaging with social entrepreneurs equips students with the mindset, skills, and networks needed to become agents of positive change in the world

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EFFECTIVENESS OF ENTREPRENEURSHIP TOWARDS SOCIAL MEDIA, EMPOWERMENT OF WOMEN AND CHALLENGES FACED BY THEM

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ABSTRACT

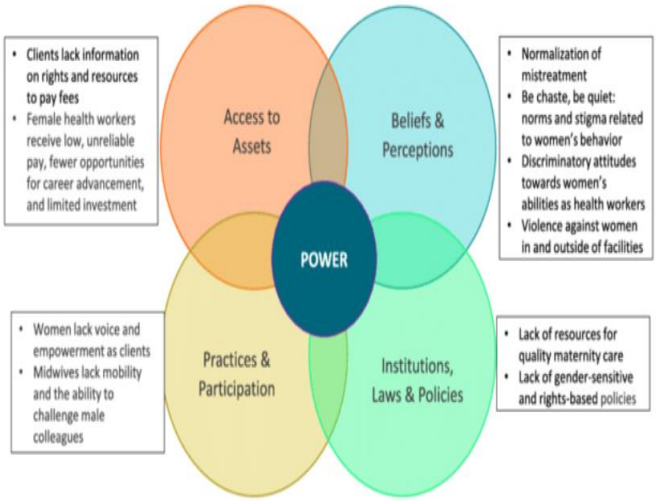
The role of social media in our daily lives has expanded substantially. In order to facilitate the creation, dissemination, and sharing of information, ideas, images, and videos inside online communities and networks, social media provides a suite of computer-related technologies. When women are empowered, they have either more control over their lives or the freedom to forge their own paths. The trend of women becoming business owners is very new. The creation and leadership of a firm by a woman provides far-reaching benefits beyond just a boost to economic growth. As India's first Prime Minister, Jawahar Lal Nehru, famously put it, "when a woman moves forward, the family moves, the village moves, and the nation moves." All information used in this study is secondary. The political, social, cultural, economic, psychological, and environmental development of women are all factors in the notion of women's entrepreneurship. Organisations can boost productivity and communication with the use of social networking platforms because of the easier distribution of information across different employee groups. Using social media can help our business in many ways: from making new connections and expanding your professional network to improving your hiring practices, publicizing your business, building your brand's reputation, and promoting your products and services. The advent of social media has shifted what constitutes a "scoop" or "breaking news" in the professional world. The media may be able to get up-to-the-moment data via social media apps as well.

Keywords: Entrepreneurship, Social Media, Empowerment of Women, Privacy and Data Security Concerns, Social Networking Sites

INTRODUCTION

Today's social media are not just a means of communication, but also a means of interaction and participation. The term "social media" is commonly used to refer to a wide variety of online and mobile-based services that facilitate communication and the exchange of ideas among users. Some of the most prominent characteristics of social media include having a free online presence, a free web address, building a profile, posting content, chatting, engaging with people, sending emails, and making pages. Many modern business executives place a high value on integrating social media into their operations. Business organisations leverage social media to cultivate connections with marketing-related stakeholders. Social media have altered people's lifestyles all around the world. The specialists have investigated fresh avenues for developing more adaptable social media software. It's easy and secure to talk to people on social media. Social media have stepped in to fill the hole created by the mass media, which have become commodities due to business pressures. "Social media" is an umbrella word for several sorts of community-based internet networking and information-sharing sites. Forums, microblogging, social networking, social bookmarking, and wikis are all examples of different types of social media.

Figure: 01



THEORETICAL UNDERPINNING- RISE OF SOCIAL NETWORKING SITES

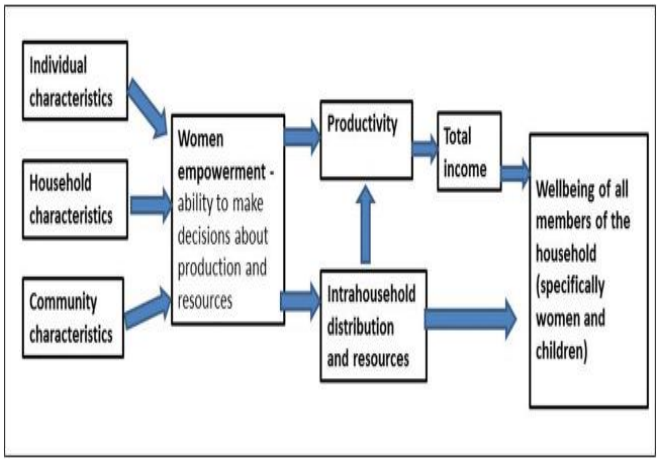
The power to create, influence, or control other people is a key feature of social media, which are interactive digital platforms. Social media platforms promote two-way communication and content exchange between message recipients and creators. Through online social networking, people may build and maintain personal and professional relationships. The ability of mobile communications and social media to boost monitoring of social and environmental realities and raise awareness of issues has garnered much attention. They are in favour of progressive reforms aimed at bettering government, social networking, and development. Social media is best viewed as a diverse array of new forms of online media with certain fundamental characteristics in common. Users can make advantage of the website's free hosting space to upload their own content. The website allows users to store and share any type of content. Having a profile makes it easier to keep track of relevant information and makes it easier to make new friends. Users also have the means to make real-time uploads of data. All sorts of media, from text and images to sound and moving pictures, can be used into the content. Those with common interests are more likely to interact on social media. Because each comment is dated, threads can be easily followed. Users of social media platforms are encouraged to share their own material and provide feedback. People from many walks of life can profit from using social media. As a result of social media's ability to facilitate virtual collaboration and networking, people's horizons are broadened. Users may keep in touch with loved ones and new acquaintances from all around the world thanks to social networking sites. In this age of globalization, the power of social media lies in its ability to link people all over the world. They've evolved into fantastically useful tools for conveying nuanced information. They facilitate communication between individuals with similar interests and provide them the opportunity to join virtual communities. Since all businesses, regardless of size, sales, or contacts, have equal access to social media, this has levelled the playing field for businesses. The social networking sites are simple to navigate, especially for individuals with limited experience with computers. Stakeholders in organisational change can connect with today's businesses. Unparalleled opportunities for user interaction and relationship building may be found on social media sites.

RESEARCH BACKGROUND

The social networking sites' built-in IM features allow users to communicate and share content in real time. Managers may utilize social media in team meetings, event organizers can keep attendees informed, and businesses can network with consumers and clients. In addition, social media sites provide non-profit and commercial organisations with free publicity for their projects and programmes. A practically immediate news cycle has been made possible by the widespread distribution of news and information through millions of social networking updates. The advent of social media has allowed people to finally interact with one another and maintain meaningful relationships for a wide range of reasons. Technology has made it easier than ever to maintain relationships with friends and family through the use of social media. Networks of supportive people

may be formed more quickly and easily using social media. In this way, people may always have access to the most up-to-date information, perspectives, and concerns. Businesses incur no costs from using social media other from the effort spent creating accounts, monitoring activity, and interacting with other users. The advantages of social networking much exceed the disadvantages. The rise of social media has led to a dramatic decline in people's ability to interact with one another in person. Children, teenagers, and young adults sometimes don't have enough opportunities to develop crucial social skills due to a lack of face-to-face interactions with their peers. The use of social media has put users at risk of being bullied or contacted inappropriately by strangers. Misuse of social media platforms can expose users to fraud and identity theft. The widespread use of social media has also led to serious confidentiality issues at work. Financial and reputational losses have resulted from hacks involving sensitive data at modern organisations. It's possible that the atmosphere at work may worsen as a result of employee tensions. Worker health problems and decreased productivity have been linked to a lack of personal connection.

Figure: 02

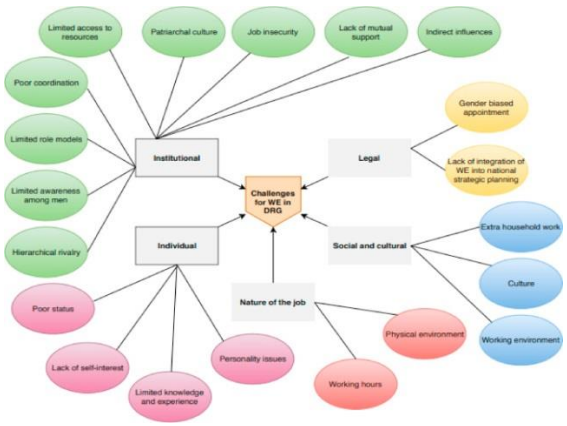


SOCIAL MEDIA'S IMPACT ON THE EMPOWERMENT OF WOMEN

The Prospects of Social Media Not only are social media widely used, but they have also become embedded in modern culture. Due to their widespread use, social media icons can no longer be ignored by businesses. Internet marketers and website owners may now gain from increased worldwide exposure to their websites as a result of social media. The benefits of social media marketing have become apparent to business owners of all sizes. The use of social media bookmarks has increased in recent years. Certain systems allow for the bookmarking of a post or webpage across dozens or even hundreds of social networking networks. Facebook and YouTube have become ubiquitous in the United States. About three-quarters of those people used Facebook on a daily basis. People's perspectives on social media have become increasingly divided. There is a lot of crossover between the demographics of the sites' users, and many people in the United States use multiple social media platforms. Because of how reliant they are on the site's content, users have a hard time stepping away from social media. There is a wide range of political information available on social media. The researchers have paid particular attention to the gaps in our understanding of the phenomena of political intellectuals and activists' usage of social media. In order to protect the public interest, nonprofits have a responsibility to offer funding for a centralized data repository on social media platforms. Social media has greatly contributed to the democratization of public discourse by giving millions of people a powerful forum in which to express their views and showcase their creativity. Social media have stepped into the gap left by the commercially oriented mainstream media in terms of shaping public opinion on pressing issues confronting contemporary society. Because of its success in amplifying the perspectives of marginalized communities, social media has emerged as the most popular media platform of the contemporary era. Computer terminals, personal computers, mobile devices, and even entire computer networks are used in the process of connecting people and businesses to the Internet. By 2018, nearly everyone had access to this, since connection speeds throughout the world had surpassed. Access to the Internet has changed the way many individuals think about and act in the political, social, and economic spheres. The use of online social networks has skyrocketed in recent years. There are

perhaps a hundred of the most popular social networks in the world, based on their user bases. Various parties invested in international progress are starting to pay attention to SNSs.

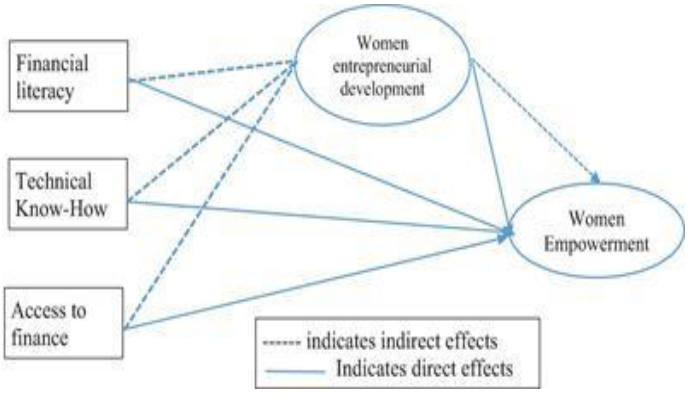
Figure: 03



SIGNIFICANCE OF THE STUDY

All barriers to working together and making progress have been removed in the modern day, to the proliferation of social media. They've also evolved into potent instruments for international progress and two-way communication. [4]In order to ensure the sustainable, integrated, and inclusive growth of the country, the government and other stakeholders should guarantee the strategic and proactive use of social media in a wide range of development efforts. Numerous studies have examined the impact of the media on progress in India and elsewhere. It is clear from our review of the literature that India has not performed sufficient scientific study on the use of social media for social networking and liberation. Women make up households, which in turn shapes communities and nations.[7]. Women's advancement in society and the workplace is essential to any society's or nations economic development. Each of these women brings a unique viewpoint to the table pertaining to business. However, there has been no proper promotion of this in India. As a whole, society has become more accepting of the fact that women need to work now, though there are always exceptions. As a result of our increasing reliance on the service industry, many entrepreneurial possibilities have emerged, especially for women, where they may thrive professionally while also achieving work-life harmony.[3] The economic and social progress of women is crucial to the development of any community or nation. Recent studies have shown that Indian women entrepreneurs are the most successful in the world. Indian women's inherent strengths suggest they have considerable business potential that is now being underutilized. Entrepreneurs need to have these traits. National progress may be aided by recognizing, unlocking, and putting this potential to work in the service sector. Women business owners in India are admired for several reasons, including their poise under pressure, creativity, critical thinking, risk-taking, and ability to inspire.

Figure: 04



IMPACT ON BOTH SOCIAL MEDIA AND THE EMPOWERMENT OF WOMEN

Entrepreneurship can have a significant and positive impact on both social media and the empowerment of women. Here's a closer look at how entrepreneurship contributes to these areas:

1. **Social Media:**
    1. Business Growth and Innovation: Entrepreneurship encourages the creation of new businesses, products, and services, many of which leverage social media platforms for marketing, communication, and customer engagement. Social media provides an affordable and accessible avenue for startups and small businesses to reach a global audience, increasing their chances of success.
    2. Increased Connectivity: Social media connects entrepreneurs with potential customers, partners, and investors. It enables them to network, share ideas, and learn from others in the industry, fostering a supportive ecosystem that helps businesses thrive.
    3. Brand Awareness and Customer Engagement: Social media platforms allow entrepreneurs to build their brand identity, establish credibility, and engage directly with customers. This engagement fosters a sense of community and customer loyalty, leading to long-term success.
    4. Market Research and Feedback: Entrepreneurs can utilize social media for market research, gaining insights into customer preferences, pain points, and trends. They can gather feedback in real-time, leading to iterative improvements and better alignment with customer needs.
2. **Empowerment of Women:**
    1. Financial Independence: Entrepreneurship can offer women an opportunity to achieve financial independence and economic empowerment. Starting their own businesses allows women to overcome traditional barriers in the job market and opens doors for financial growth and self-sufficiency.
    2. Leadership Opportunities: As women take on entrepreneurial roles, they become leaders and role models in their communities. This helps challenge gender norms and inspires other women to pursue their aspirations, contributing to a more diverse and inclusive business landscape.
    3. Flexibility and Work-Life Balance: Entrepreneurship provides women with the flexibility to manage their businesses and personal lives, allowing them to balance family responsibilities and career ambitions more effectively.
    4. Addressing Social Issues: Female entrepreneurs often address social issues and challenges faced by women, such as access to healthcare, education, and sustainable livelihoods. Their businesses can lead to social innovation and positive change in their communities.

RESEARCH PROBLEM

Women entrepreneurs are seen as vital to national development. Offering new insights and employment opportunities, but also increasing service providers' workloads and upsetting established business partnerships. [2].Women generally lack access to financial resources, including those needed to launch a business or maintain an existing one. Women entrepreneurs frequently use a combination of personal savings and grants to launch their first firms. It was discovered that many women lacked the basic capital required to begin enterprises. Entrepreneurship, albeit mostly intangible, is essential for a developing country like India to overcome its current financial difficulties [7].It's possible that entrepreneurship is essential to the success of a country's industrial, agricultural, and service sectors. Overpopulation, unemployment, underemployment, poverty, etc., are just a few of the vexing issues that plague India. Some people see parallels between running a business and starting and managing a side project. In this progressive society, women are given the same opportunities as men. The percentage of college-educated women has grown. Now more than ever, women may pursue careers in fields like engineering and administration, expanding their potential for business ownership. The region was selected because of its superior infrastructure, which offers great potential for industrial development. The

research considers the economic empowerment of women and addresses the difficulties encountered by female entrepreneurs. Women business owners are in large part shaped by the economic, social, religious, cultural, and psychological climate in which they emerge. Over the last decade, a growing number of young women have been compelled to enter the labour due to economic need. This structural transformation from an agricultural to a service-centered society, in which the family structure is also changing to the new economic arrangements in the environment, is a lengthy process that is associated with economic development.

CHALLENGES FACED BY ENTREPRENEURSHIP TOWARDS SOCIAL MEDIA

The effectiveness of entrepreneurship in the realm of social media is notably influenced by an entrepreneur's age. Younger entrepreneurs, having grown up in the digital age, tend to possess an inherent familiarity with the intricacies of social media platforms and trends. This familiarity often translates into a natural advantage when it comes to utilizing these platforms effectively for business purposes. Their adaptability to new technologies, propensity for innovation, and willingness to take calculated risks can result in creative and impactful social media strategies that resonate with younger audiences. On the other hand, older entrepreneurs bring with them a wealth of experience, wisdom, and a well-established professional network. While they might initially face a learning curve in navigating the digital landscape, their strategic decision-making, market insight, and credibility due to their age can positively influence the way they harness social media for entrepreneurial endeavors. Ultimately, the impact of age on social media entrepreneurship effectiveness is nuanced, with each age group offering unique strengths that can be leveraged for success. To tackle these challenges effectively, social media entrepreneurs need to be adaptable, responsive to user feedback, and focused on building sustainable and ethical platforms. Additionally, collaborating with relevant stakeholders, including users, policymakers, and industry peers, can lead to solutions that benefit both the platform and its users.

Table 1: Age group and challenges faced by entrepreneurship towards social media

Factors	Age group	N	Mean Rank	Chi-Square
Intense Competition	Under 30	203	272.13	3.794
	30-40	152	302.58	
	Above 40	145	217.52	
	Total	500		
User Acquisition and Retention	Under 30	203	281.37	0.017
	30-40	152	305.22	
	Above 40	145	303.64	
	Total	500		
Monetization and Revenue Generation	Under 30	203	333.92	11.884**
	30-40	152	271.31	
	Above 40	145	321.77	
	Total	500		
Privacy and Data Security Concerns	Under 30	203	345.67	27.867**
	30-40	152	254.53	
	Above 40	145	343.19	
	Total	500		
Innovative Features and User Experience	Under 30	203	333.54	47.167**
	30-40	152	242.31	
	Above 40	145	341.45	
	Total	500		
Regulatory Compliance	Under 30	203	321.99	45.877**
	30-40	152	244.51	
	Above 40	145	363.46	
	Total	500		
Dealing with Misinformation and Fake Accounts	Under 30	203	302.36	25.610**
	30-40	152	235.25	
	Above 40	145	329.41	
	Total	500		
Social Impact and Responsibility	Under 30	203	218.01	2.245
	30-40	152	341.13	
	Above 40	145	238.72	
	Total	500		

**** Significant at 1% level**

The Table 1 depicts that the respondents aged under 30-40 years are highly facing intense competition (302.58), User Acquisition and Retention (305.22), Social Impact and Responsibility (341.13). Under 30 are highly facing challenges in monetization and revenue generation (333.92), Privacy and Data Security Concerns (345.67).Above 40 Innovative Features (341.45) and dealing with misinformation and fake Accounts (329.41), Regulatory Compliance (363.46). The calculated Chi-Square values are significantly high at 1% level. Social media is a highly competitive space, with numerous established platforms and new startups vying for users' attention. Breaking through the noise and attracting a substantial user base can be challenging for new ventures (Intense Competition), Acquiring new users and retaining them as active users is crucial for social media startups. Convincing users to switch from established platforms or invest time in yet another platform can be a significant challenge, (User Acquisition and Retention), many social media startups struggle with finding effective monetization strategies. Generating revenue through ads, subscriptions, or other means can be difficult, especially for platforms that cater to niche audiences. (Monetization and Revenue Generation), with regard to privacy and data security concerns, social media platforms handle vast amounts of user data, raising privacy and security concerns. Complying with data protection regulations and earning users' trust is essential but challenging. (Regulatory Compliance), Social media startups must navigate complex and evolving legal and regulatory frameworks, including data protection, user rights, and content regulations, which can vary across different countries. (Innovative Features and User Experience) Staying ahead in the social media industry requires continuous innovation to offer unique features and a superior user experience. Keeping up with user preferences and trends can be demanding. (Dealing with Misinformation and Fake Accounts) The spread of misinformation and the presence of fake accounts are persistent challenges on social media platforms. Addressing these issues without stifling genuine free speech is a delicate task. (Social Impact and Responsibility) Social media platforms have an increasing responsibility to address issues like cyberbullying, mental health implications, and their impact on society. Balancing profit motives with social responsibility can be complex.

DISCUSSION

Online groups have used social media to raise awareness and organize campaigns for a wide range of causes in recent years. Women's increased use of platforms like Facebook, Instagram, Twitter, YouTube, etc. has helped propel the growth of women-owned businesses on the web. As a result of influential women's groups, policies and social mores have evolved [1].As a result of social media's rapid growth and changing business climate, more women are venturing into the sector as entrepreneurs. Actually, it hasn't always been simple for women to start their own businesses and become financially independent. So, it's natural to wonder if and how social media may help women by creating a safe space for the disclosure of entrepreneurial activities and the promotion of women's entrepreneurship online[2].Technological advancements like the widespread availability of the Internet have made it possible for women to use social media platforms like LinkedIn and Twitter to further their careers. However, it is important to note that while entrepreneurship can be a powerful tool for social media and women's empowerment, there are also challenges and obstacles that need to be addressed [9].These challenges include access to funding, overcoming societal biases and stereotypes, and providing adequate support and resources for women entrepreneurs. Governments, organizations, and society as a whole must work together to create an enabling environment that fosters women's entrepreneurship, provides mentorship and training, and addresses systemic barriers to fully harness the potential of entrepreneurship for social media and women's empowerment.

CONCLUSION

Social media offers women the chance to learn about the most recent styles, trends, items on the market, options, etc. In addition, social media enables women the chance to launch their own businesses by researching the most recent styles and trends, etc. However, social media is the sole platform that allows you to assess people's preferences and tastes, after which anybody may create items and start their own business [2].In reality, with platforms like Facebook and Instagram, the social media revolution has given women amazing opportunities to flourish in women's entrepreneurship in the industry. For women who want to expand their businesses and create empires, there are many fantastic internet resources accessible. However, before they can be leaders, they must first think like leaders. Social media is a fantastic tool for networking and company

promotion. It aids women in developing their own brands, gaining confidence in their professional accomplishments, and starting their own enterprises [3].Women may produce considerably greater results from using social media effectively than they could have ever dreamed when they initially started their businesses. [10]Women had to battle the glass barrier for a very long time in order to achieve in business. But now that circumstances have changed, it's time to honor and recognize the goals of female entrepreneurs.

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ROLE OF ENTREPRENEURSHIP DEVELOPMENT PROGRAMMES IN DEVELOPING SMALL SCALE INDUSTRIES

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ABSTRACT

Entrepreneurship development programs play a pivotal role in fostering the growth and success of small-scale industries, driving economic development, job creation, and innovation. These programs offer aspiring entrepreneurs essential tools, training, and support needed to navigate the complexities of starting and managing a business. Through training workshops, mentorship, and access to valuable resources, entrepreneurs acquire crucial skills in business planning, financial management, and marketing. Additionally, these programs facilitate networking opportunities, link entrepreneurs to potential investors, and provide guidance on accessing finance and market opportunities. By nurturing a thriving entrepreneurial ecosystem, entrepreneurship development programs contribute significantly to the expansion and sustainability of small-scale industries, thus playing a vital role in the overall economic development of a region or country.

Keywords: Entrepreneurship Development Programmers, Small Scale Industries, Economic Development and Social Stability and Balanced Regional Development.

INTRODUCTION

In a nation like India, where millions of people are either unemployed or underemployed, small-scale companies play a crucial part in the country's economic growth. The poverty and joblessness that plague the country at present are of paramount importance.[7] Small-scale industries offer solutions to these issues since they create many new jobs quickly and with fewer resources expended. Growth of small-scale companies is crucial for achieving balanced economic growth in a nation like India, where capital is scarce and the unemployment rate is high. Small businesses are powerful because of their proliferative nature throughout rural, semi-urban, and metropolitan regions; their ability to develop an entrepreneurial base; their shorter gestation time; and their contribution to a more just and equal distribution of income and wealth.[1] Motivated people are essential to any economy's success because of the results they can provide. This is best illustrated by the rapid expansion and continued success of entrepreneurial ventures in advanced economies. An examination of Indian history reveals that the colonial British Empire severely limited Indian business activity and initiative. The wheels of progress were slowed by the British destruction of Indian handicrafts and hamlet enterprises. Indian policymakers have recently been interested in growth. Despite efforts to ensure that everyone has a fair shot at success and to even out geographical disparities, entrepreneurship is especially strong in some parts of the country. The purpose of this chapter is to examine the long-term viability of India's entrepreneurial scene.[6]

Figure: 01



ROLE OF ENTREPRENEUR IN ECONOMIC DEVELOPMENT

India, like many other developing countries, is now a primary sector-dominated economy. Therefore, it is reasonable to acknowledge the importance of the industrial sector to the growth of the country's economy as a whole.[8] An increase in living standards for all citizens is the ultimate goal of economic growth. An entrepreneur's job is to create conditions that allow for the most efficient application of scarce resources. No business, no matter how huge, can succeed in today's fast-paced global economy unless it stays abreast of, and adapts to, emerging technologies. Therefore, only with the aid of dynamic and alert many inventions as large enterprises, compared to the number of workers employed, can economic progress be quickened and accelerated. Businesses, both public and private, coexist in India [16].Small-scale manufacturing and commerce are the purview of independent business owners. In order to speed up India's development-based entrepreneurial class, it's crucial that the country's medium- and small-scale industrial sectors receive more support for entrepreneurship. The contributions of entrepreneurs to a nation's economic growth cannot be overstated. Through his creativity and charisma as a leader, he helps a country thrive. The other sectors by generating income and opening up new job chances. The entrepreneurs drive innovation and economic progress, making entrepreneurship a potent driving force. The following elucidates the function and value of an entrepreneur:

1. **Economic Growth and Prosperity**: Employment opportunities, capital and wealth creation, higher per capita income and GDP, enhanced quality of life thanks to a higher standard of living, increased infrastructure facilities, improved forward and backward links in society, the development of economically underdeveloped regions, and economic independence are all benefits that entrepreneurs bring to a country.
2. **Social Stability and Balanced Regional Development**: Absorption of workforce in industries, eradication of poverty, improvement of health and education facilities, creation of fair competition, equitable distribution of income, creation of social infrastructures, emancipation of women and weaker sections of society, and supply of high-quality goods and services are all ways in which entrepreneurs contribute to social stability and balanced regional development. Although Adam Smith acknowledged the positive contributions business owners make to society, he also shared the common perception that entrepreneurs are primarily motivated by their own self-interest: "In spite of their natural selfishness and rapacity, though they mean only their convenience, though the sole end which they propose from the labors of all the thousands they employ be the gratification of their own vain and insatiable desires they are led by a hidden hankering after power, for the acquisition of wealth and the increase of power."
3. **Innovator in Economic Growth**: Entrepreneurs play a crucial role in fostering entrepreneurship and economic development as innovators by introducing novel ideas, combinations, products, techniques,

organisations, and new markets and by making full use of technical knowledge, achieving balanced growth, systematic innovation, technological advancement, and implementing mechanical skills. According to Peter Drucker, "innovation and entrepreneurship have to become an integral life-sustaining activity in our organisations, the economy, and society just as management has become the specific organ of all contemporary institutions and the integrating organ of our society of organisations." He goes on to argue that the most encouraging development in economic and social history is the rise of the entrepreneur.

4. **Creation of Employment Opportunities:** Entrepreneurs play a crucial role in creating new job opportunities by starting businesses in the manufacturing, trading, and service sectors; putting an emphasis on smaller enterprises; employing the idle workforce in a wide range of sectors; and promoting self-employment. Jobs are created by entrepreneurs because they are able to successfully combine resources and technology.
5. **Contribute significantly** to the improvement of productivity through the use of cutting-edge production methods. John Keudrick explored that "the task of improving production techniques is the entrepreneurial function par excellence," and this is the primary focus of entrepreneurs. Investing in R&D and purchasing new gear are two ways to boost output. But R&D and investment initiatives are intertwined, with more room for entrepreneurial initiative in each. Entrepreneurs, according to George Gilder's The Spirit of Enterprise: "evoke demand through innovation." They are the ones who generate new innovations in technology, capital, and the creation of new markets. They're on the lookout for something that hasn't been done before, be it a novel feature or a completely new product. They push the boundaries of technology and alter consumer preferences. They boost the economy and generate new jobs. Companies should not follow the market, they argue, as that is the conventional wisdom. They are the industry leaders.
6. **Increase Productivity with Modern Production System:** Entrepreneurs can now enter the field of export promotion and import substitution thanks to liberalization, privatization, and globalization [LPG]. This allows for the creation of new industries producing import substitution goods, the discovery of untapped global markets, the accumulation of foreign exchange reserves, the efficient use of available productive resources, and the attainment of maximum self-sufficiency in the production of as many goods as possible.

ENTREPRENEURSHIP IN TAMIL NADU

Entrepreneurship in Tamil Nadu has emerged as a driving force behind the state's economic growth and development. Known for its vibrant entrepreneurial spirit, Tamil Nadu has seen a surge in the number of startups and small-scale businesses across various sectors. The state government, along with several private organizations and institutions, has actively promoted entrepreneurship by providing an enabling environment through policies, financial incentives, and infrastructure support. Tamil Nadu's rich pool of skilled human resources, coupled with its strong industrial base, has created a conducive ecosystem for entrepreneurs to thrive.[1] The state boasts a diverse range of industries, including information technology, manufacturing, textiles, automotive, healthcare, and agriculture, providing ample opportunities for innovative ventures to flourish. The entrepreneurial culture in Tamil Nadu is marked by a willingness to take risks, a focus on innovation, and a strong work ethic. Young entrepreneurs, backed by experienced mentors and support networks, have been at the forefront of transforming traditional industries and embracing emerging technologies.[13] The government's initiatives, such as the Tamil Nadu Startup and Innovation Policy, have further bolstered the startup ecosystem by offering financial assistance, incubation facilities, and skill development programs. Additionally, the presence of premier educational institutions in the state has encouraged research and innovation, nurturing a pipeline of talented entrepreneurs. Moreover, Tamil Nadu's strategic location, well-developed infrastructure, and access to international markets have attracted investments from both domestic and foreign investors, providing startups with opportunities to scale their businesses and expand globally. Despite these favorable conditions, entrepreneurship in Tamil Nadu also faces challenges.[17] Access to finance, bureaucratic hurdles, and infrastructure gaps remain areas of concern that need continuous attention from the government and stakeholders. In conclusion, entrepreneurship in Tamil Nadu is a dynamic and integral part of the state's economic landscape. With a thriving ecosystem, supportive policies, and a culture

of innovation, Tamil Nadu continues to be a hub for aspiring entrepreneurs seeking to make their mark and contribute to the state's economic prosperity.

Figure: 02



OBJECTIVES AND PROBLEM OF THE RESEARCH

This research problem seeks to investigate and assess the effectiveness and impact of entrepreneurship development programs in promoting the growth and sustainability of small-scale industries. The research will delve into the various entrepreneurship development programs implemented by governments, organizations, and institutions to support and nurture small-scale businesses. It aims to understand how these programs contribute to the development of small-scale industries, their influence on job creation, economic growth, and innovation within local and regional contexts. [3]

1. How do entrepreneurship development programs differ in their design, focus, and implementation across different regions or countries?
2. What are the primary objectives and outcomes of entrepreneurship development programs for small-scale industries?
3. What are the specific areas of support provided by entrepreneurship development programs, such as training, mentorship, access to finance, market linkages, or technological assistance?
4. How do entrepreneurship development programs impact the growth, survival rate, and innovation of small-scale industries?
5. What are the best practices and success factors in entrepreneurship development programs that have led to notable outcomes for small-scale industries?
6. How can policy makers, governments, and stakeholders enhance the effectiveness and impact of entrepreneurship development programs for small-scale industries?

RESEARCH METHODOLOGY

The study has been done with a sample of 100 small entrepreneurs who are selected using convenient sampling method. The data were collected in the month of April 2023. The required information is collected using the questionnaire (google form). The perception of the sample respondents towards various role of entrepreneurship has been observed using the 5 point Likert scale. It is analyzed with the help of Friedman test

ANALYSIS AND FINDINGS

Perception of the Entrepreneurs Towards Development of Small-Scale Industries

Entrepreneurship development programs play a crucial role in fostering the growth and success of small-scale industries. These programs offer various forms of support and guidance to aspiring entrepreneurs, helping them overcome challenges and realize their business ideas. Here are some ways entrepreneurship development programs contribute to the development of small-scale industries: Entrepreneurship development programs provide training and workshops to aspiring entrepreneurs.[3] These sessions cover essential business skills such as business planning, financial management, marketing, and human resource management. By enhancing the knowledge and skills of entrepreneurs, the programs increase their chances of running successful small-scale enterprises. These programs offer valuable information about market trends, industry insights, regulatory requirements, and access to relevant resources. Entrepreneurs gain a better understanding of the business environment, enabling them to make informed decisions and take advantage of opportunities. [11].Many entrepreneurship development programs pair participants with experienced mentors or business advisors. Mentors can offer practical advice, share their experiences, and provide guidance on overcoming challenges, thus reducing the risk of failure for new entrepreneurs. Small-scale industries often face difficulties in accessing capital to start or expand their businesses.

Table 1: Perception of the Entrepreneurs towards development of small-scale industries

Benefits of ICT	Mean	Std. Deviation	Mean Rank
Training and Skill Development	3.36	1.140	4.71
Mentorship and Guidance	3.06	1.312	4.08
Promotion of Innovation and Creativity	2.19	1.275	3.39
Access to Finance	2.23	1.313	3.43
Market Linkages	2.47	1.078	3.29
Skill Upgradation for existing businesses	3.96	1.152	3.14
Access to Information and Resources	3.56	1.239	4.78

According to the opinion of the respondents, the Perception of the Entrepreneurs towards development of small-scale industries is found important Access to Information and Resources (4.78). Training and Skill Development (4.71) is ranked second. Thirdly, the respondents feel that the ICT makes catalyst for Mentorship and Guidance (4.08). Using the Friedman test, we can examine whether or not the ranking is statistically significant.

Table 2:Friedman Test

N	100
Chi-Square	57.012
df	6
Asymp. Sig.	0.000

The estimated Chi-Square value for the degree of freedom 6 is 57.012, as shown in Table 2. Therefore, the probability value of 0.000 means that the result is significant at the 1% level. It is concluded that overall, entrepreneurship development programs play a vital role in nurturing and supporting small-scale industries. They contribute to economic growth, job creation, and the overall development of a robust entrepreneurial ecosystem in a region or country.

DISCUSSION

Entrepreneurship development programs can connect entrepreneurs with financial institutions, venture capitalists, angel investors, or government funding schemes, increasing the chances of obtaining necessary funding.[1] These programs facilitate networking events, workshops, and conferences, allowing entrepreneurs to connect with other like-minded individuals, potential customers, suppliers, and industry experts. Building a strong network can lead to collaborations, partnerships, and valuable business connections. For small-scale industries, getting their products or services to the market can be challenging. Entrepreneurship development programs can help entrepreneurs establish linkages with distributors, retailers, and other relevant stakeholders, thus expanding their market reach. Small-scale industries may struggle to adopt modern technologies due to cost constraints or lack of awareness. Entrepreneurship development programs can provide guidance on adopting

technology to improve productivity, efficiency, and competitiveness. Some entrepreneurship development programs engage in policy advocacy to create a more favorable business environment for small-scale industries. [12]They may lobby for regulatory reforms, access to infrastructure, and other supportive measures that benefit entrepreneurs. Entrepreneurship development programs are not limited to new startups. They can also focus on skill up gradation and capacity building for existing small-scale industries, helping them adapt to changing market dynamics and remain competitive. These programs encourage innovation and creativity among entrepreneurs. By nurturing creativity and providing a supportive ecosystem, they can lead to the development of new and unique products or services.

CONCLUSION

By nurturing a culture of entrepreneurship and supporting the establishment and growth of small-scale industries, these programs contribute to overall economic growth. Small businesses generate employment opportunities, increase productivity, and contribute to GDP growth, leading to a more robust and diversified economy.[15] Entrepreneurship development programs encourage innovation and creativity among entrepreneurs. As small-scale industries often focus on niche markets or unique products/services, fostering innovation can lead to the development of novel solutions and contribute to industry advancements. Small-scale industries are significant contributors to job creation, especially in regions with limited formal job opportunities. Entrepreneurship development programs help create new ventures, leading to more employment opportunities and reducing unemployment rates.[19] Many entrepreneurship development programs emphasize sustainability and social responsibility. Small-scale industries can adopt eco-friendly practices, contribute to local communities, and address societal challenges, promoting sustainable development.[6] Small-scale industries are often dispersed in rural and underserved areas. Entrepreneurship development programs can drive regional development by providing support to entrepreneurs in these areas, boosting local economies and infrastructure.Entrepreneurship development programs can empower women by offering training, mentorship, and access to finance, enabling them to break gender barriers and establish successful businesses. This contributes to gender equality and women's economic independence.

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IMPACT OF SOCIAL ENTREPRENEURSHIP OF CORPORATES IN DEVELOPING THEIR BRANDS

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ABSTRACT

Social entrepreneurship undertaken by corporates can have a profound impact on developing their brands in several ways. By engaging in socially responsible initiatives, corporations demonstrate a genuine commitment to addressing pressing societal and environmental issues. This fosters a positive brand image, enhancing their reputation and credibility among customers, stakeholders, and the wider public. When corporates actively participate in social entrepreneurship, they align their brand with a higher purpose beyond profit-making, which resonates with consumers who increasingly prioritize companies with a sense of social consciousness. As a result, their brand perception evolves from being solely profit-driven to a force for positive change, instilling a sense of loyalty and trust in customers. Furthermore, social entrepreneurship often involves direct engagement with local communities and underprivileged populations. By actively contributing to the betterment of these communities, corporates can build meaningful relationships and establish a strong emotional connection with their target audience. Such engagement fosters brand advocacy, as satisfied communities become ambassadors for the corporate's products and services, spreading positive word-of-mouth.

Keywords: Social Entrepreneurship, Corporates, Brands, Brand Differentiation and Long Term Sustainability.

INTRODUCTION

Corporate social entrepreneurship (CSE) is a relatively new idea in business, but it has already received extensive media coverage and has been debated widely on several social media platforms. Along with the well-defined economic principles, the entrepreneurs interested in the notion of social entrepreneurship also build their social preferences. As a consequence, a new company model is created. It is clear that the idea of social entrepreneurship is now expanding quickly in terms of scale, scope, and support. Social entrepreneurship is being employed as a tactic by an extraordinary number of organisations to address issues like hunger, poverty, at-risk kids, recidivism, etc. As many audiences are interested in understanding these activities, the actions made by an organisation to comprehend and address societal challenges may boost the organization's total worth. This expands the potential for doing business with these organisations since social businesses have a compelling narrative to tell that may help the brand of the company. Indirectly, it also draws attention to customer and employee involvement, internal and external communications, and it aids in creating a company that everyone wants to work for. Numerous startups are starting with the intention of helping people and bringing about beneficial social and environmental changes. These people are regarded as social entrepreneurs, and their companies are dealt with as socially conscious businesses. Due to competitive marketplaces and the significant work needed to create competitive distinctiveness, many organisations struggle. This has caused a phenomenon change in the work culture of organisations, and many of them have begun adopting the Corporate Social Entrepreneurship (CSE) model by voluntarily focusing on CSR practices in order to strengthen and uphold the brand value, which in turn increases their work efficiency. Non-profit organisations have also adapted marketing strategies designed for the commercial sector with an emphasis on contributors and recipients. With one ear on social benefits and the other on organisational demands, CSE might be seen as a bastion for an organisation, and its practices also give comfort to its stakeholders. The financial performance of a company is significantly

impacted by increased corporate governance. Therefore, the connection between entrepreneurship and CSR has become crucial. Additionally, it is necessary to categories and better manage the notion of CSR in order to avoid being caught up in the cost element and to further illuminate the concept. It may be claimed that if a company introduces the idea of CSE into its core business plans and treats it seriously, rather than as a fad, then it most likely helps to increase the brand value of the company. Through this study, the researcher makes an effort to comprehend corporate social entrepreneurship and its effects on brand recognition. By using a panel data regression model, this study seeks to empirically analyze the perception of different organisations for corporate social responsibility[2] Because CSE is now an essential component of a company's brand value, the researcher anticipates discovering a relationship between brand equity and CSE. As a result, it will encourage a strong and favourable relationship between CSE and corporate performance. However, it has been noted that stakeholder demand, trends, and preferences relative to products and/or services are continually changing as markets develop quickly[5].As a result, CSE has evolved into a valuation framework for corporations by enabling them to meet the broader range of requirements of their customers and stakeholders throughout time. CSR was discovered to have evolved from a limited and marginalized idea into a sophisticated and adaptable concept, as stated in the literature. Despite the lack of a broadly acknowledged definition and structure for CSR, Crook (2005) said that it "won the battle of ideas." Many corporations have acknowledged the significance of CSR by incorporating it into their business objectives and plans through the emerging idea of corporate social entrepreneurship (CSE).

RESEARCH BACKGROUND

In order to comprehend the notion of CSE, this study has focused on CSR (for social effect), Corporate Entrepreneurship, and Social Entrepreneurship (for methods). These three ideas are therefore targeted at business owners who create business plans to advance growth, generate profit, and so fulfil the demands and requirements of consumers and/or stakeholder groups, as well as to advance the company's brand and enhance it. Utilizing social entrepreneurship just for marketing purposes carries the danger of missing out on a number of chances that may have benefited both the firm and society as a whole.[5] To take advantage of the best of these chances, one must work hard, be committed over the long term, and, most importantly, change their way of thinking. "Brand Orientation" is a recent strategic orientation that has been explored and thought about in the for-profit industry. In the past, a great deal of study on CSE has been done, with a focus on the principles and the mechanisms underpinning extraordinary entrepreneurial activity. However, further study is still required to determine how CSE improves brand recognition, reputation, equity, and other aspects of brand building. The relationship between corporate social entrepreneurship and brand building is examined in this article utilizing primary data.[3].

CORPORATE SUSTAINABLE DEVELOPMENT IN SOCIAL ENTREPRENEUR

It involves adopting innovative and socially responsible approaches to address pressing societal challenges while pursuing long-term financial viability. Social entrepreneurship goes beyond traditional corporate social responsibility by actively seeking solutions to social and environmental issues through entrepreneurial means.[1]. By embracing sustainable development through social entrepreneurship, corporations can align their business goals with the broader goal of creating positive social impact. This might involve developing products or services that directly address social needs, supporting community development initiatives, promoting fair labor practices, or implementing environmentally friendly processes. One key aspect of corporate sustainable development in social entrepreneurship is the emphasis on stakeholder engagement. Instead of solely focusing on shareholders' interests, corporations consider the needs and expectations of a wider range of stakeholders, including customers, employees, local communities, and the environment. By involving stakeholders in decision-making and co-creating solutions, corporates can better understand the specific challenges they face and tailor their initiatives accordingly. Moreover, corporate sustainable development through social entrepreneurship fosters a culture of innovation and adaptability.[10]. Corporations need to continuously assess and improve their social and environmental performance, leading to more responsible business practices and a positive organizational culture. Overall, corporate sustainable development in social entrepreneurship enables corporations to play a crucial role in advancing social and environmental goals while creating shared value for their stakeholders. By integrating purpose-driven initiatives into their core business models, corporates can

contribute to a more sustainable and equitable future while enhancing their brand reputation and long-term business success.

SOCIAL ENTERPRISE

A business's success is measured not by how happy a select few people are, but by how happy everyone is in the community and society as a whole. Revenue, profit, market share, and stock price are all useless as short-term quantitative performance criteria. Instead of quantitative indicators, such money made, social and environmental effect should be used, based on values that are widely held and held in high regard [2].They all point to the necessity of sustainable firms transforming into social enterprises that prioritize social aims above economic ones, employ people from marginalized groups, and reinvest revenues in social initiatives in order to successfully promote and enable the concept of inclusive development. Increasingly, firms with a social mission are being seen as catalysts for positive social change, economic development, and labour market participation [6].Adaptability, a cooperative culture, and a positive work environment are hallmarks of social enterprises. However, their restricted access to capital and need for self-financing pose the greatest threat to their long-term viability and growth.

OVERVIEW OF SOCIAL ENTREPRENEURSHIP RESEARCH

In order to ensure long-term sustainability, social companies must actively participate in the practice of social entrepreneurship.[1] Social entrepreneurship is increasingly being recognized as a viable alternative to conventional institutional frameworks for addressing the unmet needs of marginalized populations, particularly those residing in rural and mountainous areas of underdeveloped nations. There exists a correlation between social entrepreneurship and a manager's capacity to identify unexplored avenues for expansion, fulfil the most fundamental human needs, and create economic and social value for the broader society.[5] Social entrepreneurship relies heavily on people's innate inventiveness in the realms of business and society. Both developed and developing countries have barely scratched the surface when it comes to studying social entrepreneurship. Despite the literature's growing interest in the topic over the past two decades, there remain a wide variety of definitions for it. For additional research, we now present the views of a variety of established academics on the fundamental nature of social entrepreneurship.

APPROACH TO A LITERATURE REVIEW

The objective of the approach was to get a thorough comprehension of the present state of scholarly investigation. The initiation of a comprehensive review necessitates an initial exploration of newly published and pertinent scholarly literature. Subsequently, the acquired findings must undergo a meticulous process of filtration and evaluation. [6] The articles for our review were selected based on the use of keywords, and those that did not fulfil the specified criteria were excluded. The initial step was the identification of the research problem necessitating resolution. The primary topic of this study pertains to the examination of sustainable development and social entrepreneurship within underdeveloped nations. Subsequently, employing pre-established keywords, we systematically searched many bibliographic databases. During the course of this survey, our primary objective was to assess items that had a significant global influence. All the journals that were chosen for inclusion in this study were found to be listed in Scopus, a comprehensive database of scholarly publications covering a wide range of subject areas. [1].The literature, conferences, or critical analyses utilised in our research may possess outdated or unavailable resources, and their influence on scientific progress may be evident in subsequent publications. As a result, it was determined that the scope of this evaluation would be restricted to scholarly journal articles and conference papers. During this time frame, a considerable quantity of research originating from economically disadvantaged countries begun to be published in highly influential publications pertaining to this subject matter. During this particular era, the topics of social entrepreneurship and sustainable development emerged as noteworthy concerns, hence fostering a heightened sense of consciousness among many organisations and influential players. The advancements in social entrepreneurship and corporate sustainability as a result of the growing body of study in this field. The search engine's titles and abstracts encompassed the key terms "social entrepreneurship," "sustainability," "corporate sustainability," and "developing countries." [2].The study of each article was concluded by providing a comprehensive explanation of the investigation's objective, the considerations that were taken into account, the background information, the theoretical framework employed, the findings that were collected, the conclusions that were reached, and the

proposed future research. The findings of this investigation were recorded in an Excel database. In the previous part, the results derived from the analysis of the literature review are presented. In addition, social entrepreneurship activities frequently offer prospects for partnership with non-profit organisations and various stakeholders [9]. These collaborations serve to strengthen the brand's dedication to effecting positive change, establishing a network of like-minded supporters who possess comparable values and objectives. As the business entity's social effect continues to grow, its brand becomes closely linked with progressive ideas, thereby drawing the attention and interest of customers and investors who share similar values.

STATEMENT OF THE PROBLEM

As a result, it was discovered that the majority of the research topics we uncovered were concerned with developed nations and contained pertinent answers, findings, and recommendations. However, there is insufficient evidence to draw a firm conclusion regarding the relationship between social entrepreneurship and sustainable business growth.[2] It is expected that emerging nations would demonstrate a significant amount of diversity, as they may vary in terms of their developmental stage, entrepreneurial expertise and capability, sociocultural context, institutional and legal structures, and other relevant factors. There is a dearth of comprehensive study on the current themes of social entrepreneurship and its correlation with corporate sustainable development.[1] Nevertheless, it is likely that only a limited amount of pertinent research is published in national academic publications. Consequently, the current study's novel empirical research on social entrepreneurship and its links to concerns of corporate sustainable development may effectively replace this void.

RESEARCH METHODOLOGY

The study has been carried out in Tamil Nadu and 100 entrepreneurs are selected as samples for the study. In developing nations and rising markets, entrepreneurship is still relatively young but rapidly gaining relevance in terms of managers' abilities, qualities, and competencies. Sustainability concerns are not only growing more significant, but also more international.[1] These problems are becoming more complex, and many facets of social entrepreneurship are now included. Sustainable social entrepreneurship is necessary for corporate sustainable development, which presents new challenges for company[7].As a result, sustainable social entrepreneurship takes on a variety of forms and dimensions, incorporating inseparably both commercial and social aspects. Social entrepreneurship refers to the practice of using innovative business models and strategies to address social, environmental, and community challenges while pursuing financial sustainability. Social entrepreneurship initiatives may open up opportunities in untapped or niche markets where consumers prioritize socially responsible products and services.[3]

ANALYSIS AND INTERPRETATION

The impact of social entrepreneurship undertaken by corporations extends beyond traditional profit-driven objectives. Corporations engaged in social entrepreneurship leverage their resources, expertise, and influence to address pressing societal and environmental challenges. By integrating social and environmental considerations into their business models, these corporations create a positive impact on various fronts.[8] They not only contribute to the well-being of communities and the planet but also enhance their brand image and reputation. Socially entrepreneurial initiatives enable corporations to align their values with their actions, fostering deeper connections with customers who increasingly prioritize ethical and sustainable practices. Furthermore, these endeavors often stimulate innovation within the company, as they require novel solutions to complex issues.[2] In the long term, the positive outcomes of corporate social entrepreneurship can lead to increased employee morale, customer loyalty, and even financial gains. As corporations recognize the interconnectedness of their success with the well-being of society, their efforts in social entrepreneurship play a pivotal role in driving positive change and shaping a more responsible and sustainable business landscape. Impact of social entrepreneurship of corporates is observed from the respondents using 5 point Likert scale. They are ranked using the Garret ranking technique.

Table 1: Impact of Social Entrepreneurship of Corporates

Technique	Rank	1	2	3	4	5	6	7	Score	Rank
	GV	79	66	58	50	43	35	22		
Enhanced Reputation and Trust	f	17	23	22	11	12	5	10	5598	I
	fx	1343	1518	1276	550	516	175	220		
Brand Differentiation	f	17	10	13	14	18	13	15	5016	IV
	fx	1343	660	754	700	774	455	330		
Customer Loyalty and Engagement	f	10	18	22	18	10	10	12	5198	III
	fx	790	1188	1276	900	430	350	264		
Employee Attraction and Retention	f	11	11	17	17	16	8	20	4839	V
	fx	869	726	986	850	688	280	440		
Access to New Markets	f	9	11	8	13	17	32	10	4622	VII
	fx	711	726	464	650	731	1120	220		
Positive Media Coverage and Publicity	f	24	9	10	14	16	12	15	5208	II
	fx	1896	594	580	700	688	420	330		
Long-Term Sustainability	f	12	18	8	13	11	20	18	4819	VI
	fx	948	1188	464	650	473	700	396		

The above table denotes that enhanced reputation and trust is found most effective (5598) than other techniques. The positive media coverage and publicity is ranked second with a score of 5208. The customer loyalty and engagement is also found effective which is ranked third with 5198. Brand Differentiation (5016), Employee Attraction and Retention (4839) and Long-Term Sustainability (4819), are ranked fourth, fifth and sixth among the seven techniques. Social entrepreneurship initiatives demonstrate that a corporate is committed to making a positive impact beyond just maximizing profits. By addressing social and environmental issues, the company can build a reputation as a responsible and ethical organization. This, in turn, increases trust among consumers, investors, and stakeholders. In competitive markets, having a social entrepreneurship focus allows a corporate to stand out from its competitors. When customers perceive that their purchases contribute to a greater cause, it can create a sense of loyalty and preference for that brand. Customer Loyalty and Engagement: By supporting social entrepreneurship initiatives, corporates can attract and retain socially responsible consumers who feel connected to the brand's purpose and mission. Socially conscious initiatives can also appeal to potential employees who want to work for a company with a strong sense of purpose. As corporates address societal challenges, they may identify new ways to optimize resource usage, reduce waste, and incorporate environmentally friendly processes into their operations. By addressing social and environmental issues proactively, corporates can reduce the risk of potential negative impacts on their business due to changes in regulations or public sentiment.

CONCLUSION

In the long run, the impact of social entrepreneurship on developing corporate brands is evident in increased brand loyalty, higher customer retention rates, and a competitive edge in the market. Overall, social entrepreneurship provides a powerful avenue for corporates to elevate their brands while simultaneously making a meaningful contribution to society.[5] Overall, the impact of social entrepreneurship on developing corporate brands is substantial and multifaceted. It helps create a positive image, fosters customer loyalty, attracts and retains talent, and positions the corporate as a responsible and purpose-driven entity. By integrating social entrepreneurship into their business strategies, corporates can build stronger, more resilient brands that resonate with a socially conscious audience.[10] Employees are more likely to feel motivated and engaged when they see their work contributing to positive social change. Successful social entrepreneurship initiatives often attract media attention and positive publicity. This can enhance the corporate's visibility and create a favorable image in the eyes of the public. Engaging in social entrepreneurship can facilitate partnerships with non-profit organizations, government agencies, and other businesses aligned with similar causes. Such collaborations can lead to increased resources, knowledge sharing, and broader impact. Social entrepreneurship can foster more sustainable business practices.

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CUSTOMER SATISFACTION AND SERVICE QUALITY TOWARDS REPURCHASE INTENTION IN ONLINE FASHION STORE

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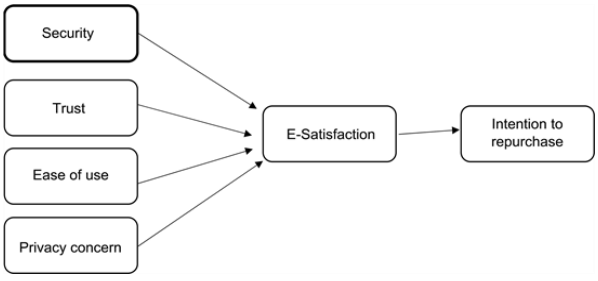
ABSTRACT

In today's digital era, online fashion stores have become an essential part of the retail landscape. Integral to their success is understanding the relationship between customer satisfactions, service quality, and repurchase intention. Recent research delves deeply into how these interrelated factors influence consumer behaviors in the online fashion sector. Primarily, customer satisfaction derived from fulfilling or surpassing customer expectations, plays a pivotal role in influencing repurchase decisions. When consumers find value in their purchase—both in terms of product quality and the overall shopping experience—they are more likely to return to the same online store. Service quality, on the other hand, encompasses various dimensions in an online context: website usability, prompt customer service, clarity of product information, and efficient delivery processes. When online fashion stores excel in these areas, they significantly bolster customer trust and satisfaction. High service quality also mitigates the perceived risk of online shopping, given that customers cannot physically inspect products before purchase. Several studies corroborate that there's a strong positive correlation between customer satisfaction and service quality with repurchase intention. For instance, a satisfied customer, having experienced superior service quality, not only tends to revisit the online fashion store but also is more likely to become a brand advocate, spreading positive word-of-mouth. This cyclical process amplifies the importance of continual investment in service enhancements and understanding evolving customer needs. In summation, for online fashion retailers aiming for sustained growth, focusing on cultivating customer satisfaction through impeccable service quality is not just beneficial—it's imperative. These elements are the linchpins driving repurchase intentions, ensuring long-term loyalty, and fostering brand advocacy in an increasingly competitive digital marketplace.

Keywords: Customer Satisfaction, Service Quality, Online Fashion Store, Website and Ease of Use

INTRODUCTION

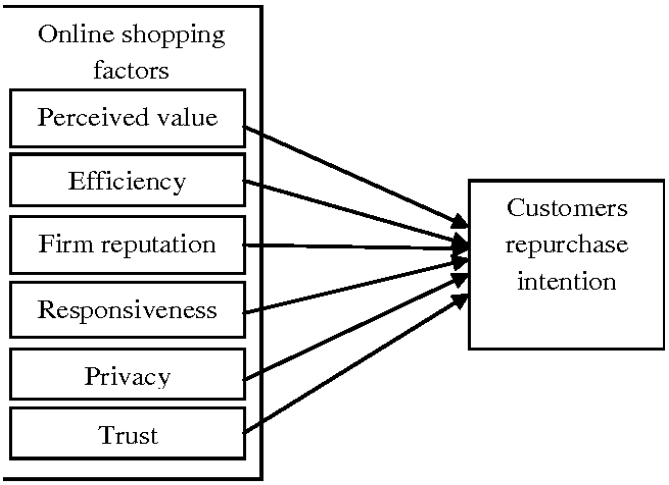
In today's digital age, online fashion stores have revolutionized the way people shop for clothing and accessories. With the convenience of shopping from the comfort of their homes, customers are increasingly turning to e-commerce platforms for their fashion needs. However, in this highly competitive landscape, customer satisfaction has emerged as a crucial factor in determining the success and sustainability of online fashion retailers. This essay explores the significance of customer satisfaction in online fashion stores, its impact on customer loyalty, and the strategies that retailers can adopt to enhance the overall shopping experience.



E-SERVICE QUALITY IN ONLINE STORE

E-service quality in online stores refers to the overall performance and efficiency of digital services offered to customers during their online shopping experience. It encompasses various aspects, including website design, user interface, responsiveness, security, customer support, and delivery services. With the rapid growth of e-commerce, ensuring a high level of e-service quality has become crucial for online retailers to attract and retain customers. An exceptional e-service quality can significantly impact customer satisfaction, trust, and loyalty. Additionally, fast-loading pages and smooth checkout processes reduce the likelihood of cart abandonment and encourage repeat business. Security is another critical aspect of e-service quality.Timely and reliable delivery services play a significant role in customer satisfaction. Meeting promised delivery times and providing tracking options keep customers informed and satisfied with their purchases. In conclusion, prioritizing e-service quality in an online store is paramount for success in the competitive e-commerce landscape. By focusing on website design, security, customer support, and efficient delivery processes, online retailers can create a positive and satisfying shopping experience that fosters customer loyalty and encourages repeat business.

Figure: 01



REPURCHASE INTENTION IN ONLINE FASHION STORE

Repurchase intention in online fashion stores refers to a customer's inclination or likelihood to make future purchases from the same online retailer after their initial shopping experience. Excellent post-purchase customer support, such as easy returns and issue resolution, can influence a customer's decision to shop with the same online fashion store in the future. By understanding the factors that affect repurchase intention, online fashion retailers can strategically focus on enhancing customer satisfaction, building loyalty, and fostering long-term relationships with their clientele. Academics and industry experts agree that repurchase intent is a crucial issue for competitive organisations. [7] The idea is to buy the same items or services on a regular basis. This word refers to the practice of making repeat purchases from tightly targeted online retailers in the realm of e-commerce. In various settings, the term "repurchase intention" has been used to characterize the emotional investment in a good or service that can result from utilizing it. Any discussion of a company's profitability must include a plan to repurchase shares. Repurchase intention, another predicted purchase behaviour, assesses how likely purchasers are to make subsequent purchases of a given product or service [5]. Online buyers like it when a retailer responds quickly to their questions or complaints. Customers who are satisfied with their online purchasing experience are more likely to make additional purchases or engage in future online purchasing activities. A study's findings support the conclusion. According to the findings of this study, when customers are satisfied, they are more inclined to purchase again. In this study, we define consumer satisfaction as the degree to which their shopping experiences match their expectations of the things they buy.

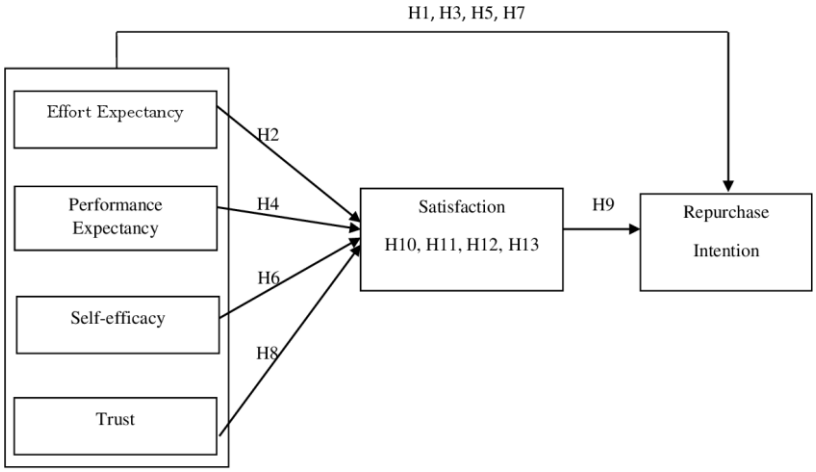
CUSTOMER SATISFACTION IN ONLINE FASHION STORE

Customer satisfaction in an online fashion store is a critical aspect that directly impacts the success and reputation of the retailer. It refers to how well the store meets or exceeds customer expectations during their shopping experience. A high level of customer satisfaction is essential for fostering customer loyalty, encouraging repeat purchases, and gaining positive word-of-mouth referrals. Monitoring and measuring customer satisfaction through feedback surveys, reviews, and analytics allows online fashion retailers to identify areas for improvement and make necessary adjustments to enhance the overall shopping experience[2].By continuously striving to meet customer needs and preferences, online fashion stores can build a loyal customer base, improve customer retention, and thrive in the competitive e-commerce market. The success of the business depends on the happiness of its clients. The degree to which a consumer is pleased or dissatisfied with a product or service depends on how it performs according to the customer's expectations. Customers will be unsatisfied if delivered results fall short of their expectations. Customers are happy if and only if their expectations are met. Customers are likely to be overjoyed if their needs are met and much more so if they are exceeded.

E-SERVICE QUALITY ELEMENT

E-service quality dimensions encompass the critical aspects that define the overall quality of digital services provided by online platforms. A well-designed and user-friendly website enhances the ease of navigation, while responsiveness ensures quick loading times and smooth interactions. Reliability relates to the consistent and error-free performance of the platform. Effective customer support, offered through various channels, resolves queries and concerns promptly. Lastly, efficient fulfillment services, including timely and accurate delivery, contribute to an overall positive impression of the online platform. By prioritizing and excelling in these e-service quality dimensions, online businesses can enhance their competitiveness and build lasting relationships with their customers

Figure: 02



MEASURING REPURCHASE INTENTION ON FASHION ONLINE SHOPPING

Shopping online is just one of several options available to modern customers. Customers shop online by browsing merchant sites, selecting and purchasing desired items, then paying for them with credit cards before the goods are shipped to their homes. Online shopping is another example of a common internet activity.[6] The term "online shopping" is commonly used to describe customer actions in virtual stores or websites. As the global reach of the internet expands, more and more people are opting to do their shopping online. Both the share of consumers who purchase online and their disposable money have increased dramatically in recent years. This study focuses on online fashion purchasing as an example of the type of online retail activity examined. According to Bai et al., more and more people are making use of e-commerce websites to purchase clothing and accessories.[4] One of the reasons for this is that online fashion retailers now provide both business-to-consumer (B2C) and business-to-business (B2B) models, giving consumers a wider range of options in terms of price point and type of fashion item. The working-age population in Indonesia is the best target

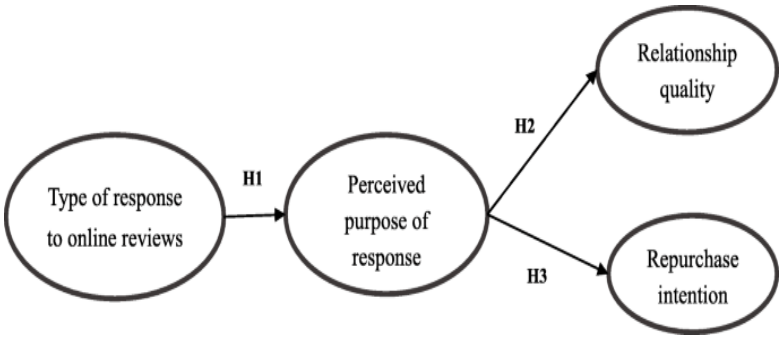
audience for an e-commerce site. According to research published by the ADBI of the Asian Development Bank, Men and women in the middle to upper class are the primary demographic for online retailers to target. This is because people of working age are more likely to be online constantly. Rising virtual enterprises and many established merchants who have embraced the internet as a route to reach younger customers face stiffer competition as online shopping becomes increasingly popular, especially among young adults. Therefore, it is crucial for businesspeople to have a firm grasp on what defines service convenience in the context of online commerce. One way to boost customer satisfaction and encourage repeat purchases is to tailor services to the needs of business customers. Consumers place a high value on convenience, and this is reflected in their shopping habits. Several things will be affected by the ease with which people can shop online. According to Pham et al., the value customers place on a product is influenced by how convenient it is for them to use. The term "perceived value" is used to describe how customers feel about the trade-off they are making in exchange for the quality and perceived benefits of a product or service. Convenience has an effect on consumer satisfaction in addition to the value it adds. Convenience has a role in how satisfied customers rate their online buying experiences; satisfied customers would likely shop online more frequently if they enjoy the process. Happy shoppers are more likely to return to their favourite online retailers. Satisfied customers are more likely to make repeat purchases, as explained by Chen et al. The term "repurchase intention" describes the emotional connection that develops between a customer and a product or service after they've used it. Repurchase intention refers to the subjective likelihood that a shopper would make subsequent purchases from a given seller or online store. According to, consumers' repurchase intent can be affected not only by their level of happiness with a product or service, but also by how much they value that product or service. Muhammad demonstrates that numerous factors, including perceived value, can influence customer desire to repurchase on e-commerce platforms. The purpose of this research is to examine how easy access to e-services influences customers' perceptions of the service's worth.

PERCEIVED VALUE

The term "perceived value" refers to how much a product or service is valued by a consumer based on their own subjective evaluations of its usefulness, quality, cost, and emotional and social significance. Value like this is what keeps customers coming back, which in turn drives sales. The term "value" refers to the subjective estimation of an activity's or an item's worth by the consumer, who does so by weighing the positives and negatives of the purchase. Consumers acquire a value system from a corporation in addition to the things they purchase. A company's brand consists of several symbols that stand for the company as a whole. Pham et al., the time and effort invested during online purchasing can be compared to the indicator value acquired from the website, providing a quantitative measure of perceived value. The perceived value rises further from the ease of making purchases online.

E-SERVICE CONVENIENCE

Consumers place a high value on convenience, and this is reflected in their shopping habits. Convenience can be defined in a more succinct manner as the reduction in the time and effort required by consumers to acquire, use, and dispose of a product or service when compared to the time and effort required by consumers to acquire, use, and dispose of other offerings in the same product category. Time saved, energy saved, and money saved are three indications that can be used to gauge the convenience of an e-service. The three metrics are used to gauge how satisfied customers are with their online buying experiences.



OVERALL SERVICE QUALITY, CUSTOMER SATISFACTION, AND REPURCHASE INTENTIONS.

Overall service quality, customer satisfaction, and repurchase intentions are interconnected aspects that play a pivotal role in the success of any business, particularly in the context of online retailers. Overall service quality refers to the comprehensive assessment of all the services and experiences provided by a company throughout the customer journey. It encompasses various dimensions, including product quality, customer support, website usability, and delivery efficiency. A high overall service quality is essential for creating a positive and memorable customer experience. Customer satisfaction is the measure of how content and fulfilled customers are with their interactions and purchases from a particular company. It is influenced by the perceived value of products or services, the quality of customer support, and the overall service experience. Satisfied customers are more likely to become loyal advocates, promoting the brand through positive word-of-mouth and repeat purchases. [1].Repurchase intentions represent the likelihood of customers to return and make additional purchases from the same company in the future. Positive customer experiences and high levels of satisfaction significantly impact repurchase intentions. In conclusion, overall service quality, customer satisfaction, and repurchase intentions are closely intertwined and form a cyclical relationship. Providing exceptional service quality leads to higher customer satisfaction, which, in turn, boosts repurchase intentions. Online retailers must prioritize these aspects to cultivate customer loyalty, foster brand advocacy, and thrive in the competitive market. By consistently delivering outstanding service and meeting customer expectations, businesses can forge strong and lasting connections with their clientele, ensuring sustained growth and success in the online marketplace.

THE SIGNIFICANCE OF CUSTOMER SATISFACTION

Customer satisfaction in an online fashion store goes beyond merely making a sale. It is about creating a positive and memorable shopping experience that exceeds customer expectations. [3]Satisfied customers are more likely to become repeat buyers and brand advocates, thereby increasing customer retention and attracting new shoppers through word-of-mouth referrals. Moreover, a high level of customer satisfaction contributes to building a strong brand reputation, which is instrumental in standing out amidst a sea of competitors.

RESEARCH METHODOLOGY

The study's target population consists of Indian online shoppers who have made at least one purchase from an e-commerce website [6]. A survey was conducted online to collect the responses. This study employs descriptive research methodology. Observing and describing the behaviour of a subject without influencing it is the objective of descriptive research design. Convenience sampling is employed to acquire data from online shoppers [7].The information were collected through Google forms from 500 respondents in the study area.

ANALYSIS AND FINDINGS

Service quality in online fashion stores is multifaceted, shaped by a blend of technical, logistical, and interpersonal factors. Addressing each aspect holistically can significantly influence repurchase intentions, ensuring sustained customer loyalty in a competitive market. High-quality images, detailed product descriptions, and honest customer reviews give shoppers confidence in their purchase decisions. Virtual try-ons or augmented reality features can further enhance this experience. The level of importance is measured using the five point likert scale and the significant difference in the rank is tested with the help of Friedman test as below.

Table 1: Results of Friedman test for that Impact Service Quality and, Subsequently, Repurchase Intention:

Reasons	Mean	SD	Mean Rank	Rank
Website Usability and Design	4.06	0.756	5.25	VIII
Product Presentation:	4.00	0.739	5.13	X
Payment security	4.10	0.720	5.42	V
Delivery and Logistics	4.63	0.629	5.67	III
Customer support	4.81	0.711	5.71	I
Personalization	4.28	0.630	5.65	IV
Transparency	4.80	0.721	5.69	II
Loyalty Programs	4.06	0.765	5.40	VI
Feedback Mechanisms	4.01	0.78	5.21	IX
Ethical Practices	4.08	0.731	5.34	VII
Chi-Square	62.157			
df	9			
p-value	<0.001**			

Table 1 revealed the results of the Friedman test for impact service quality and, subsequently, repurchase intention. Service quality in online fashion stores is pivotal in shaping repurchase intentions. Various factors influence this quality, and understanding these can guide retailers in enhancing customer experience and loyalty. The study's outcome describes the chi-square and p-value for impact service quality as 60.407. The p-value is <0.01. Therefore, the study confirmed that the essentials of emotional intelligence are important among the employees working in information technology companies in the study area. The study also described that the most significant essential of impact service quality is Customer support (4.81), ranked 1st. Responsive and helpful customer service—whether via Chabot's, email, or phone—can make a difference in post-purchase satisfaction levels. Efficient handling of complaints and queries is crucial.It is followed by Transparency (4.80), Clear communication regarding product availability, shipping costs, return policies, and potential delays can foster trust and elevate service quality perceptions. Delivery and Logistics (4.63). Prompt, reliable, and cost-effective delivery options contribute significantly to service quality. Offering services like tracking, free shipping, and easy returns can positively impact repurchase intentions.

CONCLUSION

In conclusion, customer satisfaction is of paramount importance for online fashion stores. By focusing on factors such as website user experience, product quality, e-service quality, and competitive pricing, retailers can create a shopping experience that delights customers and fosters loyalty. Embracing technological advancements and prioritizing customer feedback will enable retailers to continuously improve their services and stay ahead in the competitive e-commerce landscape. Ultimately, a satisfied customer is not only a testament to a successful transaction but a stepping stone towards a thriving and reputable online fashion store. Increasingly, consumers are concerned with sustainability, ethical production, and corporate responsibility. Brands that transparently address these concerns can elevate their service quality in the eyes of many consumers. Based on the study's outcome, the study confirmed that impact service quality also enables Testimonials, user-generated content, and collaborations with influencers can bolster the credibility of an online fashion store and its offerings.

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THE APPLICATION OF BLOCKCHAIN TECHNOLOGY IN ENHANCING THE PAYMENT PROCESS THROUGH BANKING FOR EFFECTIVE MONITORING

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ABSTRACT

Blockchains are a specific kind of distributed ledger that have the potential to be utilized for the purpose of recording transactions that take place across an entire network. These ledgers are incorruptible, well-organized, and decentralized all at the same time. The blockchain records transactions in the form of immutable blocks, and each of these blocks contains all of the pertinent data that is associated with the transaction. Any significant transaction or piece of information that is sent to the network can be stored and shared using the network's recording and dissemination capabilities. When compared to the decentralized and distributed ledger system offered by blockchain technology, the traditional methods of transaction monitoring are centralized, which makes them inefficient, expensive, and unneeded. On the other hand, the distributed ledger technology, also known as blockchain, does not have any of these problems.

The introduction of digitization, which is becoming increasingly pervasive, has had a huge influence on the provision of monetary services and has caused considerable disruptions as a result. The barter system was eventually succeeded by commodity money, which was then succeeded by fiat currency, and now digital currency and digital payment have rendered cash obsolete.

Keywords: Block chain, Payment Processing, Regression Analysis, Chi Square Test

INTRODUCTION

The use of blockchain technology to underpin a decentralized digital currency that is neither backed or supported by any single central bank. The shape that the digital currency took during its existence. The digital money utilized. Bitcoin has evolved into a symbol that represents the possibilities offered by the blockchain. Blockchain is the name given to the technology that lies beneath Bitcoin and enables it to work. The distributed ledger technology (DLT), which is more commonly referred to as blockchain, is what is used to keep track of all of the Bitcoin transactions that have ever taken place. (Gupta 2018, 3-6.)

There are several components of blockchain technology that have the potential to be used to provide answers to problems that already exist in a wide range of organizations. These components can be put to use to address a variety of issues. These solutions have the potential to be deployed in a way that confers a competitive advantage on the companies who make use of them. This technology is distinguished from others by a number of important characteristics, the most notable of which are the immutability of the data that is recorded on a blockchain and the fact that it is not centralized in any one location. As opposed to a centralized ledger, a blockchain is a decentralized database; as a result, all participants in the network have access to the documents.

This is in contrast to a centralized ledger, which restricts who may see what information. Because of this, the establishment of a decentralized communication system is now far less complicated than it was previously, as there is no longer any demand for intermediaries to act as go-betweens. When an intermediary is removed from a transaction, the procedure that emerges is one that is not only more streamlined but also results in a lower overall cost. Immutability is another important aspect of cryptocurrencies, and it relates to the fact that once a

transaction has been recorded, it cannot be modified in any way. This makes immutability one of the most desirable characteristics of cryptocurrencies. This protects the honesty of the ledger and thwarts any attempts at fraudulent behavior. If it turns out that some modifications are required, a new transaction will be drafted and distributed to all of the appropriate networks after it has been sent out. Once a transaction has been validated by all of the other computers in the network, the state of the transaction cannot be modified in any manner. This is because validating a transaction involves exchanging information between computers. Once the transaction has been validated, there is no way to change the status of the transaction in any way. As a consequence of this, there is a significantly increased level of trust and safety in the surroundings.

Barter was eventually succeeded by commodity money, which was then succeeded by fiat currency. The use of commodity money eventually gave way to the use of fiat currency, which eventually took over from commodity money. Banking innovations such as automated teller machines (ATMs), electronic funds transfers (EFTs), e-clearing services (e-clearing), real-time gross settlement (RTGS), internet banking, debit and credit cards, and mobile banking are all examples of how advancements in technology have made it possible for new banking methods to be developed. Given the already enormous role that technology plays in the financial sector, the fact that blockchain has the ability to bring about massive revolutions in this area is not surprising at all.

The use of blockchain technology makes it possible to record transactions in a block in an immutable form, which other users may subsequently verify. This makes it feasible to keep a public ledger of all transactions that have ever taken place. In the current context, there is no attempt at mediation made by any of the third parties that are involved. It is possible that the banking and financial industries will go through fundamental paradigm shifts as a direct result of the use of blockchain technology. There should not be any reason to rule out the possibility that the entire monetary and financial system would go through a period of tremendous upheaval. 2018 The Gupta family is the family in question.

Over the course of the previous two decades, the industry of information technology has experienced astounding growth and development. The dissemination of novel technologies has resulted in widespread economic upheaval, as practically every industry has been affected. The amount of competition from the financial technology (Fintech) business is quickly expanding despite the fact that entering the banking industry has historically been difficult due to regulation and compliance requirements.

REVIEW OF LITERATURE

The businesses that operate within the financial technology sector are currently engaged in the process of formulating innovative plans with the goal of providing their customers with quality financial services. Due to the fact that the scope of activities pursued by fintech companies is far more limited than that of traditional financial institutions, fintech companies are in a position to provide solutions that are superior to those offered by traditional financial institutions. As a consequence of the competitive advantages that fintech firms have in terms of speed, low costs, dependability, and openness, there is a risk that banks will be put in jeopardy as a result of competition from fintech companies. This is because of the competitive advantages that banks do not have. In spite of the fact that banks have maintained their dominant position in the payment sector for many decades, fintech companies are making significant headway in the market. The process of moving money internationally might take anywhere from one to five working days and costs between $40 and $50, as stated by the website TransferWise. The length of time necessary to accomplish the transfer is also subject to variation.

The development of fintech has made it feasible to send money in a way that is instant, at a cost that is reasonably cheap, and in a time frame that is relatively short. In addition, when compared to traditional financial institutions such as banks, fintech companies, such as those in the banking industry, are able to deliver clearing and settlement services in a manner that is substantially faster. The number of individuals who transact with virtual currencies and carry digital wallets is steadily growing. It is anticipated that this pattern will carry on.

Additionally, a growing number of companies, such as Apple, are now giving their consumers the option of using a digital wallet, which can be used to make payments and can even be used to apply for loans. This is a growing trend that has been fueled in part by the rise of mobile payments. Consumers are showing a growing interest in selecting this alternative option. Facebook has been considering the possibility of launching Libra, its payment-focused digital currency, in the year 2021 as a means of working toward accomplishing this objective.

Banks will face greater levels of competition from other types of financial institutions as customers become more interested in and trustworthy of technology.

The blockchain is only one of several new technologies that will start to make a difference in the not-too-distant future. Additional examples include robotic process automation (RPA), artificial intelligence (AI), and big data. At the present time, a wide array of financial institutions are keeping a close eye on the development of the technology that underpins blockchains. J.P. Morgan, Bank of America, Merrill Lynch, and HSBC, in addition to dozens of other financial organizations, have all successfully completed a transaction making use of a blockchain, and they are keen to implement the technology into their business processes. Additionally, hundreds of other financial institutions have successfully conducted a transaction by utilizing a blockchain.

Traditional banking institutions face potential competition from fintech companies that employ blockchain and other cutting-edge technologies to provide services to customers at lower costs and with greater transparency. By offering their consumers a variety of financial services, these businesses hope to position themselves in direct competition with traditional banking institutions. They were able to complete their mission with a reasonable amount of difficulty, and as a direct consequence of their success, they now have a great amount of control over the online payment sector. The continuous growth of the financial services industry has directly contributed to the emergence of blockchain technology as a primary area of focus and concern.

The immutable and distributed ledger that blockchain technology provides could bring about a fundamental shift in the way that record-keeping is carried out. The implementation of blockchain technology in the financial industry is only one example of the numerous potential applications that could perhaps be conceived in the not-too-distant future. Because of this, it is possible that there will be significant changes to the structure of the financial system, as well as considerable savings in the costs connected with its operation. Additionally, there is a potential that there will be significant savings. The deployment of blockchain technology is going to be an essential requirement in order for us to meet our goal of successfully resolving the problems that are now being experienced by financial institutions like banks. Blockchains have a number of advantages, the most important of which are that they are efficient, open, do not incur any administrative expenses, and do not involve any intermediaries. Other benefits include the option to remain anonymous and unchanged. To begin, one of the key ways that the blockchain technology enhances the efficiency of financial deals is by eliminating the need for a human to make a choice during a transaction. This is one of the primary ways that the blockchain technology promotes efficiency. When it comes to the maintenance of records and the running of the government, the work that is put in by machines is considerably superior to that which is conducted by humans.

This is the case because machines can work much faster than humans can. Second, it helps to cut down on the expenses that are incurred as a result of carrying out company activities and completing transactions. It is not required to involve a middleman in the process of settling a dispute and making a payment, nor is it necessary to pay pricey broker fees in order to do so. Rather, both of these can be accomplished without the involvement of a third party. The blockchain is a decentralized ledger system that enables participants feel more confident in one another without directly relying on any of the participants.

Customers of financial institutions are frequently subjected to a levy that is intended to compensate the institutions for the costs associated with maintaining current accounting and ledger systems. Because of the monotonous, costly, and time-consuming nature of the work environment in the banking industry, it is widely regarded as one of the least desirable sectors in which to find employment. The central banks of the world and other significant organizations are examining the potential applications of blockchain technology and looking into techniques to incorporate it into their existing procedures. It is of the utmost importance that the expenses that are incurred by the bank's back office activities be cut down by a sizeable amount.

METHODOLOGY

The purpose of this study is to evaluate the role that blockchain technology plays in the accounting procedures used by various commercial entities. The researchers want to conduct their investigation via a quantitative approach. In spite of the fact that they play a vital part in the economy of the modern world, banks have been obliged to struggle against a diverse assortment of challenges over the course of human history. As a direct result of the activities of those who participate in it, the current economic system is exceedingly insecure and prone to recurrence, as was demonstrated by the events that preceded the financial crisis that took place in 2008.

As a result of this, it is of the utmost importance to give equal weight to the benefits as well as the drawbacks of the blockchain technology.

These payment services are superior to those offered by banks in terms of speed, cost, adaptability, and openness. Banks offer payment services, but these services are superior in all of these areas. The SWIFT network, which is an acronym that stands for the Society for Worldwide Interbank Financial Telecommunications, is utilized by financial institutions in order to send and receive information on international monetary transactions.

RESEARCH HYPOTHESIS

There is no significant difference between Settle transactions more easily and application of blockchain technology in enhancing the payment process in banking.

There is no significant difference between Maintain the authenticity of the transactions and application of blockchain technology in enhancing the payment process in banking.

There is no significant difference between Facilitate peer-to-peer transfers and application of blockchain technology in enhancing the payment process in banking.

CRITICAL ANALYSIS AND INTERPRETATION

This part of the study is involved in presenting the data analysis based on the information collected from the respondents, the sample population were chosen using convenience sampling method. The data is analysed used SPSS statistical package and the tools used are percentage rate analysis, regression analysis and chi square test

Table 1: Percentage rate analysis

Gender	**Frequency**	**Percent**
Male	87	56.5
Female	67	43.5
Age	**Frequency**	**Percent**
Less than 24 years	55	35.7
25 - 44 years	50	32.5
45 - 64 years	18	11.7
Above 65 years	31	20.1
Nature of Profession	**Frequency**	**Percent**
Teller / Payment handler	65	42.2
FX / Treasury Operations	64	41.6
Others	25	16.2
Aware of Blockchain in Banks	**Frequency**	**Percent**
Fully aware	91	59.1
Somewhat aware	63	40.9
Level of Management	**Frequency**	**Percent**
Lower Level Management	72	46.8
Middle Level Management	57	37
Top Level Management	25	16.2
Work experience	**Frequency**	**Percent**
Less than 5 years	48	31.2
5 - 10 years	44	28.6
11 - 15 years	24	15.6
16 - 20 years	27	17.5
Above 20 years	11	7.1
Total	154	100

From table 1, it is noted that 56.5% were male respondents, 35.7% were in the age group of less than 24 years, 42.2% were working as teller or payment handler in banks, 59.1% of the respondents mentioned that they are fully aware of that in current scenario Blockchain are applied for making safer payments, 46.8% were in lower level management and 31.2% possess less than 5 years of experience

REGRESSION ANALYSIS

The researcher intends to understand the critical relationship between the independent variables: Settle transactions more easily; Maintain the authenticity and Facilitate peer-to-peer transfers towards the dependent variable: application of blockchain technology in enhancing the payment process in banking.

Table 2: Regression Analysis

R	**R Square**	**Adjusted R Square**			
.900a	.900a	0.809			
ANOVA	**Sum of Squares**	**df**	**Mean Square**	**F**	**P Value**
Regression	153.724	3	51.241	212.451	.000b
Residual	36.179	150	0.241		
Total	189.903	153			
Regressions	**B**	**Std. Error**	**Beta**	**t**	**P Value**
(Constant)	0.34	0.154		2.204	0.03
Settle transactions more easily	0.363	0.079	0.371	4.573	0.00
Maintain the authenticity	0.323	0.082	0.351	3.962	0.00
Facilitate peer-to-peer transfers	0.214	0.069	0.221	3.091	0.00

The table 2 shows that the p value of the regression analysis is 0.00 which is very less than the significant level of 0.05, hence it ca be stated that there is a significant relationship between independent and dependent variables, also the regression equation can be stated as

Y (Application of blockchain technology in enhancing the payment process in banking.) =

0.34 + 0.363 x Settle transactions more easily + 0.323 x Maintain the authenticity + 0.214 x Facilitate peer-to-peer transfers.

Chi square test

The last section is to apply chi square analysis to test the hypothesis

Table 3: Chi square test 1

Settle transactions more easily * Blockchain Crosstabulation						
	Blockchain					
Settle transactions more easily	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Strongly Disagree	0	4	0	0	0	4
Disagree	4	11	0	0	0	15
Neutral	0	0	20	0	0	20
Agree	0	0	0	12	17	29
Strongly Agree	0	0	0	28	58	86
Total	4	15	20	40	75	154
Chi-Square Tests	Value	df	P Value			
Pearson Chi-Square	319.947a	16	0.00			
Likelihood Ratio	231.22	16	0.00			
Linear-by-Linear Association	114.66	1	0.00			
N of Valid Cases	154					

Based on the analysis it is noted that the p value is 0.00 which is very less than the significant level of 0.05, hence null hypothesis is rejected and hence it can be concluded that there is a significant difference between

Settle transactions more easily and application of blockchain technology in enhancing the payment process in banking.

Table 4: Chi square 2

Maintain the authenticity * Blockchain Crosstabulation						
	Blockchain					
Maintain the authenticity	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Strongly Disagree	0	8	0	0	0	8
Disagree	4	7	0	0	0	11
Neutral	0	0	16	0	0	16
Agree	0	0	4	4	8	16
Strongly Agree	0	0	0	36	67	103
Total	4	15	20	40	75	154
Chi-Square Tests	Value	df	P Value			
Pearson Chi-Square	310.762a	16	0.00			
Likelihood Ratio	215.483	16	0.00			
Linear-by-Linear Association	115.895	1	0.00			
N of Valid Cases	154					

Based on the analysis it is noted that the p value is 0.00 which is very less than the significant level of 0.05, hence null hypothesis is rejected and hence it can be concluded that there is a significant difference between Maintain the authenticity of the transactions and application of blockchain technology in enhancing the payment process in banking.

Table 5: Chi square 3

Facilitate peer-to-peer transfers * Blockchain Crosstabulation						
	Blockchain					
Facilitate peer-to-peer transfers	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Total
Strongly Disagree	4	4	0	0	0	8
Disagree	0	11	0	0	0	11
Neutral	0	0	16	4	0	20
Agree	0	0	4	12	33	49
Strongly Agree	0	0	0	24	42	66
Total	4	15	20	40	75	154
Chi-Square Tests	Value	df	P Value			
Pearson Chi-Square	306.050a	16	0.00			
Likelihood Ratio	198.956	16	0.00			
Linear-by-Linear Association	104.674	1	0.00			
N of Valid Cases	154					

Based on the analysis it is noted that the p value is 0.00 which is very less than the significant level of 0.05, hence null hypothesis is rejected and hence it can be concluded that there is a significant difference between Facilitate peer-to-peer transfers and application of blockchain technology in enhancing the payment process in banking.

DISCUSSION

The demand that a Regulation framework be built and kept up to date is one of the most critical challenges that are posed by blockchain technology. Because blockchain is based on decentralization, the authorities have spent a great amount of time considering how they may exercise control over the technology. This discussion has taken up a significant amount of time. It is highly improbable that a completely decentralized system would ever be constructed. This is due to the fact that authorities will need to (at least partially) exist in order to supervise the operation of the financial institution. This is due to the fact that it is impossible to monitor the operations of a financial institution if they are not there. Guo and Liang (2016).

On either a domestic or an international scale, there are no limitations imposed on how the blockchain technology can be utilized. Despite the fact that several nations are looking at ways to exert control over

blockchain technology, it is still unclear what the legal position of blockchain actually is. Despite this, the legal status of blockchain is not entirely clear. (Gupta & Gupta, 2018)

Another issue that has been brought up for consideration is the question of who will step up to the plate as a figure of authority in the event that a crisis occurs. When there is no one in charge, there is no one to ease the pressure that is being placed on everyone else when things get difficult. This means that everyone must bear the brunt of the difficulty. Those who are already having difficulty are subjected to an unnecessary amount of pressure as a result of this. It is possible that this will have repercussions on the financial front as a direct consequence of this. As a result, in order for regulators to make any adjustments at all, it is essential for them to have a comprehensive view on the problem. 2016 Deloitte. It is challenging to achieve rapid adoption since there is now no rule that clarifies how the dispute between the two financial institutions may be resolved. This makes it difficult to achieve rapid adoption. Because of this, rapid adoption is much more difficult to attain.

CONCLUSION

This study is another evidence that the blockchain technology is going to bring about a dramatic transformation in the financial services industry in the very near future. As part of an attempt to tackle inefficiencies in institutions, it is encouraging to see that this technology has the potential to cut out the need for middlemen, boost productivity, and lower operating expenses. The use of blockchain technology in areas such as international monetary transactions, consumer knowledge, trade finance, the capital market, and regulatory and compliance systems all have the potential to be useful. When compared to existing technologies, such as Swift, blockchain facilitates the execution of international financial transactions between banks in a way that is both more expeditious and less expensive than was previously achievable. As a result of there not being any middlemen involved in the transaction, the customer experience is characterized by increased levels of both efficiency and transparency. Through the utilization of smart contracts, the establishment of commercial finance arrangements can be completed in a manner that is both expedient and economical. It is also an effective tool for keeping a watch on the delivery of the transaction and lowering the risk of any potential problems.

When transacting on the capital market, rapid, efficient, and open settlement of trades is always possible at any moment. The procedures of reporting and compliance could possibly be simplified with the assistance of blockchain technology, which could be deployed by financial institutions. There is also the possibility that these procedures could be streamlined. The authorities are entirely confident in the incorruptibility of the data that is kept im blockchains and have no reason to doubt it. The technology behind blockchain has a lot of potential benefits, but it also has a few potential drawbacks. The fundamental ideas behind the blockchain technology are challenging to understand and call for a significant time commitment. Since 2015, significant financial institutions have been researching the potential applications of blockchain technology, but they are not yet prepared to put it into practice. There are a number of challenges that need to be handled before the blockchain technology can be implemented in financial institutions. These issues relate to regulation, technology, trust, energy usage, and costs.

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COMPUTER MALWARE INFECTIONS AND THEIR PREVENTION ON COMPUTER USERS

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ABSTRACT

The goal of the study is to investigate the effects of a computer virus attack and to outline the steps that people may take to safeguard their personal computers (PCs) against such assaults. In an increasingly digital and interconnected world, it is essential to discuss the dangers of computer viruses and the measures that may be taken to protect against them among users of personal computers. Overidentification of common variables that contribute to computer virus assaults and the forwarding of potential remedies to personal computer users in the hope that they will be able to overcome these virus attacks and enhance their overall computer use in the future.

Keywords: Computer Viruses, Digital Security and Privacy, Digital Environment, Technology Privacy.

I. INTRODUCTION

There is a broad variety of computer viruses, each with its own unique impacts. Some only repeat themselves, while others harm the system's programmed and slow them down. In 2014–2015, Browser Hijack infections were the most often observed form of virus due to their widespread distribution and significant effect on users. This kind of infection is often not a virus but rather potentially unwanted programmed (PUP). Viruses may cause chaos for a computer's functionality. A computer virus is a kind of malicious software designed to secretly and illegally access your system. It may evolve or copy itself, increasing its chances of spreading farther. These browser hijacks often alter the user's default search engine and home page, and it may be quite difficult to get rid of them and go back to normal. [1] Bundled software, which might contain free games and wallpapers, is a common source of browser hijackers. Various computer viruses could infect your system if you engaged in common web activities like opening email attachments from suspicious senders, clicking on questionable online advertisements without thinking things through, setting up free games, toolbars, and system utilities without reading the fine print, etc. Computer viruses may be broken down into several categories based on their methodology, where they originated, the files they infect, the harm they cause, the operating system or platform they target, and the locations where they hide. [2]

II. OBJECTIVE

THE RESEARCH AIMED TO FULFILL THE FOLLOWING OBJECTIVES:

1. Digital Security and computer viruses
2. Damages made by computer viruses
3. Result and discussion

III. METHODOLOGY

This study's primary objective is to identify the causes of viral assaults on PCs. The prevalence of computers in modern life has exploded. Users of personal computers in the modern day, therefore, need thorough virus protection methods to counter the ever-evolving dangers posed by malware. The more damaging a virus is, the more damage it does to a computer. Examining the actions, a virus takes in a host system and the potential actions it may take over time is crucial. It helps in securing our computer by providing the necessary security methods. The goal of this article is to inform the reader of the dangers posed by computer viruses and to provide

suggestions forwarding against infection. Many modern computer viruses are designed to rapidly multiply and install themselves.

IV. DIGITAL SECURITY AND COMPUTER VIRUSES

It is a common belief that programmers have the power to build or ruin the internet. They contribute to the development of the internet by producing useful applications, websites, and software, among other things. However, they are also capable of tainting the internet with dangerous programmed like as viruses. One of the most prevalent subjects of conversation among regular computer users is that of computer viruses. You must have been involved in some way or another in conversations on this subject. Despite this, many people are unaware of the specifics about computer infections.

As a result of this, we are obligated to provide a comprehensive explanation of the existence and behavior of computer bugs. This article will also clarify whether or not a computer virus may go undetected and whether or not it can have an effect on humans. If you have an in-depth knowledge of the inner workings of viruses, you will be more ready to deal with them in the proper manner.

WHAT EXACTLY IS A VIRUS IN A COMPUTER?

A computer virus is a piece of harmful code or a programmed that has been designed to carry out a certain task, such as altering another programmed or replicating itself across several computer systems. When transferred to a technical gadget, they are used in the commission of harmful acts. The deployment of a computer virus to steal data or damage a device is perfectly legal![3]

Some people consider everything that is possible to harm a computer to be a kind of computer virus. However, the behavior of a computer virus is not limited to only assaulting a system; it also includes other behaviors. It is capable of damaging hard discs, a complete computer's operating system, as well as individual components of any electrical equipment.

Similarities may be seen between human-infecting biological viruses and their digital counterparts, known as computer viruses. Their effects and mode of action are remarkably comparable to those of viruses, which may infect both people and electronic equipment. They are not solicited, yet still they infect their hosts and inflict damage to them. In the year 2020, the IT Governance of the United Kingdom observed an astounding pace of 20 billion cyber intrusions. These kinds of strikes were directed at a variety of targets, but the underlying impact was terrible harm.

HOW DOES A COMPUTER VIRUS GO FROM ONE MACHINE TO ANOTHER?

Downloads from the internet at a high level, visiting infected websites, opening email attachments, and social engineering-based scams (such as phone calls to explore a website or malicious USB drives) are the primary vectors for the transmission of computer viruses.

One of the characteristics that must be understood about computer viruses in order to appreciate the risks they pose is the fact that they are able to replicate themselves via the use of shared networks. As a consequence of this, its transmission may take place through the sharing of resources across a network or via electronic mail. It is also possible for it to infect a computer system via a file when the user is downloading the file online without using any kind of protective software. After this point, a virus of this kind will be able to reproduce itself and carry out harmful acts. Additionally, it is able to attach itself to executable files, so infecting both computer systems and network infrastructures.

It is not surprising that many people who use computers are under the impression that a computer worm and a computer virus are one and the same. The terms "worms," "spyware," and "rootkits" should not be confused with "viruses." On the other hand, each one is an illustration of a piece of harmful software or code. It is hard for your system to work properly as long as it is infected with any of these forms of malware, which all have a similar purpose.

The vast majority of viruses are transmitted via online and email traffic. Users who are surfing the web run the risk of downloading dangerous programmed by accident, clicking on links included within emails, or running attachments contained within emails, all of which may result in a virus infection on the underlying computer

system. When operating in the advanced mode, viruses are able to circumvent the security precautions that are in place. In most cases, they include the use of security apps or access restrictions at the network level. [4]

V. DAMAGES MADE BY COMPUTER VIRUSES

Computer viruses are created by malicious software developers. The author's purpose determines the virus's system harm. Computer viruses may cause the following damage:

Broken DATA

Commuter viruses attack host files. Viruses may infect hard drive data. Viruses destroy data forever. Documents, music, video, and software packages are accepted.

Slow your Computer

Computer viruses are invisible. However, this procedure might delay Windows. The virus's background activity slows the system. Thus, your computer will function slowly and apps will respond slowly.

Hard Disc Data Loss

Viruses may also delete data or damage them. The virus might delete or email the file to the creator.

Malfunctioning applications

Infected computers or applications may display apparently random messages. Famous hackers employ this method.

Some software runs without human interaction. Your commuter has another viral illness. The virus may erase all your hard drive files without your approval.

Because of their multilingual nature, viruses target Windows and Linux. Mac virus rumors disproved again. Simply:

It's free

Online thieves use computer viruses. These infections may steal your data. Computer viruses look for names, addresses, and credit card numbers. Every workstation must have antivirus software. [5]

UNDETECTABLE COMPUTER VIRUSES?

Computer viruses may hide in many locations, making them hard to find. Most computer viruses exhibit malice. Antivirus software may detect it. A computer virus might nevertheless infiltrate your system without producing any issues.

Computer viruses that take your data and send it to their developer are always successful. If they disguise themselves, they may go undiscovered for a while. This malware discreetly sends your personal data to its author.

However, outdated antivirus software may cause this. To identify new viral strings and signatures, an anti-virus application must be updated constantly. Antivirus software that solely detects known signatures may miss a new infection. Viral hiding examples:

ATTACHING TO SYSTEM FILES WITHOUT CHANGING THEM.

Self-encrypting. The virus may encode data or information to make it unavailable to users or anti-virus software without your consent.

Anti-virus software cannot identify morphing viruses because they modify their code with each host. Infected systems update code every few hours. Polymorphic viruses may produce several functional versions.

COMPUTER VIRUSES AFFECT PEOPLE?

Isn't it absurd that a computer virus might affect a person? However, medical technology makes this possible. However, it may not be as harmful as biological viruses.

Technology has expanded patient treatment choices for medical implant surgery. These chips' software interacts with the body's infrastructure.

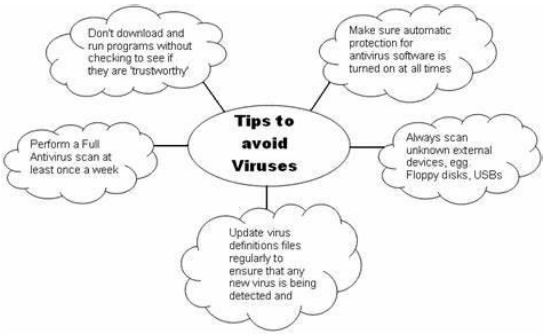
Science has revealed that certain implanted devices may be hacked. They're hackable and reprogrammable. The chip will malfunction and harm the host.

DO ALL VIRUSES DESTROY COMPUTERS?

Due to media attention, people may think all computer viruses are bad. Viruses are code, like instructions.

Some computer viruses are harmless. Some viruses may harm data. Even "white hat" hackers, who work for respectable organizations or security firms, may create viruses. These viruses aim to improve enterprise cyber security by simulating them. [6]

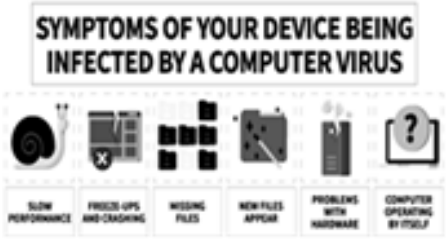
Figure 1. Avoid Computer Viruses



VI. RESULT AND DISCUSSION

Most people said that viruses are a major hindrance to using personal computers. According to the statistics, 68 individuals have had more than six separate malware attacks on their computer during the last three months. According to the results, 43% of PC virus infections occur as a result of using USB flash drives, 29% due to not having antivirus software, 12% due to accessing malicious websites, 11% due to not having the most up-to-date antivirus software, 5% due to not having a licensed copy of the software, and 9% due to excessive internet use. PC users agree that programmed le infections are a major problem because of how badly they damage their machines. In addition, respondents brought up the issues of hard disc infection, system reinfection, and boot sector infections. The vast majority of responders (70%) are using the trial version of antivirus software to safeguard their Internet surfing activities. In terms of market share among licensed antivirus software, AVG and Kaspersky are roughly tied, with Norton coming in at a distant third in Sri Lanka. The most common sign of a virus infection is a slowdown in system performance (48%), followed by a failure in programmed functioning (20%) and unwanted messages and error messages (12%). In addition, when asked what they think is the best approach to defend their PC against virus attacks, the majority of respondents (57%) said installing antivirus software and keeping it up-to-date with regular updates and a paid license was the best option. Twenty-two percent of respondents said that avoiding the use of pen drives is another effective way to protect the system from viruses.[7]

Figure 2. Computer Virus Symptoms



CONCLUSION

All respondents said virus attacks affect their PC use. This study offers many profitable methods to safeguard personal computers from viral threats. Virus protection and detection are the easiest advice for this study. It's the simplest and cheapest technique to tackle a virus by updating the antivirus programmed, patching OS, application, and browser loopholes. Often, prevent hazardous internet surfing such as accessing questionable websites, surfing on cracked websites, and downloading from unsafe websites, do not read the message immediately, store it and use checking toxic software, and delete suspicious emails immediately. Computer Viruses slow down computers. Cyberattacks target networked control systems due of their growing relevance. Malicious programmed are simple to install, causing data loss and system disturbance. Installing excellent anti-virus software protects your machine. A few virus detection methods investigate this issue. The studied research suggests that neural networks are the most promising method for viral detection and prevention. This field needs additional research.

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EDUCATIONAL ASPIRATIONS AND SOCIAL COMPETENCE RELATED TO EMOTIONAL INTELLIGENCE

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ABSTRACT

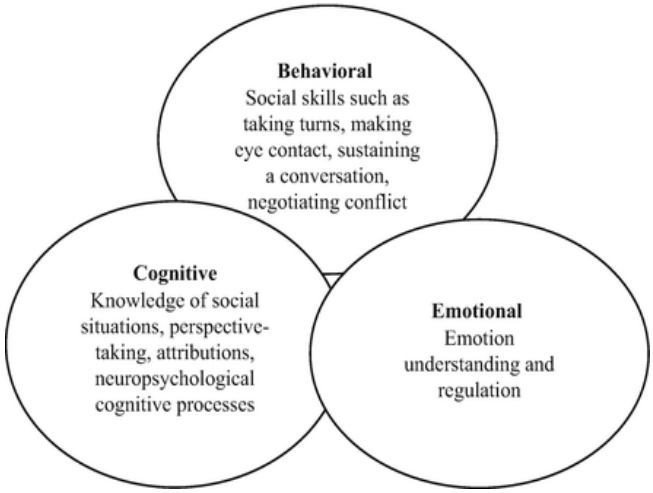
Emotional intelligence plays a crucial role in shaping both educational aspirations and social competence in individuals. Educational aspirations refer to the ambitions and goals a person sets for their academic journey and future career. People with higher emotional intelligence are often more self-aware, better at managing their emotions, and adept at understanding and empathizing with others' feelings. In the realm of education, individuals with strong emotional intelligence are more likely to be motivated and resilient in the face of challenges. They can effectively regulate negative emotions such as anxiety and frustration, enabling them to maintain focus and perseverance, leading to improved academic performance. Social competence involves effective communication, active listening, conflict resolution, and cooperation. Emotionally intelligent individuals are more attuned to the emotional cues of those around them, enabling them to communicate empathetically and respond appropriately to social situations. In educational settings, social competence is crucial as it promotes healthy interactions with peers, teachers, and other members of the school community. Emotionally intelligent individuals tend to be more accepting and understanding of diverse perspectives, fostering an inclusive and supportive environment for learning. Their ability to handle conflicts constructively and collaborate with others not only enhances their own educational experience but also contributes positively to the overall classroom atmosphere.

Keywords: Educational Aspirations, Social Competence, Emotional Intelligence

INTRODUCTION

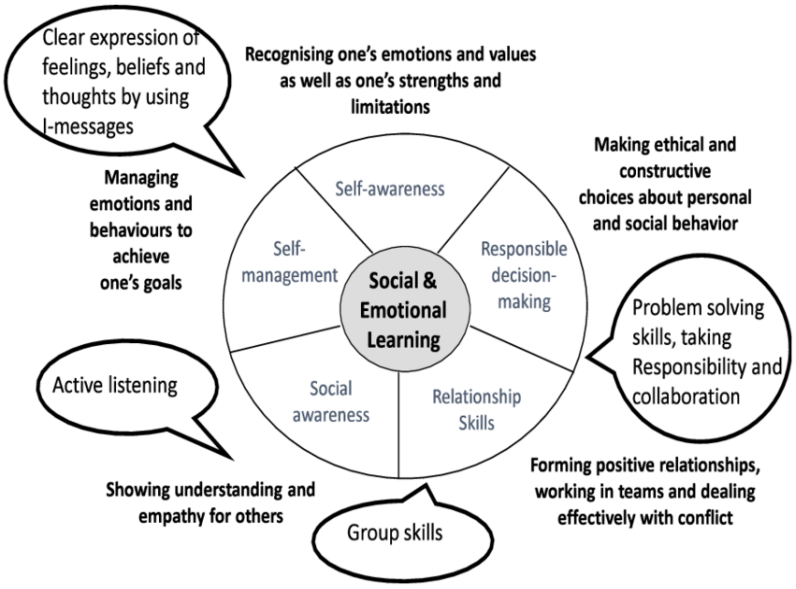
The social competences exhibited in the lives of pupils include a substantial component of their emotional intelligence. This entails leveraging the consciousness of students and the emotions of others in order to cultivate robust, efficient, and enduring interpersonal connections. Social and emotional competence refers to the ability of a student to engage in reasonable interactions with others, effectively convey their emotions in a positive manner, and regulate their behaviour accordingly. Social and emotional competence refers to the capacity of a student to engage in constructive interactions with peers, effectively express and articulate emotions, and exhibit self-regulation in their conduct. The possession of robust social-emotional competences is advantageous for students as it facilitates the development of personal effectiveness and well-being, fosters the establishment of positive relationships, enables the manifestation of personal values, and promotes character growth. Furthermore, the acquisition of these competencies has the potential to enhance students' academic achievement.

Figure: 01



The exploration of the role of emotions in comprehending the learning process and its impact on people' learning outcomes has been the focus of numerous studies. The process of learning is multifaceted, encompassing both individual and social dimensions. Hence, social interaction plays a crucial role as a fundamental component, facilitating cognitive growth through guided instruction inside the zone of proximal development, wherein individuals navigate. Moreover, the development of social competences fosters favourable interpersonal connections between individuals and other professionals within the social domain. According to Saarni (1990), emotions are considered to have a central role in social collaboration within the framework of the socio-constructivist approach. Through a comprehensive comprehension of one's emotions and sentiments, individuals can make informed decisions regarding appropriate behaviour in various situations. This ability facilitates positive interactions on both personal and societal levels, as individuals change their conduct to align with the specific context and circumstances at hand.

Figure: 02



Comprehensive literature analysis centers on a collection of commonly employed measures, whereby we provide a concise overview of the data pertaining to their validity. The paper incorporates detailed tables that provide a concise overview of significant empirical studies pertaining to each measure, encompassing details regarding their research approach and principal outcomes.[4] Our review encompasses both academic and commercial measurements, as well as those that are provided free of charge or need payment. In order to facilitate user access to various measures, we provide hyperlinks to online platforms where freely available questionnaires for EI assessment can be accessed. Additionally, we offer links to webpages and/or exemplar items for measures that are copyrighted. The last segment of this essay comprises a comprehensive literature analysis of the six widely recognized measures that have been discussed. The inclusion of our review at the conclusion of this article is presented as an optional component for readers to consider.[1] It is recommended that this particular portion will be of significant value primarily to individuals who are seeking a more comprehensive comprehension of the fundamental research that underlie the diverse measurements that have been offered in preceding sections.

REVIEW OF LITERATURE

Rani (2013),[4] the researcher examined the projected value of certain psychological factors on the academic achievement of externally assessed children. The current population under consideration consists of a significant proportion of academically motivated students enrolled in the inclusive and competitive secondary school of Delhi district. The researcher identified a noteworthy correlation between educational achievement and self-concept, the ability to empathize with others on a deep level, and academic anxiety in a group setting. Among the several elements influencing educational achievement, academic accomplishment and self-concept enhancement emerged as significant indicators. Prameela (2014) [3] focused on the development and validation of culture-specific instruments for measuring emotional intelligence, with a particular emphasis on their applicability in educational settings within the schools of Kerala. The participants of the study consisted of secondary school students and educators from Kerala. The sample consists of 1500 students from the ninth grade and 500 educators from the state of Kerala. A fundamental random sample approach was employed to ensure impartiality in the selection of the test. Furthermore, a standardized review technique was employed for the purpose of this review. The findings reveal that there were no significant differences observed in terms of gender, age, parental education, kind of school, or family situation. Marar (2015), the researcher investigated the degree to which adolescents are able to develop a deeper understanding and appreciation for individuals. The overview technique was employed for the purpose of conducting the review. This review highlights the necessity of cultivating a capacity for deeper interpersonal connections among young individuals. The assessment's composition is contingent upon the constituent elements of the self-science educational programme. The findings of the study reveal that the intervention is valuable in enhancing emotional intelligence, self-esteem, social intelligence, and adaptability, as well as reducing text-related stress among adolescents. Moreover, illustrated the variations in emotional intelligence between male and female students in educational settings. Morrison (2008). Examined the character characteristics and social capabilities of individuals engaged in wrongful behaviour towards young individuals. The findings of the investigation revealed that there are distinct differences between situational child molesters and preferential child molesters in terms of their five personality traits. A significant disparity was noted in the attributes of pleasantness, self-evaluation in terms of agreeableness and moral self-acknowledgment, the overall level of social competence, and the capacity that determines decisive behaviour in individual situations. The review posits that specific perpetrators do not fundamentally differ from one another.Several factors can influence educational aspirations and social competence in relation to emotional intelligence. These factors can either positively or negatively impact an individual's development in these areas. Some of the key factors include:

1. **Parental and Family Support**: The level of support and encouragement provided by parents and family members significantly influences a person's educational aspirations. Positive and nurturing family environments can foster a sense of self-confidence and ambition, encouraging individuals to set higher educational goals. Additionally, supportive families can also contribute to the development of social competence, as they provide a foundation for healthy interpersonal relationships and emotional understanding.

2. **Educational Environment**: The quality of the educational environment, including the availability of resources, opportunities for personal growth, and the presence of supportive teachers and mentors, can have a profound impact on a person's educational aspirations. A conducive learning environment that emphasizes emotional intelligence and social skills can help students develop the necessary competencies to excel academically and socially.
3. **Peer Influence**: Peers play a significant role in shaping educational aspirations and social competence. Positive peer relationships can boost self-esteem and motivation, while negative peer pressure may lead to lowered aspirations and hinder the development of social skills. Emotionally intelligent individuals can navigate peer interactions more effectively, making constructive connections and avoiding negative influences.
4. **Socioeconomic Background**: Socioeconomic factors can influence access to educational opportunities and resources, which, in turn, can impact educational aspirations. Individuals from disadvantaged backgrounds may face more significant barriers in pursuing higher education. Emotional intelligence can play a role in coping with these challenges and seeking support when needed.
5. **Emotional Regulation and Resilience**: The ability to regulate emotions and bounce back from setbacks is essential for both educational aspirations and social competence. Emotionally intelligent individuals are better equipped to manage stress, anxiety, and disappointment, enabling them to stay focused on their goals and maintain healthy relationships.
6. **Cultural and Social Norms**: Cultural values and social norms can shape educational aspirations and social competence. Some cultures may emphasize the importance of academic achievements, while others may prioritize social skills and emotional awareness. Understanding and adapting to these cultural dynamics can influence an individual's development in these areas.
7. **Exposure to Diverse Experiences**: Exposure to diverse experiences, such as travel, volunteer work, or participation in extracurricular activities, can broaden an individual's perspective and enhance social competence. These experiences can also spark new educational interests and aspirations.
8. **Emotional Intelligence Training and Education**: Intentional efforts to provide emotional intelligence training and education can directly impact both educational aspirations and social competence. Schools and institutions that incorporate emotional intelligence development into their curriculum can empower students to build strong relationships, manage emotions effectively, and set ambitious educational goals. In summary, a combination of individual, family, educational, and societal factors influences educational aspirations and social competence in relation to emotional intelligence. Identifying and addressing these factors can contribute to the overall personal and academic growth of individuals, fostering a more emotionally intelligent and socially competent society.

NEED OF THE STUDY

The conventional educational system focused on implementing an integrated strategy. The primary focus of this programme is to facilitate the cognitive growth of children by imparting essential knowledge and fostering the development of fundamental skills. Its overarching objective is to cultivate a range of general competencies. The current educational system fails to address the social and developmental needs of children from low-income backgrounds and families with limited emotional resources. There is evidence to suggest that pupils of this nature are facing significant challenges in their efforts to achieve socio-economic progress.

THE RESEARCH PROBLEM

The research inquiry pertaining to the examination of the association between educational goals, social competence, and emotional intelligence seeks to explore the interconnections and reciprocal influences among these three variables.[8]. The research will investigate the potential correlation between elevated emotional intelligence and increased educational aspirations. It is posited that persons with higher emotional intelligence may exhibit enhanced self-awareness, motivation, and resilience, hence fostering a propensity to establish ambitious academic objectives. This study will also investigate the potential influence of emotional intelligence on the decision-making process pertaining to educational endeavours. It posits that individuals with higher

levels of emotional intelligence may possess enhanced abilities to identify and acknowledge their personal strengths and interests, thereby enabling them to make more informed decisions regarding their educational and professional trajectories. Moreover, the study aims to examine the correlation between emotional intelligence and social competence. Individuals with high emotional intelligence may possess a notable edge in social interactions due to their enhanced ability to effectively communicate, engage in active listening, and negotiate conflicts with empathy and understanding.

OBJECTIVES OF THE STUDY

The objective of this article is to critically evaluate prominent and extensively utilised assessments of (EI) and provide suggestions regarding their suitable application. This essay is primarily intended for individuals in academia and professional fields who may not possess expertise in Emotional Intelligence (EI), but are contemplating incorporating EI into their research and/or professional endeavors[6].To enhance readability, this article commences with an introductory section that outlines the various classifications of emotional intelligence (EI). Subsequently, a concise overview is provided of the diverse assessments of EI and their corresponding components [1].Subsequently, we present an exhaustive compilation of suggestions for both scholars and practitioners. The primary emphasis of recommendations is in the selection of emotional intelligence (EI) constructs.

RESEARCH DESIGN

This particular research focuses on the evaluation of the responses provided by students in secondary schools, with an emphasis on their quality. This paper aims to examine the different elements of social competence and educational aspirations that are associated with emotional intelligence in students.[8]. Therefore, a descriptive design was chosen. The collection of primary data was conducted through the utilisation of Google forms. The data are subjected to analysis using the SPSS programme. Data was collected from a sample of students enrolled in both private colleges. This paper employed a stratified random sampling technique [1]. Stratified sampling is a sampling technique employed to select a representative subset from a population that can be divided into distinct subpopulations.

RESEARCH ON EMOTIONAL INTELLIGENCE

It were believed to possess the capacity to effectively manage emotions in themselves and others, with the aim of attaining various advantageous outcomes or emotional states, such as motivation and creative thinking. Nevertheless, while possessing a well-defined terminology and conceptual framework, first investigations into emotional intelligence (EI) were marked by the creation of numerous assessment tools [9]. One contributing factor to the widespread adoption of these tests was the potential for financial gain that developers saw in creating them, as well as the challenges experienced by researchers in obtaining copyrighted measures (see to the section on Mixed EI for a concise overview of commercially available measures). Another contributing factor to this widespread occurrence was the challenges that researchers encountered in constructing instruments that exhibited strong psychometric qualities [7]. The present article is limited in its capacity to provide an extensive analysis of this matter.

EMOTIONAL INTELLIGENCE

The study may also examine the potential mediation function of social competence in the association between emotional intelligence and educational goals. It is imperative for educators, parents, and politicians to comprehend the intricate dynamics of emotional intelligence, educational goals, and social competence.[8] This, in turn, may lead to increased educational ambitions and improved academic achievements. In summary, the investigation into the interrelationships among emotional intelligence, educational goals, and social competence is of great significance for comprehending the dynamics and impact of these variables on an individual's personal and academic growth. By investigating this study problem, significant insights can be obtained regarding the impact of emotional intelligence on educational aspirations and social competence, thereby contributing to the development of well-rounded and successful individuals.

Table 1: Emotional Intelligence

Components	Mean	Std. Deviation
Empathy	3.09	0.972
Motivation	3.33	1.281
Self-awareness	3.21	1.119
Self-regulation	3.18	1.082
Soft skills	3.59	1.034

The Motivation (3.47), soft skills (3.39), leadership skill (3.37), education (3.31) are the most possessive skills of the respondents for their teaching profession. The total of all the five components denotes the Emotional Intelligence level of the students.

1. Factors Affecting Emotional Intelligence

As stated in the theoretical concept, the five factors affecting the Emotional Intelligence are analyzed. The impact of the factors on competency is measured with the help of Regression model. The summary of the mode is given below.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.612	0.563	0.529	2.78681
a. Predictors: Factors				

It shows that R value is 0.612, R square is 0.563. The adjusted R square value is 0.529. It shows that the predictor variables are explaining 56.3% in the dependent variable (Emotional Intelligence).

Table 4: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2017.061	8	249.129	28.024	0.000
	Residual	1652.397	191	8.729		
	Total	3587.618	199			
a. Dependent Variable: Emotional Intelligence						
b. Predictors: (Constant), Factors						

The result of ANOVA shows that the calculated F value is 28.024 for degree of freedom 8. It is significant at 1% level (0.000). Educational aspirations refer to an individual's goals and ambitions in the academic domain. These aspirations not only influence academic performance and career choices, but they also play a pivotal role in shaping one's emotional intelligence (EI). First, pursuing educational goals requires resilience, perseverance, and the ability to handle setbacks. Individuals with high EI can navigate these challenges more effectively, given their proficiency in understanding and managing their emotions. They can recognize feelings of doubt or frustration, understand their origins, and devise strategies to cope. Therefore, their aspirations could indirectly hone their emotional competencies. Conversely, setting and striving towards academic goals can enhance emotional intelligence. The process necessitates interacting with peers, teachers, and other stakeholders, thereby providing opportunities for social-emotional learning. It encourages students to develop empathy, effective communication, and collaborative skills. By navigating academic challenges and interpersonal dynamics, students inevitably refine their emotional discernment and regulation capabilities.

CONCLUSION

In conclusion, emotional intelligence significantly impacts both educational aspirations and social competence. Individuals with higher emotional intelligence are better equipped to handle the challenges of education, set meaningful goals, and make informed choices about their academic journey. [5]Furthermore, their ability to understand and connect with others on an emotional level fosters healthy relationships and a positive learning environment. Cultivating emotional intelligence, therefore, is paramount in promoting personal growth and success in both educational and social aspects of life. The primary objectives of this literature study were twofold: firstly, to ascertain the prevailing measures of emotional intelligence (EI) employed in scholarly works, and secondly, to examine their specific applications within practical settings, such as the field of healthcare.[9] The emotional intelligence measures incorporated in our study encompassed assessments of both general

emotional intelligence and particular emotional intelligence components that are commonly found in numerous measures. The secondary objective was to ascertain the existence of individual research studies that have examined the validity and reliability of the particular measures of emotional intelligence that were discovered.Moreover, the very act of setting educational goals fosters intrinsic motivation, which can boost self-awareness – a key component of EI. An individual who is self-aware can better recognize and articulate their emotions, leading to improved self-regulation and relationship management. Furthermore, setting educational aspirations often involves envisioning a future self, which can enhance one's ability to delay gratification, a trait linked to emotional maturity.[6] In conclusion, educational aspirations and emotional intelligence are intricately connected. Aspirations offer a context wherein individuals can cultivate their emotional skills, while emotional intelligence equips individuals with the tools to pursue their educational goals with vigor and resilience. The symbiotic relationship between the two underscores the importance of holistic educational environments that prioritize both academic and emotional growth.

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ASSESSMENT OF ACADEMIC STRESS AND COPING MECHANISM AMONG COLLEGE STUDENTS

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ABSTRACT

The physical, emotional, and psychological strain or tension experienced by students due to academic-related challenges. As college enrollment numbers continue to rise, understanding and addressing the unique stressors faced by students becomes increasingly important. College life, often celebrated as a time of learning, exploration, and growth, can also be laden with considerable academic stress. Factors such as a rigorous curriculum, pressure to maintain high grades, concerns about future career prospects, social relationships, financial strains, and adapting to a new environment contribute to heightened levels of stress among college students. Coupled with the natural developmental challenges of emerging adulthood, these stressors can take a toll on their psychological and physical well-being. In response, many students develop coping mechanisms, ranging from positive strategies like time management, seeking academic help, and mindfulness exercises, to maladaptive ones like substance abuse, procrastination, and social withdrawal. Understanding the sources of stress and recognizing effective coping mechanisms is essential for educators, counselors, and policymakers. It paves the way for the creation of supportive environments and interventions that foster resilience, ensuring that students not only survive but thrive in their academic pursuits.

Keywords: Academic Stress, Coping Mechanism, College Students, Time Management, and Performance Expectations.

INTRODUCTION

The predominance of academic stress among medical students during their training time has been widely acknowledged. The prevalence of this phenomenon appears to be increasing among this group, potentially attributable to the escalating demands of academic coursework. Several factors have been identified as contributors to academic stress, including an overwhelming amount of work, intense competitiveness among peers, the pressure of examinations, and difficulties in managing time effectively. University students, in addition to navigating the transitional era of their lives, are confronted with various stressors including separation from their families, the development of self-identity, and challenges associated with adolescence and employment as students. The stress experienced by medical students is closely linked to their interactions with patients during the clinical phase. The presence of academic stress can be advantageous since it fosters a constructive sense of competitiveness among peers, facilitates the acquisition of knowledge, and contributes to academic excellence. Park (2020), explored that left undetected and untreated, this condition has the potential to give rise to depressive symptoms, anxiety disorders, maladaptive behaviours, heightened irritability, social isolation, and various medical ailments. In addition to evaluating the levels of academic stress experienced by undergraduate medical students, it is imperative to examine the many coping strategies employed by this population. This will assist researchers in proposing suitable intervention techniques for the betterment of the students. In the future, students will have the opportunity to educate their patients about stress identification and recommend strategies for managing it.

RESEARCH BACKGROUND

Prior research has indicated that medical students employ several active coping methods, such as positive reframing, planning, seeking emotional support, engaging in peer conversations, and practicing acceptance, as strategies to manage stress. There was a limited amount of documentation regarding the utilisation of avoidance strategies as a means of managing stress among medical students.[2]. According to a report by the Royal

College of Psychiatrists (2011), individuals who have stable attachments to their family and live in a supportive community are more equipped to effectively manage stress. Hence, it is imperative to evaluate different factors contributing to academic stress in order to develop appropriate interventions for the individuals afflicted by this phenomenon. This study was conducted to evaluate the prevalence of academic stress among medical students in a coastal city in south India.[6] The study aimed to ascertain the elements that contribute to academic stress, investigate other sources of stress, and analyze the coping mechanisms adopted by students to effectively manage academic stress.

THE PRACTICAL RAMIFICATIONS OF THIS PHENOMENON

The analysis of key factors contributing to academic stress and corresponding coping mechanisms among students in public higher education institutions might provide valuable insights for university administrators in developing policies aimed at fostering a harmonious academic environment conducive to enhanced learning outcomes. Furthermore, this study puts forth policy recommendations [3].. The research findings indicated a notable incidence of academic stress, with a statistically significant correlation between the amount of academic stress and the gender and living situations of the participants. The primary characteristics correlated with academic stress among participants included challenges in retaining learned material, anxiety around examinations, and diminished focus during study sessions.[7] The results of the study indicate a significant rise in mental health morbidity among the individuals involved, highlighting the urgent need for intervention through academic counselling, regular monitoring of mental well-being.

THE ORIGINALITY AND VALUE OF THE RESEARCH

The findings of this study will provide valuable insights for academic faculty and university administrators in developing and executing strategies aimed at enhancing pedagogical practices within the realm of higher education. Furthermore, this study holds significant importance for academic faculty and university administrators as it aims to establish a comprehensive framework for integrating stress coping mechanisms into the higher education curriculum. The significance of this study lies in the limited number of empirical investigations undertaken on the topic of academic stress and coping methods within the built environment disciplines.[6] This suggests that factors related to academic stress, such as academic expectations, workload, grading, and students' self-perception of their academic abilities, are equally influential in determining psychological well-being. The present study builds upon and enhances the current body of research on stress by validating previous findings that have documented elevated levels of academic stress and diminished psychological well-being among college students, employing same measurement instruments. Based on the available literature, it appears that most previous research with comparable results have focused on distinct aspects of stress, investigated indicators of negative mental health, utilised varying measurement scales or methodologies, employed smaller sample numbers, or were done in diverse geographical contexts. In general, students at various educational levels encounter varying degrees of stress, which can be attributed to factors such as their academic demands and surrounding circumstances. There is a prevalent issue among students at the University of Education, Winneba (UEW), pertaining to the substantial academic demands they face. [12]This concern is more pronounced when students are required to balance their academic responsibilities with their involvement in extracurricular pursuits. The majority of these students are individuals who are married and often prioritize their familial responsibilities by travelling back home whenever the opportunity arises. In addition to this, students, particularly those who are experiencing their first time away from home, encounter significant levels of stress as they strive to acclimatize to the university environment and life in general. Typically, students tend to exhibit stress-related behaviour towards the midpoint of the semester, as the combination of academic responsibilities and various external pressures can lead to physical and emotional exhaustion. Based on observations made during interactions with nurses and the administrative assistant at the University of East West (UEW) clinic, it can be inferred that a significant number of students seeking medical assistance at the clinic commonly report experiencing symptoms such as headaches and sleepiness. These symptoms are often associated with the presence of stress. The aforementioned circumstance necessitates an inquiry into the coping mechanisms employed by students of the University of Education, Winneba (UEW) in order to effectively navigate difficult conditions within the academic setting.

ACADEMIC STRESS AMONG COLLEGE STUDENTS

Definition: Academic stress can be described as the anxiety and pressure that stems from academic-related challenges. It's the emotional, physiological, and psychological reactions that students experience due to obstacles in their educational path.

Sources of Academic Stress:

1. **Coursework & Exams**: The primary and immediate causes of academic stress are related to academic responsibilities like attending lectures, handling assignments, preparing for examinations, and maintaining grades.
2. **Performance Expectations**: High expectations, whether from oneself, parents, teachers, or peers, can intensify the pressure. Some students face stress from the competition to excel among their peers.
3. **Future Concerns**: The uncertainty about future career prospects, the pressure of securing a good job after graduation, or doubts about further studies can exacerbate stress levels.
4. **Financial Pressure**: The stress of tuition fees, coupled with other living expenses and possibly the weight of student loans, can be daunting for many students.
5. **Personal Relationships**: Managing relationships, whether friendships or romantic, can sometimes clash with academic commitments, leading to added stress.
6. **Transition to College Life**: Especially for freshmen, adapting to a new environment, staying away from family, and the need to be self-reliant can be significant stress inducers.

ASSESSMENT OF ACADEMIC STRESS: AN OVERVIEW

The college experience encompasses opportunities for social contacts, the cultivation of friendships and relationships, as well as the participation in a variety of parties and events. Social interactions reach their zenith throughout the college years, bolstered by the use of mobile technology and various social media platforms. When students experience stress, they often exhibit observable indicators of frustration, such as displaying irritability towards their peers and family members, or becoming easily agitated by little matters. The impact of stress on emotional intelligence is also noteworthy.[12] Emotions play a crucial role in our regulatory system, as they aid us in conscientiously assessing the effects on both ourselves and others while working effectively. When individuals are deprived of external influences, they tend to exhibit a higher propensity for engaging in risky behaviours. Emotions have a crucial role in the process of decision-making. Individuals from diverse racial, ethnic, professional, and academic backgrounds universally encounter various manifestations of stress. The researcher expressed the perspective that stress manifests in various forms and impacts individuals across all age groups and socioeconomic backgrounds. Stress coping strategies encompass a range of behavioural and cognitive approaches employed to effectively manage and adapt one's reaction to a stress-inducing situation. There are two distinct categories of coping strategies: problem-oriented coping techniques and emotion-oriented coping approaches. In the present investigation, individuals employed a range of stress coping mechanisms, encompassing both positive and negative tactics. The religious practice of "praying and trusting in God" emerged as the most commonly employed positive method, followed by attempts to exert control over the situation, and engaging in diverse modes of thought to address the circumstances. In a survey conducted among medical students at King Saud University, it was found that religious activities were the coping mechanism most frequently utilised by participants.[6] In contrast, participants resorted to crying and experiencing feelings of depression as the most detrimental strategies for managing academic stress.[9] The present study found no statistically significant association between coping methods and stress levels. This finding contradicts prior research that has demonstrated a link between coping strategies and the development of anxiety or depression among undergraduate students. Furthermore, in order to alleviate academic stress, several techniques for participant relaxation were employed. The prevailing relaxation tactics seen were the consumption of coffee or tea, as well as engaging in music listening. [12].Coping methods can be categorized into three primary types: proactive strategies, which are employed to effectively manage or resolve the problem at hand; emotional strategies, which aim to regulate or diminish the emotional arousal linked to the stress; and avoidance strategies, which are devised to evade the conditions that induce stress. Various coping mechanisms can be employed,

exhibiting variability in their efficacy. Several studies have indicated that personality factors have a significant role in influencing the coping techniques employed and the resulting consequences [3]. Additional research may be necessary to examine the factors influencing decision-making and evaluate the efficacy of various coping mechanisms.

COPING MECHANISMS AMONG COLLEGE STUDENTS:

Creating schedules and prioritizing tasks to manage academic and personal responsibilities effectively. Time management is a pivotal skill that greatly influences the academic and personal success of college students [8]. Given the multifaceted demands of coursework, extracurricular activities, part-time jobs, and social commitments, students often find themselves juggling a multitude of responsibilities. To navigate these challenges, many students adopt a range of coping mechanisms. The use of planners, calendars, and digital task management apps has become commonplace, helping students visualize and prioritize their tasks. By breaking assignments into manageable chunks and setting specific deadlines, students can prevent last-minute cramming and reduce feelings of overwhelm [1]. Additionally, many students benefit from establishing a consistent routine, allocating specific times for studying, relaxation, and sleep. This not only maximizes efficiency but also ensures a balanced lifestyle. Lastly, seeking support through study groups, time management workshops, or counseling services can offer students tailored strategies and a sense of community. In essence, as college students embrace these coping mechanisms, they not only enhance their academic performance but also foster resilience and adaptability, skills that serve them well beyond their college years. Utilizing campus resources like tutoring centers, writing labs, or study groups. Recognizing and implementing effective coping strategies can significantly enhance the college experience, promoting mental well-being and academic success. Amid the rigors of academic life, social support emerges as a crucial buffer against the stresses faced by college students. Navigating the challenges of higher education, from academic pressures to personal growth and identity exploration, students often lean on social networks for solace, understanding, and guidance. Peer support plays a pivotal role, with friendships providing a safe space for emotional venting, mutual encouragement, and collaborative problem-solving. Study groups or academic partnerships can merge the lines between academic and social support, offering both camaraderie and academic aid. Beyond peers, many students also seek support from family members, maintaining close communication through calls, messages, or visits, drawing strength from familial bonds. Mentorship, whether through faculty, senior students, or alumni, offers another dimension of support, providing guidance, sharing experiences, and fostering a sense of belonging. On-campus resources, like counseling centers, support groups, or clubs centered on shared experiences or identities, offer structured avenues for students to find and offer support. By actively seeking and maintaining these social connections, college students not only find immediate relief from pressing concerns but also build a foundation of relationships that can sustain them through life's ups and downs.

MATERIALS AND METHODS USED IN THE RESEARCH.

The cross-sectional study was done in March 2018 at a private medical college located in Mangalore. Prior to the initiation of the study, approval from the institutional ethics committee was obtained [2]. A sample size of 364 participants was determined using a 95% confidence interval (CI) and 90% power, based on the estimated proportion of medical students experiencing an average level of academic stress. The subject of stress has gained significant prominence within the academic sphere. Nevertheless, there has been a lack of research focusing on the examination of academic stress experienced by students in the built environment field[5].The objective of this study is to evaluate the factors contributing to academic stress and explore the coping mechanisms employed by undergraduate students in the built environment discipline. A sample of 300 college students who have completed their higher education during the year 2021-2022 have been purposively selected for the study. The information were collected through Google forms

ANALYSIS, FINDINGS AND DISCUSSION

Academic stress pertains to the psychological strain experienced in relation to the pressures of school and the capacity of pupils to effectively manage these expectations. Academic stress in higher education can arise from various circumstances, such as elevated performance standards, substantial academic demands, peer rivalry, and apprehensions regarding future career opportunities. Gaining insight into the coping strategies utilised by pupils can facilitate educators and health professionals in providing enhanced support.

1. Gender and level of Stress

The level of stress of the respondents towards gender is measured in a 5 point Likert scale using 8 statements related to academic stress. The relationship between the nature of the respondents and level of stress is tested by comparing the means. The result is given below.

Table 1: Gender and level of Stress

Gender	N	Mean	Std. Deviation	Z	Sig.
Female	149	16.7186	5.39842	-2.197	0.027
Male	201	17.2605	4.36987		
Total	350	17.5862	4.72561		

The male respondents (17.2605) feel more stress than female respondents (16.7186). The difference in the mean shows that the calculated Z score (-2.197) is significant (<-1.96). The p value is 0.027 (<5%).

Table 2: Year of study and level of Stress

Level of stress	N	Mean	Std. Deviation	F	Sig.
Less	100	18.2358	4.76875	14.115	0.000
Moderate	180	19.3125	4.68741		
More	70	16.8972	3.33215		
Total	350	18.5962	4.36548		

The above table indicates that the stress of the moderately experienced respondents is high (19.3125). The calculated F value (14.115) shows a significant difference in the means (0.000) at 1% level. The issue at hand pertains to the negative impact of academic stress on college students, as evidenced by research findings. This stress has been found to have a detrimental effect on their academic performance, which afterwards has the potential to hinder their career objectives. Nevertheless, a considerable number of students refrain from seeking assistance for their challenges, primarily attributable to time constraints and the negative connotations associated with counselling services. [16]. In light of the aforementioned scenario, it would be beneficial for health educators to ascertain different stressors and comprehend the ramifications of stress on students' academic achievements. This knowledge will enable them to offer appropriate psychological assistance and counselling to affected students.[3] Additionally, exploring diverse coping mechanisms will furnish valuable insights for implementing remedial measures in response to stress. This study is necessary due to the prevalent occurrence of college students expressing complaints about experiencing stress throughout the academic year. Many students have developed a tendency to independently manage stress by employing many coping techniques, some of which may be detrimental to their well-being, as a means to reclaim a sense of control. This subject holds significance within the field of health education as it aims to ascertain and delineate health-promoting behaviour that can be effectively adopted by college students in order to address stress-related concerns. [13]Additionally, this intervention will enhance the knowledge of health educators regarding the stress experienced by college students, the impact of stress on their behaviour, and the provision of sufficient resources to effectively address these concerns

CONCLUSION

Historically, societal expectations, roles, and pressures have varied for different genders, and this can influence how stress manifests and is coped with. Studies have shown that female students might be more likely to report higher levels of stress compared to their male counterparts.[5] This could be attributed to a variety of reasons, including hormonal fluctuations, societal pressures such as body image standards, or the multitasking often expected of women. In contrast, male students, while they might report lower levels of stress, often face societal pressures to conceal their emotional vulnerabilities, leading to different coping mechanisms and potentially unreported stressors.[9] It's crucial to recognize that these findings are generalized, and individual experiences will vary based on factors like culture, upbringing, personality, and individual life circumstances. It's also important to note that with the evolving understanding of gender beyond the binary, there's a need to consider the experiences of non-binary and transgender students in discussions about stress. In conclusion, while gender

can influence the perception, manifestation, and coping strategies associated with stress among students, it is one of many intersecting factors that contribute to an individual's overall well-being.

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DEVELOPMENT OF MARKETING EFFECTIVENESS AND BUSINESS PERFORMANCE OF HOUSING FINANCE

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ABSTRACT

Housing Finance Institutions (HFIs) play a crucial role in the real estate sector by providing financial services and support to individuals and businesses looking to purchase or invest in residential properties. When it comes to evaluating the marketing effectiveness and business performance of HFIs, several key factors come into play. Firstly, effective marketing strategies are essential for HFIs to attract potential customers and promote their financial products and services. HFIs need to develop targeted marketing campaigns that highlight the benefits of their offerings, such as competitive interest rates, flexible repayment options, and personalized customer service. By effectively communicating these features and advantages, HFIs can differentiate themselves from competitors and capture the attention of their target market. Furthermore, measuring the effectiveness of marketing efforts is crucial for HFIs to optimize their strategies and allocate resources efficiently.In terms of business performance, HFIs need to evaluate their financial health and profitability. Key indicators of business performance for HFIs include loan portfolio growth, net interest margins, asset quality, and return on equity. These metrics reflect the institution's ability to attract borrowers, manage credit risks, generate income, and maximize shareholder value. HFIs must also consider market conditions, interest rate fluctuations, and regulatory changes that can impact their business performance. Additionally, customer satisfaction and retention are crucial for the long-term success of HFIs.

Keywords: Marketing Effectiveness, Business Performance and Housing Finance Institutions

INTRODUCTION

The housing finance institutions rely heavily on resources from the financial industry without taking significant measures to diversify their funding sources. In such circumstances, these institutions' financial structures tend to become even more unbalanced, with a reliance on wholesale resources for lending to retail consumers. In this view, it is necessary to comprehend the various components of the organisation that finances accommodation. The typical justification for the formation of housing finance institutions was the inability of banks to meet the sector's demand for housing finance services. A bank that specializes in home financing is advantageous and, most importantly, meets its specific needs. The 1980s marked the beginning of an era of institutional housing finance, with the emergence of more home financing companies, nationalized banks, and foreign banks. Madhu Verma (2022)[1]. In October 1997, the most significant change in the home finance market was the liberalization of monetary policy, which permitted additional funds from the financial system to enter the home financing sector. Currently, housing finance institutions are an integral part of India's financial and service sectors. This is a summary of the factors addressed in empirical research on the efficacy and performance of marketing from an organisational standpoint, as well as customer concerns, expectations, satisfaction, and loyalty. It discusses the objectives of the research and provides an overview of the empirical analysis and results.

HOUSING FINANCE INSTITUTIONS IN INDIA.

(HFIs) in India are financial institutions that specialize in providing housing finance to individuals and businesses. They play a crucial role in facilitating home ownership and promoting affordable housing in the country. In India, HFIs are regulated by the National Housing Bank (NHB) and operate under specific guidelines and regulations. The primary objective of HFIs in India is to provide financial assistance to individuals and organizations looking to purchase, construct, or renovate residential properties. These loans are typically tailored to meet the specific needs of borrowers, with features such as flexible repayment options, competitive interest rates, and longer loan tenures. They have contributed to the growth of the real estate sector by providing affordable and accessible financing options to a wide range of borrowers, including individuals from lower-income groups and economically weaker sections of society. In addition to providing housing finance, HFIs in India also offer services such as property valuation, loan counseling, and advisory services to help borrowers make informed decisions. To ensure the stability and soundness of the housing finance sector, HFIs in India are subject to stringent regulatory oversight by the National Housing Bank. The NHB sets prudential norms, capital adequacy requirements, and guidelines for risk management and asset classification. This regulatory framework aims to safeguard the interests of borrowers, maintain the financial health of HFIs, and promote responsible lending practices. HFIs in India have witnessed significant growth over the years, driven by factors such as rising urbanization, increasing disposable incomes, government initiatives, and favorable demographic trends. They have played a crucial role in addressing the housing needs of a growing population and supporting the government's vision of "Housing for All" by providing affordable housing finance solutions.

LITERATURE REVIEW

Madhu Verma (2022) [1] witnessed significant growth over the years due to increasing urbanization, rising income levels, and government initiatives to promote affordable housing. Several housing finance companies have emerged as key players in the market. It has experienced consistent growth and maintained a strong performance over the years. HDFC has a robust loan portfolio, a wide range of housing finance products, and a strong customer base. It has also expanded its presence across different regions in India and diversified its offerings to cater to various segments of the housing marketplace Housing Finance, a subsidiary of Life Insurance Corporation of India. It has witnessed steady growth and has a significant market share in India. LIC Housing Finance offers a range of housing loan products and has a strong distribution network. PNB Housing Finance is a subsidiary of Punjab National Bank and has shown considerable growth in recent years. It offers various home loan products and has expanded its presence in different parts of India. PNB Housing Finance has been focusing on improving its customer service and leveraging technology to enhance its operations. It has demonstrated rapid growth in the past, primarily driven by its focus on retail housing finance and its ability to tap into different customer segments. However, it faced financial difficulties and underwent a resolution process under the Insolvency and Bankruptcy Code (IBC) in recent years. It's essential to conduct thorough research and refer to the latest financial reports and news to obtain the most accurate and updated. Folentia Kamal (2020)[10] pointed out Due to favourable government policies and regulations, the housing finance companies have been the leading actors in the residential financing sector. The efficacy of such financial institutions has experienced a sharp decline over the past decade. Since then, the market share of housing finance companies has steadily declined, resulting in the liquidation of a number of lesser companies. In order to survive in such a competitive and exploitative market, housing finance companies must assess the factors influencing their performance and take corrective action. The growth of the housing finance sector in India in order to determine the factors that have led to the rise and fall of housing finance companies, to identify the factors influencing performance, and to analyze the deficiencies in order to provide suggestions for improvement. The researcher found the services and financial products offered to customers and the appropriate marketing of their financial products had a significant impact on their market share. Kamala and Kathaian (2016)[10] explained that regarding housing finance activities, the inside-out performance measure and outside-in customer satisfaction were utilised as business performance indicators. All categories of clients receive housing financing from a variety of institutions. All of these initiatives were implemented to increase customer satisfaction and revenue. However, consumers have numerous expectations of housing finance institutions. The researcher anticipated considerate service from institution personnel. The efficacy of marketing appears to be determined by the performance targets established by housing finance institutions. According to the findings, consumer philosophy is of the

utmost importance in housing finance services. Increasing demand for housing financing is a natural consequence of rising housing demand. The market for housing financing is expanding exponentially. Many new actors entered the housing finance market as a result. Aside from the established ones, the players have become very aggressive. Few of these developments have had a very favourable impact on housing finance activities: declining interest rates, simpler terms for consumer credit, availability of housing finance from multiple sources, and tax rebates.

NEED FOR THE STUDY

Studying the marketing effectiveness of Housing Finance Institutions (HFIs) is crucial for several reasons. Understanding and assessing the marketing strategies and their impact on the target audience can provide valuable insights to enhance customer acquisition, brand visibility, and overall business growth. Marketing efficacy depends on the ability to effectively implement marketing plans at various organisational levels. There is a growing demand for businesses to improve their marketing effectiveness. The advantages of effective marketing should be self-evident. Successful marketing is the key to consumer retention. Effective marketing is characterized by customer focus, service quality, a diverse product offering, and the fulfilment of customer requirements. A company is said to have a high level of marketing effectiveness if it has a close relationship with its customers. The business should be governed by a common set of values, which demonstrates its market orientation.

STATEMENT OF THE PROBLEM

In the competitive real estate finance industry, Housing Finance Institutions (HFIs) confront the challenge of optimizing their marketing efficacy and enhancing their business performance. It is crucial that their marketing strategies and campaigns are effective in order to attract potential consumers and promote their financial products and services.[7] However, it is unclear how HFIs can measure and evaluate the effect of their marketing efforts on customer acquisition, conversion rates, and overall business performance. In addition, HFIs must identify the key indicators and metrics that accurately measure their financial health, profitability, and customer satisfaction. [1].Consequently, it is necessary to investigate strategies and methodologies that can improve the marketing effectiveness and business performance of HFIs, allowing them to differentiate themselves in the market, optimize resource allocation, and ultimately drive sustainable growth in the housing finance sector.

RESEARCH OBJECTIVES

The following are the objectives of the study

1. To determine the marketing efficacy of the employee performance measure on quality in the chosen housing finance institution.
2. To sketch the appropriate marketing strategies that will increase customer satisfaction.

METHODOLOGY

Population of the study consists of customers from leading housing finance institutions. The research study takes up from specialized housing finance institutions among the selected banks. These samples are selected on the basis of Convenience sampling method.250 sample respondents were taken for the analysis.

ANALYSIS, FINDINGS AND CONCLUSION

Implementing employee performance measures to assess and enhance quality within a chosen housing finance institution can have a profound impact on marketing efficacy. By establishing clear performance metrics and standards for employees, the institution can ensure that its services are consistently of high quality. This commitment to quality reflects positively in marketing efforts. Customers are more likely to choose a housing finance institution that demonstrates a strong dedication to delivering excellent service. When employees are incentivized and motivated through performance measures tied to quality, they become more engaged in their roles, leading to improved customer interactions, faster query resolution, and smoother transactions. This, in turn, contributes to positive customer experiences, which can be a central focus of the institution's marketing campaigns. Quality assurance driven by employee performance measures can also lead to positive reviews and

testimonials from satisfied customers. Such social proof is a powerful marketing tool, influencing potential homebuyers to consider the institution's services. Additionally, the institution can highlight its commitment to quality in its branding and messaging, effectively differentiating itself from competitors and creating a unique selling proposition.

Table 1: Factors influencing Development of Marketing Effectiveness

Factors	Mean	Std. Deviation	Mean Rank	Rank
Customer Acquisition	2.78	1.004	2.85	III
Brand Awareness and Perception	2.34	1.021	2.12	IV
Customer Engagement and Retention	2.22	1.015	2.04	V
Return on Investment (ROI)	2.89	1.127	3.95	I
Market Segmentation and Targeting	2.79	1.159	2.97	II
N	250			
Chi-Square	16.716			
Asymp. Sig.	0.004			

The above table revealed that the respondents ranked Return on Investment (ROI) (3.95) which is highly influenced for development of marketing effectiveness. Assessing the effectiveness of marketing initiatives enables HFIs to determine the ROI of their marketing efforts. This knowledge helps allocate marketing budgets more effectively and optimize marketing campaigns for maximum ROI. They are also highly aware about Market Segmentation and Targeting (2.97). The study of marketing effectiveness allows HFIs to evaluate how well they are reaching their target audience and segmenting their market effectively. By analyzing the success of different marketing campaigns and channels across various customer segments, HFIs can identify the most responsive segments and tailor their marketing strategies accordingly. This helps optimize marketing investments and improve overall campaign performance. Thirdly, Customer Acquisition (2.85) was ranked most by the respondents. Examining the marketing effectiveness of HFIs helps in evaluating the success of various customer acquisition strategies. By studying the effectiveness of different marketing channels, campaigns, and messaging, HFIs can identify which approaches yield the best results in terms of attracting and converting potential customers into borrowers. This knowledge can inform future marketing investments and optimize customer acquisition efforts. Followed by Brand Awareness and Perception (2.12) marketing effectiveness allows HFIs to assess brand awareness and perception among their target audience. It helps in understanding how well the brand is recognized, how it is perceived in the market, and whether the marketing efforts are effectively communicating the unique value proposition of the HFI. By evaluating brand awareness and perception, HFIs can make informed decisions to improve their brand positioning and strengthen their competitive advantage. Customer Engagement and Retention (2.04) Effective marketing strategies not only attract new customers but also foster engagement and retention. By studying marketing effectiveness, HFIs can assess how well their marketing initiatives engage existing customers and build long-term relationships. This understanding enables HFIs to refine their marketing tactics to enhance customer loyalty, cross-selling opportunities, and repeat business. It is concluded that the perceived benefits of the respondents towards development of marketing effectiveness are significantly high. Furthermore, data from employee performance measures can guide targeted training and development programs. Continuously improving the skills and knowledge of the workforce translates into enhanced service quality, which can be highlighted in marketing materials and communications. In summary, incorporating employee performance measures to enhance quality not only benefits the internal operations of the housing finance institution but also serves as a strong foundation for effective marketing. It establishes credibility, fosters positive customer experiences, and sets the institution apart in a competitive market, ultimately leading to increased customer trust, loyalty, and business growth.

DISCUSSION

Implementing effective marketing strategies can significantly enhance customer satisfaction in the housing finance industry. One strategy is to provide personalized and transparent communication throughout the customer journey. By clearly explaining terms, interest rates, and repayment options, potential homebuyers can make informed decisions, leading to a sense of trust and satisfaction. Moreover, offering educational content and resources about the housing market, mortgage processes, and financial planning can empower customers to feel more confident in their choices. This could include webinars, articles, and workshops that address common

questions and concerns. Another vital approach is to streamline and digitize processes, such as online application submissions and document uploads. Simplifying procedures not only saves time but also reduces frustration, creating a smoother experience for customers. Furthermore, excellent customer service is paramount. Promptly addressing queries and concerns, whether through phone, email, or online chat, demonstrates a commitment to customer care. Additionally, gathering and acting upon customer feedback showcases a willingness to adapt and improve based on their needs. Collaborations with real estate agents can also be fruitful. Offering joint seminars or special deals for customers referred by agents can enhance customer satisfaction, as they benefit from a comprehensive approach to home buying. Incorporating these strategies can result in higher customer satisfaction rates, improved loyalty, and positive word-of-mouth referrals, ultimately contributing to the success of housing finance companies.

CONCLUSION

Housing Finance Institutions in India are financial institutions that specialize in providing housing finance to individuals and organizations. They contribute to the growth of the real estate sector, promote affordable housing, and play a vital part in facilitating home ownership in the country. Regulated by the National Housing Bank, HFIs in India offer a range of housing finance to cater to the diverse needs of borrowers while adhering to regulatory guidelines. Satisfied customers are more likely to recommend the institution to others and become repeat borrowers. Therefore, HFIs should focus on delivering excellent customer service, streamlining loan approval processes, and offering personalized solutions to meet the unique needs of their clients. The marketing effectiveness of Housing Finance Institutions depend on their ability to develop effective marketing strategies, measure and optimize marketing efforts, evaluate financial performance, and prioritize customer satisfaction. By successfully executing these aspects, HFIs can strengthen their market position, attract a wider customer base, and drive sustainable business growth in the competitive real estate finance industry. One of the key performance measures in evaluating employee performance related to the quality of HFIs is the loan portfolio quality. This measure assesses the ability of employees to effectively evaluate loan applications, conduct thorough credit assessments, and manage loan portfolios. By monitoring the delinquency rates, default rates, and non-performing loans, HFIs can gauge the quality of their employees' work in terms of ensuring sound lending practices and minimizing credit risk. Another important measure is customer satisfaction. The quality of service provided by HFIs is directly linked to the satisfaction levels of their customers. Employee performance can be evaluated through customer feedback, surveys, and reviews, which shed light on the effectiveness of employees in addressing customer needs, providing accurate information, and delivering timely and responsive customer service. Studying the marketing effectiveness of HFIs provides valuable insights into customer acquisition, brand awareness, customer engagement, market segmentation, and ROI. By understanding the impact of marketing strategies, HFIs can make data-driven decisions to optimize their marketing efforts, enhance customer relationships, and drive sustainable business growth.

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IMPACT ON HUMAN RESOURCES MANAGEMENT PRACTICES ON EMPLOYEE SATISFACTION IN SELECT BANK

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ABSTRACT

In the banking sector, the link between human resources management (HRM) practices and employee satisfaction is paramount. Banks operate in a highly competitive environment, and the efficiency, loyalty, and commitment of their workforce can significantly influence their overall performance. Effective HRM practices, such as transparent recruitment processes, fair performance evaluations, continuous training opportunities, and well-structured reward systems, directly contribute to enhanced job satisfaction among bank employees. When employees feel valued and understand that their personal and professional growth is a priority for the organization, they tend to demonstrate higher levels of job satisfaction. Additionally, opportunities for career progression and a work culture that promotes work-life balance further solidify employee contentment. Given that banks often deal with clients' sensitive financial information, the satisfaction and loyalty of employees are crucial, not only for productivity and innovation but also for maintaining trust and reliability with their customer base. In essence, robust HRM practices are not just an operational necessity for banks but a strategic tool that ensures employee satisfaction, ultimately leading to improved service quality and organizational success.

Keywords: Human Resources Management, Employee Satisfaction, Bank, Recruitment and Selection.

INTRODUCTION

There is a lot of demand on businesses nowadays to speed up their growth and improve their efficiency. This is why many businesses constantly experiment with new methods of expanding their operations. Most of the time, they make rapid adjustments so they can better serve their customers. [9].As a result, businesses must constantly evaluate and enhance not just the quality of their services, but also their procedures, objectives, and metrics for measuring performance. The HR department's management of the staff determines the organization's productivity and success. Despite the widespread belief that their people are their greatest asset, few companies really maximise their human capital. Organisations like banks and other enterprises may ensure their financial success by investing in their most valuable asset: their employees. As a consequence of technological development, the banking business is experiencing a lot of rapid changes. As a consequence of technological advancement, banks now have different criteria for their staff [7]. Inside a business People are considered valuable resources when they have the expertise required to do their jobs. People are the building blocks of every organisation, and they are also its driving force. Individuals are essential to the success of any organisation. A community is formed when individuals pool their human, material, and technological resources. These means are insufficient to realize the organization's aims [4].

BACKGROUND OF THE STUDY

Employee satisfaction is a critical factor in the success of any organization, including banks. A satisfied and motivated workforce tends to be more engaged, productive, and committed to the organization. Human resources management practices play a pivotal role in shaping employee satisfaction levels. According to their

stated goals, almost all businesses see their employees as their most valuable asset [8]. In order to achieve its goals, maintain its viability, and achieve success, each organisation must have the right people in the right positions at the right moments. Staff quality and experience are crucial to the success of any business, including financial institutions. Organisations should pay more attention to their human resources since doing so may help them maximise the competences of their employees[2].Human resource management practices are associated with more intelligent, flexible, and capable firms. These companies institute policies and practices to attract, screen, and educate future employees to meet their skilled labour needs. These employees, in turn, will do all they can to help out the groups shared resources [3]. The organisation can only thrive, survive, and remain competitive thanks to the unwavering commitment of its members. Since it is essential for members to be satisfied with their occupations in order for them to be committed to their organisation, job satisfaction is often cited as a required prerequisite for membership loyalty. Human resource management practices may facilitate a close bond between employers and employees based on mutual respect and trust. This link is grounded on the "social exchange theory,"[5] which states that workers do work for employers in exchange for financial compensation and other benefits. Human resource practices that improve both individual and collective output are also made easier to execute using this tool. Training's practical value and effect on worker productivity are the topics of this study. In addition, people won't be able to develop to their fullest potential or increase their productivity on the job if they aren't given enough training. Banks may lose a lot of money due to employee blunders. Employees who haven't been properly trained will ultimately perform poorly and make costly mistakes. This study will help business leaders save money by laying the groundwork for an efficient and comprehensive training programme. In the baking business in particular, it is imperative that companies maintain their current levels of investment in employee training. In-house training provided by the bank might help reduce expenses even more. This research will demonstrate that experienced workers don't need close supervision when they know what they're doing. Trained workers may get higher results if they fully implement the strategy and make the most of all available resources.[5]. Trained workers are more likely to make effective use of available resources and provide fruitful work. Training boosts employee loyalty since it allows them to realize their potential at their bank. Training produces a steady stream of qualified and capable managers by preparing employees for increasingly complex and senior roles. There is less absenteeism and turnover, and workers who have received training are more flexible in their roles. Trained workers will be able to increase both output and quality. When it comes to adapting to new technologies, nothing beats a well-trained workforce

LITERATURE REVIEW

The researchers found that effective HRM practices strongly predicted levels of employee engagement. Organisational commitment was also demonstrated to mediate the link between HRM practices and employee engagement. Happier workers are more committed workers, hence HR policies and practices should aim to boost workers' satisfaction in the workplace. Human resource management practices, worker happiness, and loyalty to the company all have predictable feedback loops with one another. In today's competitive market, employees seek more from their jobs than simply a paycheck. Because people expect more incentives from their job than they get, management is worried that employee satisfaction may decline. Alima Aktar and Faizuniah Pangil [3]. In today's business climate, retaining experienced workers while also attracting new, competent ones is a top priority. However, retention becomes a problem if workers become discontented with their jobs. The rate of employee turnover is on the rise, and the loyalty of current workers is often called into doubt. Loyal workers are vital to any company since they put in so much effort for an extended time without considering alternative employment opportunities. They promote the company to others and don't look for work elsewhere. Successful employee retention may reduce the cost of hiring and training new workers. Ghafoor, Khan, and Khan (2011) [5] provide empirical evidence linking training and development with improved productivity in the workplace. Training and development strategies, as well as on-the-job training delivery formats, were considered separate variables that influenced employee performance. Professors from different institutions were polled using standardized questionnaires with five Likert ratings to compile the data. The study made use of SPSS for both descriptive and inferential statistics. According to the findings, there is a substantial relationship between training and development, on-the-job training, training design, and training delivery style, and employee performance. That it boosts productivity across the board in an enterprise is implicit. Fatima and Tayyaba.S. (2012)[4] examined a paper examining the impact of group-based prizes on workers' views. In settings when there is a strong feeling of teamwork, the research aimed to demonstrate that group-based

incentive systems provide the greatest rapid growth in rewards. The emphasis of this essay was on the employee's perspective on what is most important in a group-based rewards scheme. The organisational dependent variable was used to categories the independent variables of pay, employee satisfaction, trust, and employee empowerment. The quantitative study for this work was carried out with the help of institutions. A questionnaire was designed to conduct the research needed to put the idea to the test. The data analysis and interpretations are based on the responses received from the organisations. How well do the results fit into the theoretical framework that was developed after a careful examination of the literature on the subject of the thesis? Each and every hypothesis tested was successful. Organisational happiness among workers was found. Ali and Ahmed (2009) [2] examined an insightful piece on the topic of employee motivation and job satisfaction as it relates to reward and recognition programmes. The major objective of this research was to verify the positive effect that incentive and recognition programmes have on staff morale and productivity. Employee job satisfaction served as the dependent variable, with reward, recognition, and motivation serving as the independent factors in this research. The information was collected by a systematic questionnaire sent to all workers of Unilever. Out of a total of 200 surveys sent, 180 were selected at random and completed. The statistical analysis, performed in SPSS, included correlation and regression tests. All variables were shown to have a linear relationship with workers' reports of happiness on the job.

PROBLEM STATEMENT

Organisations often revolve around banks, which are at the epicenter of many of the globalization and deregulation processes. In light of these rapid changes, they must effectively manage their firms' human resources in terms of employee satisfaction, productivity, and loyalty to the company[6].It was found that when employees were happy in their occupations, they were more committed to their companies, worked more for them, and helped them succeed. Despite the growing body of research investigating the links between HRM practices and outcomes like job satisfaction, performance, and commitment in the workplace. Rafiq et al. (2012) [11] analyzed data from Pakistan to determine how incentives affect employees' happiness on the job. The major purpose of this research piece was to analyze the relationship between pay and productivity. Compensation was the independent variable in this study, with employee performance serving as the dependent variable. The information was provided by 210 customer service representatives from different financial institutions. A standardized questionnaire was employed for the data collection. Positive tendencies were seen throughout the board. Extrinsic incentives were shown to be much more important than intrinsic advantages when evaluating employee satisfaction with their jobs [3].Regression research suggests that extrinsic incentives, such as financial compensation, are more crucial to employee happiness than intrinsic rewards. Management implications of the results have also been addressed.

SIGNIFICANCE OF THE STUDY

Human resource management, job happiness, and organisational loyalty in the banking sector may all benefit from the insights provided by this research. As a consequence, it's important to identify skilled workers (Mizan et al., 2013). This research could assist the banking sector expand, which might have a positive impact on the country's economy and job market. A practical sample method was first used to recruit the participants. This restricts the generalizability of the study's results to different settings and demographics [4].Second, since this was a cross-sectional study, it is important to proceed with care when extrapolating the results. It is recommended that in future research, more people participate from a wider geographical area, i.e. from different private and public bans. Information was also gathered via the use of self-report questionnaires. Future researchers are encouraged to diversify their data collection methods, such as conducting interviews over the phone and in person. This might help get reliable information when any confusion is cleared up [2].

METHODOLOGY

The goal of this research is to learn how HR practices in the banking sector impact worker productivity. This research aims to better understand the recruiting, selection, incentives, and training practices that have the most impact on employee performance in the banking business [5]. Employees that obtain training will become more skilled, which will boost the company's earnings potential. The quantitative phase will involve surveying bank employees to gather data on their level of satisfaction and perceptions of various HR practices.[8].The survey

will include standardized scales to assess employee satisfaction and specific aspects of HR practices, such as compensation, training opportunities, and work-life balance.

RESEARCH QUESTIONS

1. How do recruitment and selection processes influence employee satisfaction in banks?
2. What is the relationship between training and development opportunities and employee satisfaction in the banking industry?
3. How does the compensation and benefits structure affect employee satisfaction in banks?
4. To what extent do performance management practices contribute to employee satisfaction in the banking sector?
5. How do work-life balance initiatives impact employee satisfaction in banks?
6. What is the connection between employee engagement strategies and employee satisfaction in the banking industry?
7. How does employee recognition and rewards influence employee satisfaction in banks?
8. How does effective communication between management and employees affect employee satisfaction in the banking sector?
9. To what extent does the support for employee well-being and mental health impact overall employee satisfaction in banks?
10. How do career growth opportunities within the organization affect employee satisfaction in the banking industry?

Human resources management practices can significantly impact employee satisfaction in the banking industry. Employee satisfaction is a crucial factor that affects employee motivation, productivity, and retention. Here are some key HR practices that can influence employee satisfaction in a bank:

1. **Recruitment and Selection**: The process of hiring and selecting the right candidates for various roles within the bank can affect employee satisfaction. When employees feel that they were hired based on their skills, qualifications, and fit with the organization's culture, they are more likely to be satisfied with their job.
2. **Training and Development**: Providing adequate training and development opportunities to employees helps them acquire new skills, improve performance, and advance in their careers. When employees feel supported in their professional growth, it can lead to higher job satisfaction and engagement.
3. **Compensation and Benefits**: Fair and competitive compensation packages, including salary, bonuses, and benefits, play a crucial role in employee satisfaction. If employees believe they are being fairly compensated for their efforts, they are more likely to be satisfied and committed to the organization.
4. **Performance Management**: Effective performance management practices, including regular feedback, goal-setting, and performance evaluations, can enhance employee satisfaction. Employees who receive constructive feedback and recognition for their achievements are more motivated and engaged.
5. **Work-Life Balance**: Maintaining a healthy work-life balance is essential for employee satisfaction. HR policies that promote flexibility, offer paid time off, and support work-life balance initiatives can contribute to a positive work environment.
6. **Employee Engagement**: Implementing strategies to boost employee engagement is crucial for job satisfaction. Engaged employees are more likely to feel connected to their work, their team, and the organization, leading to higher satisfaction levels.

7. **Communication**: Effective communication between management and employees is essential for creating a positive work environment. Transparent communication about organizational goals, changes, and decisions helps build trust and reduces uncertainty, leading to higher job satisfaction.
8. **Employee Well-being and Support**: HR practices that prioritize employee well-being, mental health support, and work-related stress management can contribute to higher employee satisfaction and reduced turnover.

IMPACT OF WORK LIFE BALANCE ON JOB PERFORMANCE WITH SPECIFIC REFERENCE TO JOB INVOLVEMENT AND SATISFACTION

Age and gender relationship with the opinion of the respondents

The respondents opinion may differ based on the HRM practices. This study considers two variables age and gender of the respondents to analyze their opinion. The results are given below.

Table 1: Age and the opinion about HRM practices

Practices		N	Mean	Std. Deviation	F	Sig.
Recruitment and Selection	Young	170	3.7752	0.41587	3.318	0.027
	Middle	140	3.2398	0.51472		
	Old	90	3.4315	0.43125		
	Total	400	3.0897	0.41472		
Training and Development	Young	170	4.2395	0.52518	2.361	0.069
	Middle	140	4.1862	0.54781		
	Old	90	4.1582	0.62140		
	Total	400	4.1427	0.61022		
Compensation and Benefits	Young	170	4.2151	0.51246	3.348	0.084
	Middle	140	4.1257	0.61254		
	Old	90	4.3158	0.52143		
	Total	400	4.2780	0.51255		

The result from the ANOVA test shows that opinion of the young group respondents is better on Recruitment and Selection (3.7752) and Training and Development (4.2395) and the old age group respondents on Compensation and Benefits (4.3158). The F values of Compensation and Benefits (3.348) and the Recruitment and Selection (3.318) are Significant. It is concluded that opinion of the old age group respondents on the Compensation and Benefits are significantly high.

Table 2: Gender and the opinion on the HRM practices

Practices		N	Mean	Std. Deviation	Z	Sig.
Performance Management	Male	186	3.6521	0.52145	3.048	0.001
	Female	214	3.3325	0.51268		
	Total	400	3.4328	0.43321		
Employee Recognition and Rewards	Male	186	4.1871	0.73399	0.332	0.704
	Female	214	4.1124	0.618210		
	Total	400	4.1315	0.67358		
Employee Well-being and Support	Male	186	4.1234	0.61254	-0.171	0.872
	Female	214	4.1712	0.61258		
	Total	400	4.1825	0.51732		

The above table shows that the male respondents' opinion on the HRM practices in the performance management (3.6521) and employee recognition and rewards (4.1871) are high and the opinion of the female respondents is better on the employee Well-being and Support. Other opinion on the employee recognition and rewards and the employee Well-being and Support (4.1712) do not have significant association in the opinion of the male and female respondents. Human Resources Management (HRM) practices play a pivotal role in shaping the workforce dynamics and overall organizational performance within the banking sector. Age, as a significant demographic variable, has a profound impact on these practices. Each generation possesses distinct characteristics, work preferences, and expectations. Effective HRM practices take into account these

generational differences to ensure a harmonious and productive work environment. One key impact of age on HRM practices is talent acquisition and recruitment. Younger generations, such as Millennials and Generation Z, tend to place a higher emphasis on flexible work arrangements, technological advancements, and opportunities for rapid career growth. Banks need to adapt their recruitment strategies to showcase these features to attract top young talent. On the other hand, older generations might seek job stability, mentorship programs, and options for phased retirement.

DISCUSSION

In summary, human resources management practices can significantly impact employee satisfaction in the banking industry.[8] By focusing on recruitment and selection, training and development, compensation and benefits, performance management, work-life balance, employee engagement, recognition, communication, employee well-being, and career growth opportunities, banks can create a positive and fulfilling work environment for their employees. [2]This, in turn, can lead to improved productivity, reduced turnover, and enhanced customer service, ultimately benefiting the organization as a whole.

Expected Outcomes: The research aims to provide valuable insights into the role of HR practices in influencing employee satisfaction within the banking sector. The findings will help banks identify areas of improvement in their HR strategies to enhance employee satisfaction, engagement, and overall organizational performance [8]. Ultimately, this research can contribute to the creation of a more positive and supportive work environment for bank employees, fostering a culture of productivity and long-term commitment to the organization.[4] This study explored the relationship between human resources management (HRM) practices and employee satisfaction within the banking sector. Recognizing that banks operate in a dynamic and competitive market, the efficacy and dedication of their workforce play a pivotal role in ensuring sustained growth and customer trust. Through a systematic review of HRM practices—including recruitment, performance evaluation, training, rewards, career progression, and work-life balance policies— identified key factors influencing job satisfaction among bank employees.[7] The findings underscore that effective HRM strategies lead to higher job satisfaction levels. Specifically, when employees perceive HRM practices as transparent, equitable, and geared towards their professional and personal development, their satisfaction and organizational commitment are significantly bolstered. For banks, ensuring employee satisfaction through sound HRM practices is not merely an operational imperative but a strategic initiative, impacting service quality, customer trust, and overall institutional success.[15].

CONCLUSION

Human Resources Management (HRM) plays a pivotal role in shaping the satisfaction and overall well-being of employees within an organization. Effective HRM practices, encompassing aspects like fair recruitment processes, comprehensive training and development, transparent performance appraisal systems, competitive compensation, and fostering an inclusive work culture, directly correlate with increased employee satisfaction.[2] When employees perceive that their growth, well-being, and contributions are valued by the organization, it nurtures a sense of belonging and loyalty.[19] On the contrary, poor HRM practices can lead to dissatisfaction, low morale, reduced productivity, and high turnover rates. A consistent and strategic approach towards HRM, which acknowledges the evolving needs and aspirations of employees, will not only enhance satisfaction but also promote a positive organizational culture, paving the way for sustainable success. Training and development initiatives also need to be tailored based on age groups.[14]. Younger employees might require more digital and technology-oriented training, while older employees might benefit from up skilling programs to stay relevant in a rapidly evolving industry. Performance management systems should consider age-related factors to evaluate employees fairly. This involves recognizing that different generations might have diverse approaches to work and varied definitions of success. HRM practices must create performance metrics that accommodate these differences while maintaining equity [7].Moreover, succession planning is deeply affected by age. As Baby Boomers retire, there is a need to ensure knowledge transfer and a smooth transition of leadership roles. Banks must identify potential successors from younger generations and provide them with appropriate training and mentoring. Employee engagement initiatives also hinge on age-related preferences. Regular feedback, recognition, and opportunities for involvement might be particularly motivating for younger employees, while older employees might appreciate a sense of legacy and contribution [5].Inclusive HRM practices are vital, ensuring that all age groups are valued and represented in decision-making processes. Age-

diverse teams can lead to innovative solutions, as different perspectives come into play. In conclusion a strategic approach that recognizes and adapts to the preferences, expectations, and strengths of various age groups can lead to a cohesive, high-performing workforce that contributes to the overall success of the bank.

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RELATIONSHIP BETWEEN ORGANISATIONAL EFFECTIVENESS, CLIMATE AND ITS PREDICTORS AMONG IT SECTOR

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ABSTRACT

Organizational effectiveness in the context of technology companies refers to their ability to achieve their strategic goals, remain competitive, and adapt to dynamic market changes. A positive organizational climate, on the other hand, reflects the collective perceptions and attitudes of employees towards their work environment and the organization as a whole. The predictors that influence organizational effectiveness and climate in the IT sector are multifaceted. Firstly, effective leadership plays a critical role in shaping both factors. Strong and visionary leaders can inspire employees, foster innovation, and create a positive climate that motivates individuals to excel in their roles, thereby contributing to overall organizational effectiveness. Secondly, the level of employee engagement and job satisfaction is a significant predictor. In the IT sector, where talent retention is a challenge, satisfied and engaged employees are more likely to be committed to the organization, resulting in increased productivity and efficiency, and ultimately influencing organizational effectiveness. Organizational culture is another essential predictor that impacts both climate and organizational effectiveness. Effective leadership, employee engagement and satisfaction, organizational culture, and resource availability all contribute to shaping the organizational climate, which in turn impacts overall effectiveness. Understanding and managing these relationships is essential for technology companies seeking to thrive in a competitive environment and achieve sustainable success.

Keywords: Organisational Effectiveness, Team Commitment, Capability Development, Climate and IT Sector

INTRODUCTION

Every corporation is looking for ways to outcompete its rivals in this tumultuous business environment with fierce rivalry. Even with the most up-to-date production techniques, automated machines, and marketing strategies, an organization will dominate the market if its personnel are reliable, devoted, and committed. The rate of staff turnover and absenteeism will decline as a result of the high degree of dedication and loyalty. Employees' attitudes, perspectives, and convictions about their work, as well as other closely linked aspects, are referred to as their "job satisfaction." When a job satisfies an employee's essential job values, the person develops an emotional attachment to that employment. In the discipline of management, the research of organizational efficiency has not only been crucial but also challenging. Organizational effectiveness, which has historically been primarily understood in terms of production, is simply how successfully an organization achieves its objectives. Effectiveness is connected to an organization's capacity to reach organizational objectives and access and use resources efficiently.

BACKGROUND OF THE STUDY

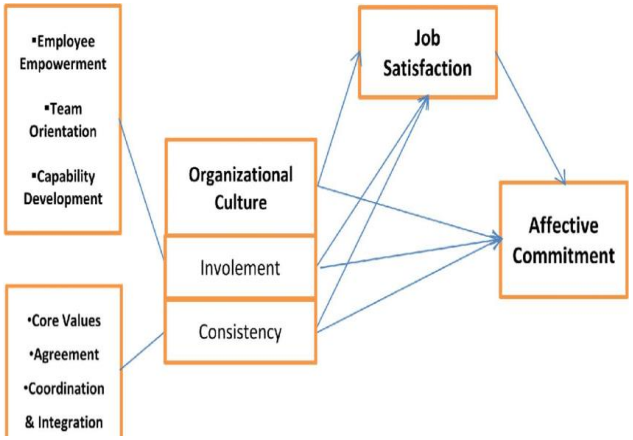
The extent of employee commitment may be used to forecast an organization's effectiveness. Employees that are dedicated to the organization work hard to achieve its goals and take extra precautions to protect its resources. In order to increase organizational performance, management and the organization are looking for strategies to increase employee commitment. When employees are dedicated to the company and also want to keep their membership for the long term, they work harder. Employees who are committed to the organization are more

likely to follow its rules, values, standards, and code of conduct as well as be bound to stay with the firm for the foreseeable future. Employment satisfaction is a related variable that denotes how an individual feels about his employment generally. It is a feeling, a person's view on their job, their beliefs, and various other connected things. Bakotic (2016) believed that employees play the primary role in determining the climate, in contrast to structural approach (Payne & Pugh, 1976), which was the result of size structure and hierarchy in the company. Because of criticism that these strategies are difficult and one-sided, an interactive method was developed. It went on to explain that environmental and individual factors may be evaluated together to determine how organizational climate is shaped. Benjamin (2012), organizational atmosphere and dedication are positively correlated with organizational success. Some research have also claimed that work satisfaction is a key predictor of effectiveness. Thus, the present study examines the interactions between these factors in Indian IT firms.

ORGANIZATIONAL COMMITMENT AS MEDIATING VARIABLE PREDICTORS OF ORGANIZATIONAL EFFECTIVENESS IN IT SECTOR

In the dynamic and competitive landscape of the IT sector, understanding the factors that contribute to organizational effectiveness is crucial for sustainable success. Researchers have identified several predictors that can influence organizational effectiveness, such as leadership style, employee satisfaction, and organizational culture. However, one essential aspect that plays a significant role in this relationship is organizational commitment. Organizational commitment refers to the degree to which employees feel emotionally attached to their organization and are dedicated to its goals and values. It acts as a mediating variable between the aforementioned predictors and organizational effectiveness. Effective leadership, for instance, fosters a sense of trust and respect among employees, which enhances their commitment to the organization. Similarly, when employees are satisfied with their job roles and work environment, their commitment to the organization strengthens. Furthermore, a positive and supportive organizational culture can significantly impact employees' commitment, leading to improved overall organizational effectiveness. By acting as a mediating variable, organizational commitment bridges the gap between these predictors and organizational effectiveness. It enhances the impact of positive predictors while mitigating the negative effects of potential challenges that the IT sector often faces, such as high turnover rates and intense competition for talent. In conclusion, organizational commitment plays a vital role in the IT sector as a mediating variable that influences the relationship between various predictors, like leadership, employee satisfaction, and organizational culture, and overall organizational effectiveness. Recognizing the significance of organizational commitment allows organizations in the IT sector to create a workforce that is dedicated, motivated, and aligned with the organization's goals, leading to increased productivity and long-term success.

Figure: 01



ORGANIZATIONAL COMMITMENT IN IT SECTOR

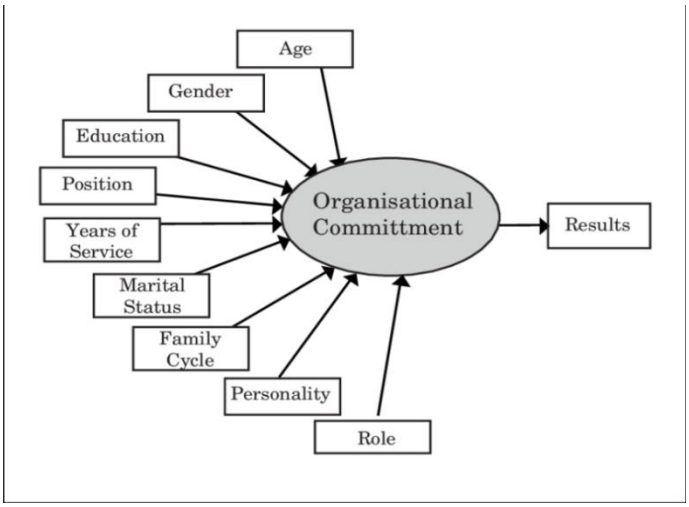
In the rapidly evolving and competitive IT sector, organizational commitment holds immense significance for the success and sustainability of technology companies. In the IT sector, where innovation, agility, and adaptability are paramount, having a highly committed workforce is essential. When employees in the IT sector

exhibit a strong sense of organizational commitment, they are more likely to go above and beyond their duties, display a higher level of engagement, and remain loyal to the company even in challenging times. This commitment translates into improved job performance, increased productivity, and better customer service, all of which are crucial for staying competitive in the fast-paced IT industry. Moreover, organizational commitment fosters a positive work culture and enhances teamwork. In a sector that heavily relies on collaboration and knowledge sharing, a committed workforce is better equipped to work together cohesively and creatively, leading to more innovative solutions and faster problem-solving. Employees are more likely to get emotionally attached to the company and show enhanced dedication, which increases the likelihood of long-term retention, when they feel appreciated and supported. In summary, organizational commitment is crucial to the success of IT businesses. Nurturing a culture of commitment not only enhances individual job satisfaction but also leads to a more robust and resilient organization. In the fast-paced and ever-changing landscape of the IT sector, having a committed workforce can be a game-changer, ensuring continued growth and innovation for technology companies.

JOB SATISFACTION IN IT SECTOR

Job satisfaction in the IT sector is a critical factor that significantly influences the performance and overall success of technology professionals and organizations alike. Given the demanding and fast-paced nature of the IT industry, job satisfaction plays a pivotal role in retaining talented employees and fostering a productive work environment. One of the primary determinants of job satisfaction in the IT sector is the nature of the work itself. IT professionals often find satisfaction in their jobs when they have challenging and meaningful tasks that allow them to apply their skills and expertise creatively. The opportunity to work on cutting-edge technologies and be part of innovative projects can contribute significantly to their sense of fulfillment. Another crucial aspect of job satisfaction in the IT sector is work-life balance. The nature of IT work, particularly in software development and support roles, can be demanding and require long hours. IT professionals thrive in environments where their contributions are acknowledged and valued, and where teamwork and collaboration are encouraged. A culture that promotes open communication, professional growth opportunities, and recognition for achievements fosters a sense of loyalty and commitment among employees. Providing competitive compensation and benefits is also crucial for job satisfaction in the IT sector. Given the high demand for skilled IT professionals, companies that offer competitive salaries, performance-based incentives, and comprehensive benefits packages can attract and retain top talent, contributing to higher job satisfaction levels. In conclusion, job satisfaction in the IT sector plays a vital role in attracting, retaining, and motivating skilled technology professionals. Companies that prioritize meaningful and challenging work, work-life balance, a positive work culture, and competitive compensation are more likely to have satisfied and engaged employees who contribute to the organizations overall success and growth.

Figure: 02



ORGANIZATIONAL CLIMATE AS MEDIATING VARIABLE PREDICTORS

The common understanding, emotions, and attitudes shared by the individuals who make up an organization regarding its fundamental components are referred to as the organizational climate. Since personality refers to a person's fundamental traits, the climate is also connected to the stable features of the organization. Organizational climate displays the norms, beliefs, and attitudes that shape the organization's culture and distinguish one organization from another. The behavior of an organization's members is influenced by the organizational climate. The morale, motivation, contentment, and desire of employees to remain in the organization are all significantly impacted by this problem4. Any collaborative and cooperative management might fail due to an unfavorable organizational atmosphere that breeds distrust and antagonism. In the context of the IT sector, organizational climate can serve as a crucial mediating variable that influences the relationship between various predictors and overall organizational effectiveness. A mediating variable is one that helps explain the process through which independent variables (predictors) affect the dependent variable (organizational effectiveness).The key predictors mentioned earlier, such as effective leadership, communication, employee development, work-life balance, recognition and rewards, and diversity and inclusion. Each of these predictors can directly impact the organizational climate within an IT company. Effective leadership, characterized by visionary and supportive leaders, fosters a positive organizational climate by setting a clear direction, promoting open communication, and empowering employees. A positive climate, in turn, enhances employee motivation, engagement, and satisfaction, leading to improved overall organizational effectiveness. Similarly, open and transparent communication channels contribute to a positive climate where employees feel valued, heard, and involved. Such a climate encourages collaboration, knowledge sharing, and innovation, all of which positively impact the organization's effectiveness. Employee development initiatives, providing opportunities for skill enhancement and career growth, create a climate of learning and personal growth. This climate can lead to increased employee commitment and a sense of loyalty to the organization, consequently influencing organizational effectiveness. Furthermore, offering work-life balance initiatives can contribute to a positive climate where employees experience reduced stress and burnout. A climate that prioritizes employee well-being and flexibility can result in higher job satisfaction and, ultimately, improved organizational effectiveness. Recognizing and rewarding employees' contributions can create a climate of appreciation and acknowledgment. This positive climate, in turn, motivates employees to perform at their best and contributes to overall organizational effectiveness. Moreover, embracing diversity and inclusion practices leads to a climate of fairness, respect, and acceptance. A diverse and inclusive climate enhances creativity and problem-solving capabilities within the organization, positively impacting its overall effectiveness.

Figure: 03



SAMPLING PROCESS

Primary data was gathered primarily through the use of survey questionnaire (google form). The sample method used for the study was simple random technique – 200 samples have been taken in the study area. A convenient technique sampling of 200 respondents from the IT sector for their opinions. Employers' demographic

characteristics were evaluated using SPSS, which was also used to examine descriptive data. Job satisfaction and organizational atmosphere are two crucial factors in this study. Therefore, we will utilize the following indicators and variables to experimentally assess the relative impact of organizational climate factors in predicting employee job satisfaction: Benjamin, A. (2012) The right administrative approach, support from superiors, workload, performance reviews, and open lines of communication, compensation package, and advancement chances all contribute to job happiness. Purang(2008).

ANALYSIS, INTERPRETATION

Organizational effectiveness refers to the extent to which a company can achieve its goals and objectives while optimizing resource utilization. A positive organizational climate fosters a work environment that promotes employee satisfaction, engagement, and productivity, leading to improved overall performance. The organizational climate serves as a critical indicator of the prevailing attitudes, values, and behaviors within the workplace, impacting the overall employee experience. It encompasses factors such as communication patterns, leadership styles, teamwork, and the level of employee involvement.

Table 1: Impact of Organisational Effectiveness and job satisfaction

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	70987.660	8	8238.173	35.345	0.000
Intercept	406126.339	1	31154.386	1788.200	0.000
Organisational Effectiveness	15251.152	2	7552.575	28.687	0.000
Job satisfaction	6823.095	2	3182.548	12.317	0.000
Organisational Effectiveness *Job satisfaction	2709.0251	4	673.915	2.625	0.042
Error	50322.215	191	261.138		
Total	145437.000	200			
Corrected Total	121258.875	199			
a. R Squared = 0.583 (Adjusted R Squared = 0.565)					

The table 1 indicates that the impact of Organisational Effectiveness is significant. The calculated F value is 28.687 for the degree of freedom 2. Its p value is 0.000 which is significant at 1% level. The impact of the job satisfaction on the performance of the employees is also found as significant impact. The F value is 12.317 for the degree of freedom 2. The significance is at 1% (0.000). The impact of intercept value of effectiveness and job satisfaction on the job performance of the respondents also have been identified as significant at 5% level ($0.042<0.05$). Hence, it is concluded that the effectiveness and job satisfaction of the employees are influencing their performance.

DISCUSSION

A culture that promotes open communication, collaboration, and continuous learning can create a positive climate where employees feel valued and motivated to contribute their best efforts, thus enhancing organizational effectiveness. Moreover, the availability of resources and technological infrastructure is a crucial predictor in the IT sector. Well-equipped employees can deliver higher-quality output, positively influencing organizational effectiveness, while inadequate resources may lead to dissatisfaction and hinder performance. Indicators and factors such management and leadership styles, involvement in decision-making, hard work, boredom and discontent, fringe benefits, personnel policies, working conditions, and an appropriate career ladder are used to further analyze organisational climate. Academics, management specialists, and consultants may benefit from using the study's primary concepts, facts, and statistics to better understand the dynamics of interactions and impacts of organisational environment factors and job satisfaction variables. People's attitudes or impressions of a corporation are measured by the organisational environment. Purang, P. (2008) Management or leadership styles, involvement in decision-making, providing difficult work, reducing boredom and irritation, supplying perks, personnel rules, providing pleasant working conditions, and creating an academic career ladder are all examples of organisational environment. In the IT industry, the organisational environment functions as a mediator, amplifying or reducing the impact of numerous predictors on organisational success. IT firms may foster an atmosphere that promotes employee happiness, engagement, and productivity by putting a strong emphasis on building a good climate through effective leadership, communication, employee development, work-life balance, recognition and incentives, and diversity and

inclusion. As a result, organisations become more productive, giving them a competitive edge in the quickly evolving IT sector. Chuang H.(2015).

CONCLUSION AND IMPLICATIONS

Understanding the predictors of organizational climate is equally vital, as it enables companies to identify areas for improvement and develop strategies to enhance employee satisfaction and engagement. Predictors may include effective leadership, clear communication channels, employee recognition programs, opportunities for skill development, work-life balance initiatives, and a strong commitment to diversity and inclusion. McKenna, E. (2000) .In the IT sector, where talent retention and motivation play a pivotal role, a favorable organizational climate can lead to reduced turnover rates, higher levels of innovation, and enhanced problem-solving capabilities. Moreover, an organization with a positive climate is better equipped to attract top-tier talent, creating a competitive edge in the market. Mohanty (2012).To thrive in the ever-evolving IT landscape, companies must prioritize the development of a positive organizational climate and actively assess and address its predictors. By fostering a supportive work environment that values employee well-being and growth, IT organizations can drive organizational effectiveness and achieve sustainable success in the dynamic and competitive industry.Increasing organisational effectiveness has long been a top priority for policymakers and HR Managers. Management should implement processes and regulations that may strengthen positive workplace norms. Employers who are prone to commitment should be sought out by policymakers and management experts. The current research advises businesses to create a pleasant and welcoming workplace atmosphere that will support the growth of their human resources and foster a culture of high dedication [11]. Understanding the psychological and emotional aspects of the workplace may improve employee motivation to fully contribute to organisational efficiency. The main factors in helping a company win the loyalty of its workers are empathy, trust, honesty, and teamwork. In order to increase their dedication, organisations should assist their workers and provide their desires. Employees should have the chance to learn new skills relating to their jobs, and they should sometimes be given innovative assignments [6].Management must concentrate on providing workers with accurate and timely information so that they may do the assigned job without difficulty. On the basis of their production and accomplishment, workers should get the proper rewards, incentives, and promotions in order to inspire them to meet the organization's goals.

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IMPACT ON ONLINE IMPULSIVE BUYING BEHAVIOUR OF CONSUMERS IN FASHION INDUSTRY

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ABSTRACT

The fashion industry's shift to online platforms had a profound impact on consumers' impulsive buying behavior. The allure of attractive visuals, coupled with limited-time offers and discounts, creates a sense of urgency, leading to spontaneous purchasing decisions. Social media's influence plays a significant role, with fashion influencers and sponsored content swaying consumers to make impromptu purchases. Additionally, personalized recommendations, one-click purchasing options, and easy return policies further facilitate impulsive buying. The fear of missing out on exclusive products of shopping through loyalty programs also contribute to this trend. Emotional marketing tactics further intensify the desire to buy on impulse. While this phenomenon benefits the fashion industry, consumers must be cautious about responsible spending to avoid unnecessary financial strain.

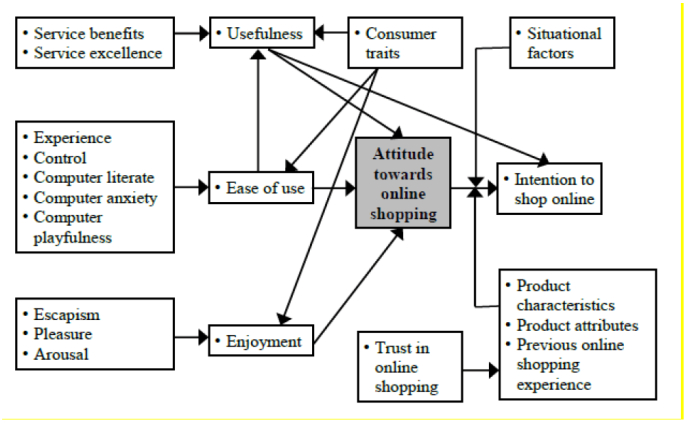
Keywords: Buying Behaviour, Consumers, Fashion Industry, Fashion Involvement and Mobile Shopping

INTRODUCTION

Online shopping is clearly one of the most popular ways to spend money nowadays. Customers have to rely on the pictures and descriptions provided to make a choice without ever handling the product before buying it online. Consumers may use information provided by other parties, such as other customers' online comments, to supplement the information provided by businesses. As a result, user reviews have emerged as a significant resource for internet shoppers. Online shopping in China has evolved in recent years to include the popular new medium of live broadcasts of mobile short video apps. The rise of the mobile short video app has made it possible to promote mobile shopping malls through live broadcast. The purchasing behaviour of consumers have conventionally been categorized into two distinct classifications: deliberate and impulsive. The investigation of the phenomenon surrounding impulse purchases is vital due to the significant influence exerted by the presence of friends and family. Social presence refers to the perception that individuals form of each other through video chat interactions, which can be either favourable or unfavourable. Research findings indicate that individuals who possess a considerable level of social presence tend to exhibit higher levels of life satisfaction. Moreover, these individuals frequently employ emoticons as a nonverbal mode of expression, hence enhancing their social and emotional encounters. Furthermore, research has revealed that the social presence sent by websites might potentially influence individuals' behavioural intentions through the factors of enjoyment and perceived utility. Additionally, the interactive nature of websites has the potential to foster the comparison of personal presence. Research has also demonstrated that the presence of others can potentially augment customers' sense of security and their inclination to engage in online shopping activities. Nevertheless, the impact of social presence on impulse purchases remains largely unexplored in existing studies. The study investigated the primary precursors of social presence in the context of online shopping, elucidating the impact of these elements on social presence. Furthermore, it explores the influence of social presence in online shopping on impulsive buying behaviour, drawing upon existing research on impulsive buying in the online shopping domain. This article examines the relationship between consumers' inclination towards impulsive buying and their behaviour in online purchasing. The paper's most notable contributions are as follows: This study aims to assess the efficacy of online comments in the context contributing to the understanding of online marketing management via the lens of system innovation. This paper aims to investigate the potential influence of online comments on customer attitudes and

conformity psychology. It builds upon existing research on the determinants of consumer attitudes and provides valuable insights for organisations seeking to adopt effective online marketing tactics.

Figure: 01



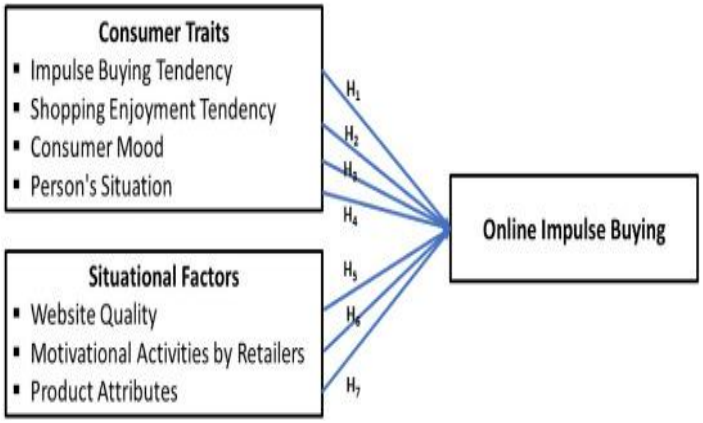
Source: Hirst & Omar (2007), Assessing women's apparel shopping behavior on the Internet

FIGURE 1
THEORETICAL FRAMEWORK

THEORETICAL BACKGROUND

Customers in the core route have an active interest, intrinsic motivation, and cognitive capacity. In order to alter their perspective, alter their purchasing intentions, and ultimately make a purchase, they will give careful consideration to the information's arguments and analyze the qualities of information arguments. The peripheral route will also have an effect on the attitudes, purchasing intentions, and purchase decisions of the kind of customers that lack the desire, motivation, and aptitude to digest information. According to the idea, people are persuaded to accept new knowledge. When consumers acquire information, they evaluate its credibility in a variety of ways, which in turn influences their adoption decisions. In ELM theory, the core route and the peripheral route each reflect a distinct sort of information processing. According to Fang (2022), the amount of a product's online sales is determined by customers' propensity to make arbitrary decisions about their consumption in the face of imperfect information. Therefore, feedback left on websites is vital to customers. This paper discusses consumers' reactions to the introduction of new clothing items via mobile short video app live broadcast, as well as the feedback provided on these items following their purchase via the app.Steven (2016), the presence of favourable online reviews can significantly enhance company outcomes over the internet and exert a significant influence on consumers' ultimate purchasing choices. Lee et al. (2021) suggested that internet reviews provide shoppers with a valuable resource by capturing customers' perspectives. Online reviews play a key role in the feedback mechanism of online trading platforms, facilitating customers to express their thoughts and experiences while fostering interactive contact between sellers and buyers. Wu (2020), the presence of online review material has the potential to stimulate customers' purchase intention and induce changes in their behaviour, ultimately exerting a substantial impact on their purchasing decisions. Seo and Lee (2013) did a study investigating the impact of the direction and substance of online comments on customers' opinions towards apparel goods. The study conducted by Kim and Kim (2018) examined the responses of customers towards online reviews of sports shoes. The findings revealed that the intention of consumers to make a purchase was positively influenced when they had pre-existing shopping plans. However, the impact on customers who did not have prior intentions to buy was shown to be minimal. The scope of these research primarily centers on the traditional online shopping mall. This research endeavors to investigate the impact of emerging online feedback mechanisms on customers' inclination towards impulsive clothing purchases.

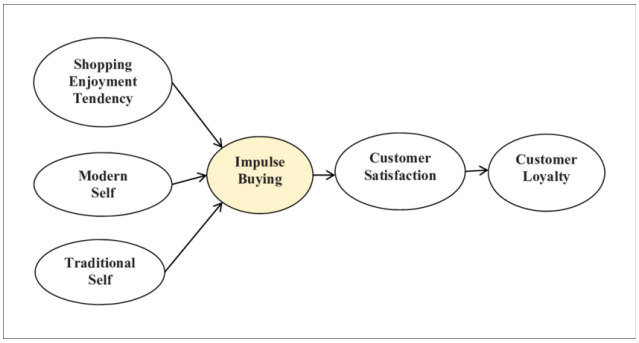
Figure: 02



IMPULSE BUYING BEHAVIOR

Beatty and Ferrell (1998), an impulsive purchase is one made without planning, as in the case of shopping for a certain product category or to satisfy a particular need. Consumers make impulsive purchases when they give little thought to their purchase after experiencing the impulse to make one. The temptation to acquire new fashion goods is based on the consumer's own recommendation, as detailed by Han et al. (1991). Customers making fashion-related impulsive purchases often have no prior exposure to the items they are purchasing. The term "impulse buying" is used in this research to describe the unplanned purchase of apparel that occurs when viewers of live broadcasts utilize mobile short video apps. The marketing of apparel relies heavily on impulse purchases. Cengiz (2017) investigated 333 samples based on their Amazon buying history to determine the effect fashion pursuit has on the choice to buy and on the purchase decision. The study's findings demonstrated that the desire to fit in influenced both the likelihood that a person would make a spontaneous clothes purchase and the frequency with which they did so. Wiranata and Hananto (2020), impulsive purchases are common while doing shopping online. They conducted an analysis of the elements that contribute to people making impulsive purchases of apparel. Results indicated that sales advertising and fashion awareness positively impacted impulsive purchases of apparel, whereas website quality had no effect. The influence of Internet celebrities on spontaneous purchases of high-end fashion brands Chen et al. (2021). According to their poll of 585 Chinese Internet celebrity admirers, trust is a significant element influencing consumers' propensity to make impulsive purchases. The article investigated the phenomenon of mobile short video application live broadcast as a trigger for impulsive purchases of clothes. Rook and Fisher described impulsive purchasing as a consumer's description of their internal state prior to making an impulsive purchase. However, more recent research has shown that emotional responses often accompany impulsive purchasing. An impulsive purchase, in Wood's view, was one made without prior thought or research and was followed by intense feelings of guilt or regret. Parboteeah et al. shown that customers' perceptions of a product's utility and hedonism, and hence their propensity to make an impulse buy, may be considerably influenced by ambient stimulation.

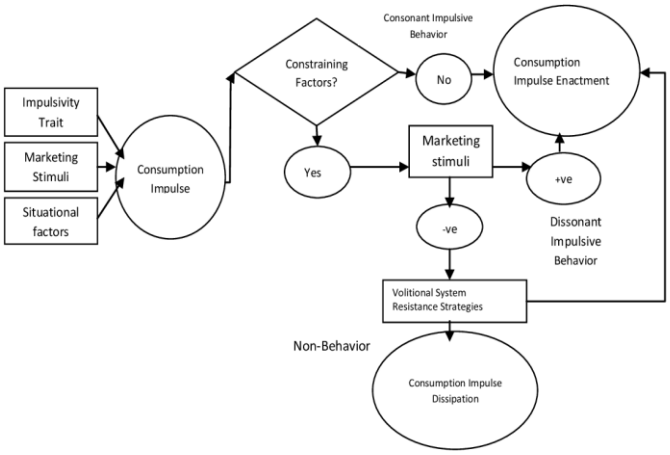
Figure: 03



FASHION INVOLVEMENT

Traylor (1981), the concept of product engagement pertains to the level of significance a product holds for a consumer. It also pertains to individuals' inclination and reliance on commodities, with the correlation between personal values and consumer goods. Zaichkowsky (1994), the concept of engagement pertains to individuals' perception of the significance and relevance of their buying decisions in connection to their personal needs, interests, and values. Participation in consumer behaviour is influenced by various antecedents, including personal, object, and situational factors. These factors are believed to play a significant role in shaping consumers' interactions with advertisements, product usage, and purchase decisions. Product involvement encompasses various aspects such as consumer awareness, demand, and preference for a certain product. The level of customer interaction with things exhibits a positive correlation with their knowledge of said items. In the context of this study, the concept of "fashion involvement" pertains to the extent of customers' familiarity with fashion products. Gitimu et al. (2013), customers' evaluations of clothes quality might be influenced by their level of interest in fashion. The influence of fashion participation on consumers' perceptions of garment quality has been substantiated through the utilisation of multivariate analysis of variance and analysis of variance techniques. The impact of shopping behaviours and fashion engagement on impulsive purchasing. The results of the partial testing revealed a significant negative effect of fashion participation, while the simultaneous tests demonstrated a substantial positive influence of both factors on impulsive purchasing. The results of the study revealed that engagement in fashion, consumer buying behaviour, and promotional activities exerted a significant influence on impulsive buying of fashion products. In 2021, Hewei and Youngsook conducted an investigation into the loyalty and satisfaction levels of China's Post-00 generation towards fashion purchasing applications. The results of the study indicated that the impact of features of fashion shopping applications on individuals' pleasure and loyalty was moderated by their level of engagement with fashion. The research conducted has confirmed the need of incorporating fashion engagement strategies in garment marketing. The act of engaging in fashion activities, whether through offline or online channels, has a significant impact on consumer purchasing behaviour.

Figure: 04



Impact on Online Impulsive Buying Behaviour of Consumers in Fashion Industry

The availability of a wide range of products, convenient shopping platforms, and persuasive marketing strategies have all contributed to the rise of impulsive buying behaviors among consumers. Here are some key factors that influence online impulsive buying behavior in the fashion industry:

1. **Visual Appeal**: Online fashion retailers utilize high-quality images, videos, and interactive features to showcase their products attractively. Visually appealing presentations can stimulate impulsive purchases as consumers are enticed by the products' aesthetics.

2. **Social Media Influence**: Social media platforms have become powerful channels for fashion influencers and brands to promote products. Consumers often make impulse purchases influenced by endorsements, product recommendations, and sponsored content they see on these platforms.
3. **One-Click Purchasing**: E-commerce websites often provide one-click purchasing options, enabling consumers to buy items with minimal effort and time, which can increase impulsive buying.
4. **Personalized Recommendations**: Online retailers use data analytics to provide personalized product recommendations based on consumers' browsing and purchase history. Such tailored suggestions can lead to impulse buying as customers find products that cater to their specific tastes and preferences.
5. **FOMO (Fear of Missing Out):** The fear of missing out on exclusive or limited edition products can drive impulsive purchases, especially when consumers perceive them as unique or trendy.
6. **Easy Return Policies**: Customer-friendly return policies reduce perceived purchase risk, making consumers more likely to indulge in impulsive buying as they know they can easily return the items if dissatisfied.
7. **Gamification and Reward Systems:** Loyalty programs, points, and reward systems can gamify the shopping experience, encouraging impulsive buying to earn additional benefits or achieve higher status.
8. **Mobile Shopping:** The prevalence of mobile shopping apps allows consumers to make purchases on the go, leading to more impulsive buying as shopping becomes increasingly spontaneous and accessible.
9. **Emotional Triggers**: Emotional marketing tactics, such as storytelling and emotional appeals, can influence consumers' emotions and lead to impulsive purchases driven by desire, pleasure, or perceived need.

Research Problem: The research problem pertaining to online impulsive buying behavior of consumers in the fashion industry in the study area is examined and the factors influencing online impulsive buying behavior among consumers in the fashion industry and its impact on consumer decision-making, shopping patterns, and overall satisfaction is also investigated. The research problem seeks to understand the underlying reasons behind impulsive buying behavior in the online fashion domain and its consequences on consumers. The study would aim to identify the key drivers that lead consumers to make impulsive purchases, the role of various online marketing strategies in triggering impulse buying, and the extent to which impulsive buying affects consumer satisfaction and subsequent purchase patterns.

Possible research objectives and questions related to the problem could include:

1. How do limited-time offers, discounts, and flash sales impact consumers' impulsive purchase decisions?
2. What role does social media play in influencing impulsive buying behavior in the online fashion industry?
3. How do personalized product recommendations affect impulsive buying behavior among fashion consumers?
4. What are the consequences of impulsive buying on consumer satisfaction and post-purchase regret?
5. How can fashion retailers utilize ethical marketing practices to encourage responsible impulse buying behavior?
6. What strategies can be implemented to help consumers avoid excessive impulsive buying and maintain financial well-being?

ANALYSIS, DISCUSSION AND CONCLUSION

Factors that influence online impulsive buying behavior in the fashion industry:

The customers behaviour is mostly influenced by the factors the prefer before making buying decision. Particularly, the customers of online shopping prefer some important factors related to the digital market and online market. It has different aspects in the online shopping like anytime shopping, information about the goods and services, etc. The factors mostly considered by the online customers are calculated using the ranking technique as below.

Table 1: Factors considered by online buyers

Factors	Mean	Std. Deviation	Mean Rank
Visual Appeal	3.27	1.176	6.19
Limited-Time Offers and Discounts	3.16	1.155	6.71
Social Media Influence	3.04	1.041	6.76
Personalized Recommendations	3.26	1.067	6.18
Easy Return Policies	3.72	1.214	6.79
Reward system	3.31	1.337	6.26
Product Attributes	3.17	1.172	6.04
Mobile Shopping	3.24	1.095	6.15
Emotional Triggers	3.28	1.108	6.01
FOMO (Fear of Missing Out)	3.62	1.225	6.12
One-Click Purchasing	3.39	1.250	6.31
N	250		
Chi-Square	21.681		
df	10		
p	0.006		

From the above table, it is found that **online impulsive buying behavior in the fashion industry** is an easy return policies (6.79) is important from the customers' point of view. Secondly, social media influence is considered as most important factor (6.76). The Limited-Time Offers and Discounts are also liked by most of the customers (6.71). The significance of the result of ranking is tested with the help of Friedman ranking. The ranking result from 250 sample respondents shows the difference in the ranking for each factor is significant. The calculated Chi-Square value is 21.681 for the degree of freedom 10 is more than expected level. The value of probability is 0.006. It shows that the ranks given by the respondents are significant.

CONCLUSION

Despite the apparent advantages of impulsive buying for fashion retailers, it is essential to strike a balance and ensure ethical marketing practices to avoid exploiting consumers. Additionally, consumers should be mindful of their impulsive buying tendencies and practice responsible spending to avoid unnecessary expenses and financial strain. The fashion industry's shift to online platforms has had a profound impact on consumers' impulsive buying behavior. The allure of attractive visuals, coupled with limited-time offers and discounts, creates a sense of urgency, leading to spontaneous purchasing decisions. Addressing these research questions would provide valuable insights into the dynamics of impulsive buying behavior in the online fashion industry, helping fashion retailers to better understand their customers and implement effective marketing strategies. Additionally, it would empower consumers to make more informed decisions and adopt responsible buying practices. Social media's influence plays a significant role, with fashion influencers and sponsored content swaying consumers to make impromptu purchases. Additionally, personalized recommendations, one-click purchasing options, and easy return policies further facilitate impulsive buying. It is believed that future research may augment and enhance the findings of this study by investigating other possible influencing factors, intermediate variables, and moderating variables, thereby adding to the body of knowledge surrounding e-commerce sites. In the world of live streaming, topics like social presence are seldom discussed. The level of a company's social presence may vary widely across various markets and product types. This provides a foundation for future research into the ways in which different forms of social currency alter consumers' feelings

toward brands. As a result, there has to be more in-depth and thorough discussion of consumers' impulsive buying behavior in regard to online shopping.

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EMPLOYEE ENGAGEMENT A REVIEW OF CURRENT RESEARCH AND ITS IMPLICATIONS. A THEORETICAL FRAMEWORK

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ABSTRACT

Employee engagement, an integral component of organizational success, has been the subject of substantial research in recent years. Rooted in the early management theories of the 20th century, its importance has grown, coinciding with a shift from task-oriented management to a people-centric approach. The current body of research converges on the understanding that an engaged employee is not merely satisfied or motivated but is deeply connected and committed to their work, driving better business outcomes and lower turnover. Several metrics and instruments have been developed to measure engagement, such as the Utrecht Work Engagement Scale (UWES) and the Gallup Q12. These tools gauge factors like vigor, dedication, absorption, and a strong sense of belonging. Factors influencing engagement are multifaceted, spanning leadership quality, opportunities for professional growth, recognition, work-life balance, and organizational culture. Recent studies indicate that organizations with high engagement levels outperform their counterparts in key metrics, including profitability, productivity, customer satisfaction, and reduced absenteeism. The 2017 Gallup report, for instance, showed that businesses in the top quartile of engagement were 21% more profitable than those in the bottom quartile. However, despite its significance, many organizations grapple with low engagement levels. This misalignment arises from a combination of factors: rapidly changing work environments, lack of clarity in roles, miscommunication, and inadequate attention to employees' emotional well-being. The substantial body of research available offers a roadmap for businesses aiming to foster a more engaged workforce, yielding both quantitative and qualitative benefits. However, its real-world implications require continual adaptation to emerging workplace realities and a genuine commitment to employee well-being.

Keywords: Employee Engagement, Implications, Theoretical Framework and Perceived Support

INTRODUCTION

Because of the strong correlation between employee involvement and positive outcomes including pro-social behaviour at work, positive health and wellness, and increased productivity, the notion of employee engagement is gaining traction. In today's highly competitive business landscape, organisations and their employees are under intense pressure to succeed. Organisations should prioritize identifying their strengths since studies have shown that highly engaged individuals outperform their less enthusiastic peers and stay with their employer for longer. The importance of employee engagement can be traced back to the fact that businesses see their employees as valuable assets crucial to their success.[3] Organisational outcomes like as total shareholder return, customer satisfaction, staff productivity and retention, revenue growth, and safety performance all improve with higher levels of employee engagement. When employees contribute to a company's success and the company in turn shares the rewards of that success with the employees, everyone wins. Participating in the success of an organisation, doing work that is meaningful, and making a constructive contribution may all lead to a sense of personal fulfilment? It has been shown that involving workers more actively may improve safety results. To harness the benefits of engagement, organizations need to adopt holistic strategies.[9]These encompass clear communication, fostering a culture of trust, regular feedback mechanisms, opportunities for growth, and recognizing and rewarding contributions. Furthermore, as the nature of work evolves with the rise of remote work, gig economy, and technological advancements, engagement strategies must adapt to cater to a diverse and changing workforce. In conclusion, employee engagement remains central to achieving organizational excellence

RESEARCH BACKGROUND

Engaged employees feel that their opinions are heard and valued, leading to higher job satisfaction and commitment. Flexible work arrangements and employee support programs can contribute to a positive work environment that enhances engagement. Furthermore, the digital age has brought new dimensions to employee engagement research[6].The use of technology and social media in the workplace has created opportunities for real-time feedback, recognition, and collaboration. Understanding how these digital tools can be effectively leveraged to boost engagement is an area of ongoing exploration. In conclusion, current research on employee engagement highlights its importance in driving positive organizational outcomes. Investing in employee engagement can lead to a more motivated, committed, and productive workforce, benefiting both employees and the organization as a whole.

EMPLOYEE ENGAGEMENT A REVIEW OF CURRENT RESEARCH

The concept of employee engagement holds considerable significance within the domains of organisational behaviour and human resource management. Recent studies on employee engagement have provided valuable insights into its significance in promoting a range of favourable outcomes for both individuals and corporations. Employees who are actively involved in their work have a tendency to exhibit higher levels of productivity, innovation, and customer orientation, hence resulting in enhanced overall business outcomes.[2] Moreover, individuals who possess these characteristics exhibit a decreased propensity to willingly depart from the organisation, hence mitigating turnover rates and the consequential expenses incurred in the recruitment process. The acknowledgement of the role of leadership and organisational culture in generating employee engagement is a significant implication of research in this area. Leaders that demonstrate strong communication skills, provide constructive criticism, and acknowledge the efforts of their people are crucial in fostering higher levels of engagement. Likewise, the presence of a constructive and all-encompassing organisational culture that places importance on the welfare of employees and fosters a feeling of meaning can have a substantial influence on employee engagement.[6] Another crucial aspect emphasized by scholarly study is the necessity for efficient bilateral communication

CONCEPT OF EMPLOYEE ENGAGEMENT

Human resources have been identified as a key factor in the development of a country's economy. By treating their employees as assets, manufacturing companies have set a new standard, one that recognizes the importance of human resources. Beginning with the turn of the millennium, a new era of rapidly developing information and communication technologies emerged. The internet is largely responsible for this upheaval. [13]Technology is the lifeblood of today's fast-paced institution. But we can't afford to downplay the significance of the human element either. There is no denying that the organization's performance depends on how well it manages its energy use and makes use of its human resources. Human resource and management practices have shifted away from emphasizing employee engagement, enjoyment on the job, and participation in decision-making in recent years. Worker dedication is a relatively new concept. In today's businesses, staff engagement is more important than the traditional concept of employee retention. According to this adage, a company's greatest strength is in its people. So, to boost morale in the workplace, you need to have a strong rapport with your staff. Employee engagement strategies prioritize creating a work environment where all employees feel valued and respected. Worker trust and loyalty are two other forms of employee engagement. More and more businesses understand the value of employee participation, realizing that doing so improves workers' access to possibilities and their sense of agency inside the company. "Employee commitment" described how enthusiastic people are about their jobs and their companies. They have put in a lot of effort and care into their project. It's a plan for keeping workers around, but its organizers also want to immerse the personnel by making them feel emotionally and intellectually invested in the company. In this case, workers are not just enthusiastic about the initiative, but also committed to seeing it through to fruition. Active employees provide additional support for the company without being asked because they care about its well-being. [9]One effect that might be related to the culture of the company is the loyalty of employees. The worker sensed a personal investment in the company's success and felt that their contributions were being recognized and appreciated. The word "commitment" may also be used to describe a person's devotion to and identification with a group. If employees believe their labour is valued, they are more likely to invest time and energy into the company. An organization's long-term success may be traced back to its culture, which lays the groundwork for employee success by encouraging their active

participation, catering to their needs, and guaranteeing their productivity and advancement. Organisations with highly engaged workers perform better as a whole and create more value for their shareholders. Investing in one's workforce is a priority for practically every business today. This improves the company's bottom line. Management's ability to foster two-way communication that acknowledges and appreciates workers' contributions and points of view is crucial for boosting employee engagement. Employee dedication requires fostering outstanding connections between staff. Employee engagement is the primary motivator for employees to put in additional effort, work hard, and care about the success of their organisation and their coworkers. Therefore, a company should value its people more than any other factor that could affect its competitiveness.[6] The company's mission, strategy, and key business objectives may all benefit from workers who are fully invested in their work. Employees boost their organizations' competitiveness in a number of ways, including via greater productivity, customer happiness, and low turnover. Companies are using employee commitment techniques to increase employee desire to contribute to the company's success via commitment, loyalty, and affiliation. To achieve these goals, it is important to provide things like an open line of communication, a motivating incentive, room for professional development, and an unrestrictive environment in which to do business, strong leadership, and an encouraging work environment. The objective is to encourage the worker's active engagement in the work and the company as a whole.

EMPLOYEE INVOLVEMENT – AN OVERVIEW

In order to foresee cohesiveness of effort and combat readiness during World War II, U.S. Army researchers boosted the moral worth of organisations. Moral ratings were utilised as predictors of speed, quality, and militancy in the postwar society that depended on mass production, as well as the necessary unity of execution efforts. The need for a term to characterize an individual's emotional commitment to their organisation, their coworkers, and their job evolved with the rise of the knowledge worker and the necessity of individual talent management. Workers' dedication includes things like taking part in redeployment, pushing employees to think outside the box, and setting up an environment where communication between managers and staff is straightforward and open. [12]A dedicated worker is one that is well-versed in the company's mission and works cooperatively with colleagues to boost the firm as a whole. People use them not only physically, but also mentally and emotionally, during role plays. Staff involvement clearly involves the relationship between the employer and the conditions, the proper treatment of employees, increased opportunities for promotion, and flexible work practices. Commitment from workers is crucial to any company's success because it allows them to attract and retain high-caliber individuals who, without it, would be easy prey for rival businesses. Therefore, an individual's dedication to the company is the deciding factor in whether or not they are considered an insider. While "Employee Engagement" describes a specific psychological event, "morals" describes a group of situations with similar traits. Internal and extrinsic motivation combine to generate employee engagement, which is the basic material of morality. Human capital is an organization's lifeblood and cannot be replaced by any other asset. Investing in people should be the company's first priority if it wants to maximise its riches. It's paradoxical that the process of becoming richer by making the most of one's valuable human resources tends to devalue such resources. In contrast to other resources, human capital does not degrade over time. Perhaps there is no agreed-upon way to evaluate a company's human capital.

REVIEW OF LITERATURE- A THEORETICAL FRAMEWORK

Diah Pranitasari (2022) identified how organisational culture factors including internal communication, organisational fairness, intrinsic incentives, and self-development affect professors' dedication to their jobs. The population consists of economics professors working at a university in eastern Jakarta and holding a National Lecturer Registration Number. The population of this research consists of 377 professors; from this pool, a random sample of 200 was selected to participate in the analysis. The results of this research should be used by the school to inspire their faculty more. Faculty job engagement may benefit from increased emphasis on internal communication, organisational justice, intrinsic motivations, and professional growth. Deepa and Bhojanna (2022)[12]explored that the majority of the faculty members are pleased with their workplaces. At light of the trend towards a greater emphasis on research at many academic institutions, the administration has begun funding faculty travel to the most cutting-edge research training workshops. To increase the number of students enrolled in Ph.D. programmes, several institutions have begun funding research efforts by offering financial incentives to faculty. Institutions also cover faculty members' expenses to go to and participate in

academic conferences both domestically and abroad. Such faculty-friendly practices must be maintained if high-quality outcomes are to be achieved. Fransiskus(2022) argued that in order to motivate workers to provide their absolute best, a culture of employee engagement must be fostered. High-engagement workers put in extra effort for the company and their own financial gain. Depending on how ambiguous the results of new methods of working are, employee engagement may rise or fall. In the new methods of working, the organisation decides the working style or pattern for each individual based on their role and responsibilities. Since the company decides on the working schedule, individual employees' choices don't matter much in terms of who gets what shifts. The company is certain that this arrangement will be the most effective working arrangement to boost employee engagement since it takes into consideration both business needs and employee input from an internal survey. The study's sample size of 40 participants was determined by a random selection process. The ideas offered here are based on the many recommendations and comments employees have made to aid in the transition to the new ways of working.Kalpana Kirti1 and Shikha Goyal (2022)[8]. Many companies already use or plan to use employee engagement strategies. Results, productivity, and efficiency may all benefit from employee engagement techniques. Employee commitment affects not just the bottom line but also the quality of service provided to customers and the rate at which employees leave the company. The researcher will use primary and secondary data, such as interviews and a literature review, to investigate the different approaches to employee engagement used by universities and colleges. This would pave the way for their practical implementation in a wide range of academic settings. Several methods, including financial and non-financial incentives and public acknowledgment of employees' efforts, were discovered to be used by HEIs to increase the engagement and devotion of their academics and staff. Saumya Shirina (2022)[3] assessed the factors that affect faculty and staff dedication to their universities. The purpose of this research was to identify the elements that have an impact on employee participation. The characteristics demonstrated to be predictive of employee engagement in HEIs were identified using factor analysis. Factors including employment characteristics, leadership, work-life balance, opportunities for advancement, and company culture all played a role. Workplace factors such as leadership and job satisfaction have a crucial role in determining employee engagement. Companies should put more effort into creating a positive work atmosphere, adopting a leadership style that inspires trust and respect, and implementing programmes that boost morale. Shaan et al. (2022),[6] well-respected works have always had a stellar reputation. It's a sad truth that most academics believe their contributions are unrecognized and undervalued due to the inconsistent and often incorrect work practices established by their different organisations. This is a particularly pressing issue for women in academia, who often have to balance their careers with caring for children and the household. Although the importance of organisational policies in this context cannot be denied, the motivational and research literature has traditionally put the onus of work-life and career planning on the individual. In this empirical article, the author explores the relationship between employee engagement strategies and their impact on the work-life balance of female academics. The study published its results, as well as its limitations and suggestions for further research. Ashwini Kundar and Pakkeerappa (2021), [4] employee involvement should be taken into account while formulating corporate strategies. Author maintains that knowing how invested teachers are in seeing their children succeed is crucial to improving educational outcomes for everybody. Employee engagement has become more important in the service industry, and it is thus crucial to understand how it helps the firm and contributes to its success. The information included in the empirical study was gathered through firsthand accounts. The results show that faculty members who are actively engaged in their organisations are more committed to the success of their institutions. Nagoji and Swapnil Mackasare (2021)[2] conducted a comprehensive evaluation of the existing literature pertaining to faculty engagement. Subsequently, a conceptual framework was developed, aimed at facilitating the engagement of individuals and fostering their motivation to actively contribute towards the sustainable development of an organisation. This framework is intended to serve as a practical guide for practitioners seeking to enhance faculty engagement within their respective contexts. By conducting a thorough examination of the existing body of research, a theoretical framework was developed to promote active engagement in classroom discussions. The present study's results pertaining to the associations among employee resilience, individual optimism, and emotional commitment, locus of control, income, and job security indicate that the inclusion of faculty engagement could potentially yield benefits within the context of the Indian higher education system. By employing the provided framework and theories, it becomes possible to ascertain the implications of pertinent factors. This study offers the higher education institution (HEI) sector a comprehensive framework for comprehending employee engagement. This

framework may be utilised by professionals in the field to formulate effective strategies aimed at both attracting and retaining highly skilled individuals. This study presents a comprehensive framework that enables practitioners and scholars to gain a deeper understanding of the various elements that impact teacher involvement within the context of higher education. Nisha Chanana and Sangeeta (2021) [16]argued that in during the COVID-19 pandemic, the current business landscape has necessitated a heightened focus on employee engagement for human resource managers and practitioners across organisations due to the implementation of lockdown measures. The objective of this article is to assess the strategies employed by various organisations in effectively engaging their staff during the course of the coronavirus pandemic. In contemporary times, organisations are consistently devising novel and effective strategies to maintain high levels of motivation among their employees throughout challenging circumstances. This conceptual essay draws upon a diverse range of scholarly sources, including research studies, journal articles, online blogs, reputable news outlets, and reports from the World Health Organisation. Amidst the ongoing pandemic, organisations are actively formulating a diverse range of engagement strategies. These strategies encompass online family engagement practices, virtual learning and development initiatives, online team building activities, webinars featuring industry experts, weekly alignment meetings conducted through online platforms, team lunch meetings facilitated via video conferencing, concise online game sessions, virtual challenges and competitions, online courses.The initiatives aimed at fostering employee and organisational engagement within the context of remote work have shown to be highly effective. These organisations are experiencing professional growth and acquiring new skills through the engagement activities they offer to their workforce. Despite the formidable COVID-19 pandemic, staff persist in maintaining motivation and experiencing a profound sense of dedication towards the organisation. Haribaska and Opika (2020). [1]The primary objective of the research was to compare the experiences of male and female workers who participated in engagement activities. Employee commitment may be successful if the workforce as a whole is enthusiastic and dedicated. Employees are more likely to stay with a company that has an open line of communication and rewards them for accomplishing organisational goals. Employee dedication, the author concludes, is a "motor word" for internal communications. The staff has a favourable outlook on the company and its principles. It has a dramatic effect on business operations as it rapidly gains acceptance, use, and significance in the workplace. The dedication of workers highlights the need of talking to workers to achieve economic success. Therefore, a firm should value its workers highly since they are the single most important factor in ensuring the company's success. The study's authors found that increasing employee engagement requires a systematic approach to learning, assessing, and taking action. Muhammad Yasir Imran et al. (2020) found that the phrase "flourishing" or "flourishing" promotes employee happiness and success indirectly by referring to the contributions obtained from organisational support for work satisfaction. Study variables and time periods were compared from one data set to the next as part of the data compilation process. Six hundred and thirty-eight people from a variety of organisations were studied, and they found that all three measures of health—prosperity, prosperity, and productivity—were correlated with a sense of being supported. When workers are invested in their work, they experience an increase in subjective well-being, which increases the value of their perceived support. The research looks at the subjective well-being of employees and the role they play in generating a favourable psychological environment in the workplace, as well as at the evolution of (healthy, successful) organisational structures. Research aimed at determining the generalizability of the study's findings to other nations and sectors would include collecting more data from other locations and analyzing the results. It was suggested that future research use a mixed or qualitative methodology in addition to other methodologies for studying study factors. According to the author, the team's efficacy will evolve in accordance with its level of blooming in the future.

METHODOLOGY

This research endeavor seeks to identify the positive and negative aspects that may exert an influence on innovative work behaviour. This study used a qualitative methodology, which involves examining, uncovering, illustrating, and interpreting the unique characteristics of the phenomenon under investigation in order to present their findings. In addition, the author performed a comprehensive study of previously published literature by a systematic literature review. Utilizing previously published literature as a primary data source is an essential prerequisite for conducting systematic literature review methodologies in order to fulfil the objectives of this research endeavor. Mulrow (1994), the systematic review is considered the most efficient and successful approach for discovering and evaluating credible international journals. A systematic review or meta-analysis is

a rigorous scientific approach used to examine and synthesize existing research articles that have been selected based on specific criteria. This method aims to generate new scientific insights and knowledge within a particular field of study. The methodology employed to ascertain prominent worldwide journals involved the utilisation of indexed criteria on Google Scholar and Scopus. The papers considered for inclusion in this study were limited to those authored in the English language and published between the years 2009 and 2019. Based on the outcomes of the selection process employing the aforementioned criteria, a total of 32 publications were identified for inclusion in this literature review study. The present study employed the literature review approach to conduct an analysis aimed at gaining a comprehensive understanding of the positive and negative aspects that have the potential to influence innovative work behaviour.

FACTORS WHICH CONTRIBUTE TO THE ENGAGEMENT OF THE TEACHERS

Teacher engagement plays a crucial role in the success and effectiveness of the educational process. Engaged teachers not only contribute positively to student outcomes but also have a higher job satisfaction, which in turn can lead to reduced teacher turnover rates. Here are several factors that contribute to the engagement of teachers

AGE GROUP AND ENGAGEMENT

Age shows the experience and maturity of the consumers which could have impact on their satisfaction. The respondents are grouped into young (less than 25 years), middle age (26 to 40 years) and old (more than 40 years). The relationship between age and level of satisfaction is given below.

Table 1: Relationship between age and level of engagement

Age group	Level of engagement			Total	Chi-Square
	Less	Moderate	High		
Young	23	44	15	82	22.072
	28.0%	53.7%	18.3%	100.0%	df
Middle	16	18	10	44	4
	36.3%	41.0%	22.7%	100.0%	Sig.
Old	14	26	34	74	0.000
	19.0%	35.0%	46.0%	100.0%	
Total	53	88	59	200	
	26.5%	44.0%	29.5%	100.0%	

The Table 1 shows that most of the young respondents (53.7%) are moderately satisfied, majority of the middle age group respondents (41.0%) are moderately satisfied and most of the old age group respondents (46.0%) are less satisfied. The Chi-Square value (23.091) for the degree of freedom 4 is found significant. The significant value is 0.000 (<0.01). It is concluded from the above result that engagement of young consumers is more than old age group respondents and the satisfaction is reduced when the age of the consumers increases. Age can significantly influence the engagement levels of teachers in both positive and negative ways. The impact of age on engagement can be understood by considering the various phases of a teacher's career, the accumulated experiences, the changing societal norms, and even the physiological changes that come with age. Often, younger teachers, fresh out of their training programs, exhibit high levels of enthusiasm and passion for their profession. Their relatively recent exposure to modern educational methodologies, tools, and technology might make them more adaptable and open to innovation. Their energy can be infectious, leading to a vibrant classroom environment. As teacher’s age and gain more experience, they often build a repertoire of effective teaching methods and classroom management strategies. Their engagement might be more rooted in confidence, stemming from years of experience. However, some may also experience burnout or complacency during this phase, which can impact their engagement negatively.

DISCUSSION

Radhakrishnan and Sujatha (2020) [5] showed genuine interest in their work and who go above and beyond to further the organization's goals. An organisation with "high" employee engagement is more likely to succeed than one with "low" engagement if all other elements are same. Finding out how different demographic factors are related was the key motivation for this research. To enhance job performance and increase employees' abilities and capacities, which in turn affects the entire organisational problem, responders unanimously agree that organisational welfare for employee development is vital. Deepa & Bhojanna (2022). analysed, workers'

satisfying relationships with their coworkers and team members fulfil a fundamental human need. In every group, the leader needs the backing of his followers and coworkers. This persuasive backing is the key to getting them to their goal. Employee dedication is shown when workers get emotionally invested in the success of their firm. The primary focus of this research was on the level of enthusiasm shown by IT workers. In order to get insight into the working habits of workers, an empirical research was done. In this research, the importance of having healthy workers who can contribute to the company's success cannot be overstated. In addition, their willingness to take on unanticipated tasks reflects their dedication to the company, helping it stand out from its rivals. The findings showed that most workers are ready to work in the IT industry, with motivation playing a key role in the company's total dedication to the task at hand. When total dedication causes health problems on the personal and professional fronts, the company owes the employee more than just a salary rise since that's not where the value is. The author suggested more investment and the use of concepts to maintain a high level of staff retention over time. Shivani Gulati (2020)[15]. Job engagement is crucial in fast-changing workplaces. The term "employee engagement" is used to describe how dedicated an employee is to their work. Today's highly competitive business environment may put a burden on workers' ability to concentrate and stay motivated. This article reviews the research linking enthusiastic participation by workers to increased productivity. Teachers' effectiveness is influenced by their level of engagement with the institutional culture of today's schools. In addition to employee incentive schemes, organisations need to boost employee engagement to achieve their objectives. Having invested faculty is crucial at a time when universities want their employees to take initiative, be creative, and actively seek answers to the problems with today's methods of instruction.

CONCLUSION

This section provided visuals to accompany the chapter's literature evaluation of workers' contributions to the structure. Studies on employee involvement, various definitions of employee engagement, and the correlation between employee commitment and various outcomes at work are presented in this chapter. Product or production participation by employees is never a justification [16].The experience of employee engagement varies widely among industries, companies, and individuals. Businesses should investigate the factors that motivate employee involvement. An employee may be very engaged and invested in his job, but this does not always mean that he has received sufficient training. It's crucial for the company's continued success and seamless operations [5]. Companies that don't motivate their workers will struggle to gain a competitive edge. HR professionals have a difficult task in developing and sustaining a positive work environment that will inspire and engage their employees. Important elements that influence employee participation and engagement for the long term include good work environments, career progression possibilities, management style, incentives and benefits, rewards and recognition, job design, and teamwork.

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FACTORS INFLUENCING SELF-EFFICACY, STUDENT'S ATTITUDE TOWARDS EDUCATIONAL LOAN REPAYMENT

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ABSTRACT

Student's attitude towards educational loan repayment, self-efficacy plays a significant role. Students with a high level of self-efficacy regarding educational loan repayment tend to approach the task with confidence and a positive attitude. They believe in their ability to secure a stable job or income after graduation and are optimistic about their capacity to manage their finances responsibly. These students are more likely to take proactive steps towards repaying their loans, such as budgeting, seeking financial advice, or exploring additional sources of income. Students with low self-efficacy may experience feelings of doubt and uncertainty about their ability to repay their educational loans. This can lead to negative attitudes and behaviors, such as avoidance of loan repayment discussions, procrastination, or a lack of financial planning. These students may feel overwhelmed by the financial burden and perceive loan repayment as an insurmountable obstacle. It is important to note that self-efficacy is influenced by various factors, including previous experiences, personal attributes, and external support systems.

Keywords: Self-Efficacy, Student's Attitude, Financial Commitments, Bank and Educational Loan Repayment

INTRODUCTION

The majority of students are not aware of the effects of the student loans they have taken out for their study. How much they borrowed and how they intend to repay it are both important considerations. While attending college, students are not concerned about their debt. The fact that HE has expanded quickly in both rich and emerging nations, together with the significant rise in education prices, highlights the significance of the issue. The sustainability and growth of the higher education sector are significantly impacted by students' and their families' capacity to pay the rising prices. Most nations have implemented certain financial aid programmers for higher education students; however these programmers tend to be nation-specific. Typically, a special organisation is created to manage student loans, and both public and private funding sources are used to support it. Importantly, most nations are aware that they cannot finance their students only from the government budget.[3] The governments' ability to provide for a variety of social necessities, including housing, healthcare, and education, is constrained. The theoretical underpinning of university students' attitudes towards loan repayment is presented in this essay. In addition, it assesses the validity and reliability of socio-demographic data as well as their connection to attitude-influencing variables. [9]The focus of the research is on how students' attitudes towards student loan repayment are influenced by their socio-demographic features as students or borrowers. Previous research conducted in western societies have found weak relationships between attitudes and behaviour.[12] The borrower's outlook on a variety of issues that might affect his or her tendency to default is meant by the term "attitude." According to quantitative research and interviews with students, faculty, and staff, students' attitudes regarding debt and default are only two of the many factors that contribute to their loan default.

BACKGROUND OF THE STUDY

The cost of attending college might be prohibitive for many students. With the increase in borrowing, so have worries about students' ability to repay their debt. Student loan debt is a growing problem, and universities throughout the globe are scrambling to find solutions. The present economic slump and competitive job market are simply adding to the already high levels of student loan debt.[6] For most students, taking out a loan means entering into a period of uncertainty after graduation in which they may or may not be able to complete their studies within the time limit given by the loan, as well as the difficulties of finding employment to meet the cost of the loan. It's possible that the student's attitude will play a significant role in his or her decision to repay under these conditions. Public authorities may wander from their intended course of action if they overestimate

expenses and assume too much on students' will to repay. Borrowers' mindsets are important, although they are seldom discussed in the literature.[2] Therefore, there is a dearth of information about the methods used to gauge students' opinions of their educational debt. There is also a dearth of evidence-based study on the links between students' attitudes and their intentions to repay loans, between students' attitudes and parental influence, and between students' attitudes and their beliefs about how loan repayment would affect their quality of life after graduation. More study is required to uncover the factors that affect attitude, such as the power of the media and the specifics of the loan agreement. This study adds to the body of knowledge by creating a battery of new items for the concepts of attitude towards the loan agreement, media-influenced awareness of the problems of loan repayment, parental influence, and intention to repay the loan. In addition, the model now takes into account graduates' expectations on the impact that debt payments would have on their quality of life in the future.

PERSPECTIVE ON LOAN REPAYMENT

Students with low self-efficacy in loan repayment face various barriers and challenges that hinder their ability to effectively manage their educational loans. One significant challenge is the presence of financial anxiety and stress. [2]These students often feel overwhelmed by the financial burden and view loan repayment as a daunting task, leading to heightened worry and emotional distress. Another barrier is a lack of financial literacy. Students with low self-efficacy may have limited knowledge and understanding of loan terms, repayment options, and financial management strategies. This lack of knowledge can leave them feeling uncertain and ill-equipped to navigate the complexities of loan repayment effectively. Additionally, negative attitudes and beliefs about their own financial capabilities contribute to the challenges faced by these students. They may doubt their ability to secure stable employment or generate sufficient income to repay their loans, leading to a sense of helplessness and resignation. [5]These negative attitudes can perpetuate a cycle of inaction, procrastination, and avoidance of loan repayment responsibilities. Furthermore, external factors such as limited job prospects, economic instability, or unexpected financial hardships can exacerbate the challenges for students with low self-efficacy. These circumstances can further erode their confidence and increase their feelings of powerlessness in managing their loan obligations. Addressing these barriers and challenges requires targeted interventions aimed at enhancing students' self-efficacy and providing them with the necessary financial knowledge and skills. It is crucial to offer comprehensive financial literacy programs, counseling services, and resources that empower students to develop confidence, plan for loan repayment, and make informed financial decisions.[9] By addressing these barriers, educational institutions can support students in overcoming challenges and fostering a positive attitude towards educational loan repayment.

Factors Can Influence Self-Efficacy And A Student's Attitude Towards Educational Loan Repayment.

1. **Support Systems**: The presence of supportive networks, such as family, friends, mentors, or financial advisors, can positively impact a student's attitude towards loan repayment. These support systems can provide guidance, encouragement, and practical advice, which can enhance self-efficacy and motivation.
2. **Employment Prospects**: Students' perceptions of their future employment prospects can influence their attitude towards loan repayment. If students are confident about securing a well-paying job or entering a field with good employment opportunities, they are more likely to view loan repayment as a manageable task. On the other hand, a lack of confidence in finding suitable employment can create anxiety and negative attitudes towards loan repayment.
3. **Personal Financial Situation**: Students' current financial situation can affect their attitude towards loan repayment. Factors such as income level, savings, and existing financial obligations may impact their confidence in meeting loan repayment obligations. Students who feel financially secure are more likely to have a positive attitude and higher self-efficacy towards loan repayment.
4. **Previous Experiences**: Past experiences with financial management, such as successfully handling personal finances or observing others managing loans effectively, can shape a student's self-efficacy towards loan repayment. Positive experiences can instill a sense of competence and belief in one's ability to manage financial responsibilities.

5. **Access to Resources and Support Programs**: The availability of resources and support programs, such as financial literacy courses, loan counseling services, or debt management workshops, can significantly impact students' self-efficacy. These resources provide information, tools, and strategies that empower students to navigate loan repayment effectively. It is essential for educational institutions, policymakers, and financial institutions to recognize these factors and implement measures that foster a supportive environment and provide students with the necessary knowledge and resources to enhance their self-efficacy and positive attitude towards educational loan repayment.
6. **Financial Knowledge and Education**: Students with a higher level of financial knowledge and education tend to have greater self-efficacy in managing their finances, including loan repayment. Understanding concepts such as interest rates, loan terms, and repayment options can empower students and increase their confidence in dealing with their educational loans.

IMPORTANCE OF THE STUDY

Students' perspectives on paying back their college loans may differ depending on things including their financial situations, career prospects, and personal beliefs. It's possible that some students may take the responsibility of paying back their loans seriously and work hard to do so. They've taken the time to consider the implications of not repaying the loan as arranged and may be actively looking for work that will allow them to do so. On the other hand, some students may have trouble paying back their debts. Finding stable job soon after college might be challenging for some, sometimes putting them in a financial bind. Some people may be unable to make their monthly loan installments because they are saving for something else or because of unforeseen circumstances. Societal and cultural variables also play a role in shaping individuals' perspectives on paying back student loans. Students' motivation to repay their loans may be influenced by cultural norms around debt. Student loans may be met with greater acceptance and an emphasis on practical repayment strategies in nations where they are seen as a common way of funding higher education.[2] It's crucial to remember that people's perspectives on paying off student loans may change over time. They may be in a better position to take charge of their debt repayment as soon as they join the employment and earn experience and income.[5] Students' perspectives may be molded and they can be given the skills they need to handle their educational loan commitments if resources like financial literacy programmers and support services are made available to them. Individual differences, societal norms, and resource availability all play a role in shaping how students feel about paying back their student loans. [8]. Student loan repayment positivity and responsibility may be encouraged via financial education, the promotion of responsible borrowing practices, and the provision of assistance for individuals experiencing difficulties

RESEARCH PROBLEM

The problem addressed in this study is the influence of self-efficacy on students' attitudes towards educational loan repayment. Educational loans have become a prevalent means for students to finance their higher education, but the successful repayment of these loans depends not only on financial circumstances but also on students' beliefs in their own abilities to manage the repayment process effectively.[13] Few studies, however, have investigated whether or whether students' confidence in their ability to repay their loans influences their motivation to do so.[7] Understanding this relationship is crucial for developing interventions and support systems that can promote positive attitudes and successful loan repayment outcomes among students.

Objectives and the problem statement seek to investigate the following questions:

1. How does self-efficacy influence students' attitudes towards educational loan repayment?
2. What are the barriers and challenges faced by students with low self-efficacy in loan repayment?
3. How can educational institutions, policymakers, and financial institutions promote self-efficacy and positive attitudes towards loan repayment among students?
4. What interventions and support programs can be implemented to enhance self-efficacy and improve loan repayment outcomes?

By addressing these questions, this study aims to fill the gap in the literature and provide insights into the role of self-efficacy in shaping students' attitudes towards educational loan repayment. The findings can inform the development of effective strategies and interventions to support

METHODOLOGY

During the month of March 2023, this research was conducted empirically in the chennai District. 250 college graduates from the 2021-2022 academic years were randomly chosen for the research. The information were collected through Google forms. Level of each problem is ranked using Kendall's W Coefficient test.

Factors influencing Self-Efficacy, Student's Attitude towards Educational Loan Repayment

Educational institutions, financial literacy programs, and counseling services can play a crucial role in fostering students' self-efficacy by providing guidance, resources, and assistance in developing financial management skills. Promoting a positive attitude towards educational loan repayment and enhancing students' self-efficacy can lead to better financial outcomes and overall well-being. By empowering students to believe in their abilities to manage their finances effectively, educational institutions can help them navigate the loan repayment process with confidence and success. Various factors considered by Student's Attitude towards Educational Loan Repayment are ranked with the help of Kendall's W test. The result is given below.

Table 1: Factors influencing the CRM: Kendall's Coefficient of Concordance

Factors	Mean	Std. Deviation	Mean Rank
Access to Resources	3.29	1.161	5.79
Banking norms	3.35	1.685	6.15
Natural disasters	3.25	1.232	5.58
Financial Commitments	3.78	1.410	6.61
Higher interest rate	2.49	1.114	4.65
Lack of family support	2.21	1.431	5.23
Lack of Government support	3.26	1.126	6.14
Lack of motivation	3.13	1.147	5.25
Low salary	3.15	1.114	6.08
Employment Prospects	3.14	1.233	6.03
N	250	df	9
Chi-Square	81.119	p	0.000

The result from the above table shows that Financial Commitments (6.61), Banking norms (6.15) and Lack of Government support (6.14).The result from the Kendall's W test shows that the ranks identified from the mean ranks are significant. The Calculated value of the Chi-Square test is 81.119 for the degree of freedom 9. The p value is 0.000.

Table 2: Weighted Ranking technique

Sources	Rank	1	2	3	4	5	6	7	Total	Rank
	Weight (x)	7	6	5	4	3	2	1		
Financial Burden	f	42	42	41	34	27	32	32	1064	I
	fx	294	252	205	136	81	64	32		
Unemployment	f	38	24	62	45	26	38	17	930	VII
	fx	343	234	110	84	132	104	23		
Lack of Financial Literacy	f	49	39	22	21	44	52	23	1030	III
	fx	343	234	110	84	132	104	23		
Insufficient Income-to-Debt Ratio	f	47	16	53	17	38	42	37	993	V
	fx	329	96	265	68	114	84	37		
Limited Job Opportunities	f	37	45	26	31	46	25	40	1011	IV
	fx	259	270	130	124	138	50	40		
Inflexible Repayment Terms	f	54	32	31	38	29	28	38	1058	II
	fx	378	192	155	152	87	56	38		
Mental and Emotional Stress	f	29	43	23	41	29	38	47	950	VI
	fx	203	258	115	164	87	76	47		

According to Weighted Ranking technique Financial Burden found to be the first problem faced by the students which weighted value is 1064. Inflexible Repayment Terms (1058) is ranked second, some educational loans have inflexible repayment terms, which may not align with the borrower's financial situation. Lack of Literacy (1030) is ranked third. Many students lack adequate financial literacy or understanding of loan repayment options. They may not fully comprehend the terms and conditions of their loans or be aware of available repayment plans and assistance programs. This lack of knowledge can hinder their ability to make informed decisions and effectively manage their loan repayment. Limited Job Opportunities (1011) ranked fourth, certain fields or industries may have limited job opportunities, leading to intense competition and lower salaries. Students who graduate in these fields may find it difficult to secure well-paying jobs, making it harder to meet their loan obligations. Insufficient Income-to-Debt Ratio (993) ranked fifth. After graduation, students may face a situation where their income is not sufficient to cover their loan payments along with other living expenses. This can result in a high debt-to-income ratio, making it challenging to maintain a reasonable standard of living while repaying the loan. Mental and Emotional Stress (950) and Unemployment (930) are ranked sixth and sixth. The burden of educational loan repayment can take a toll on students' mental and emotional well-being. Constant worry about loan repayment can lead to stress, anxiety, and even depression, affecting their overall quality of life and ability to focus on career and personal growth and Graduating students may struggle to find employment or secure a job that matches their qualifications and provides a sufficient income to repay the loan. This can lead to difficulties in meeting monthly loan payments and cause stress and anxiety for the borrowers.

DISCUSSION

It has been shown that the deterioration of the loan default is not the result of any student's conduct. Some researchers have concluded that this indicates an "attitude-behavior gap," or a discrepancy between rhetoric and practice.[5] A difficulty with this prognosis is that it draws attention to the fact that attitudes and worries are only reliable predictors and explanations of conduct when they are issue specific. Everyone hopes to finish college without incurring any debt, but this isn't possible unless students have access to sufficient funding via scholarships, grants, or other means. Although taking out student loans may seem like a good idea at the time, it may be a huge burden later on, particularly if the borrower isn't prepared for it. In particular, first-generation students may not have somebody to talk to about their finances, leading them to take out huge loans without fully contemplating the implications. [11].Student loans, defaults on student loans, retention, and graduation all merit attention because they affect present and future decisions regarding things like whether to continue college, which major to enroll in, how and where to search for and accept job offers, and so on. The consumer confidence index is useful because it sheds light on the state of the national debt, the job market, and the global economy as a whole.

IMPLICATION OF THE STUDY

Educational institutions can integrate financial literacy programs into their curriculum to equip students with the necessary knowledge and skills to manage their educational loans effectively. These programs can cover topics such as loan repayment options, budgeting, debt management, and financial planning. [1]Additionally, providing access to counseling services or workshops specifically focused on loan repayment can offer personalized guidance and support to students with low self-efficacy. Policymakers can advocate for policies that support loan repayment assistance programs, flexible repayment options, and income-driven repayment plans. By implementing supportive policies, policymakers can alleviate some of the financial burdens faced by students and create an environment that encourages responsible loan repayment. Financial institutions can play a role by offering transparent information about loan terms, repayment options, and financial management resources.[6] They can provide easily accessible online tools, calculators, and educational materials to help students understand the implications of their loans and make informed decisions. Financial institutions can also collaborate with educational institutions to provide workshops or guest speakers who can share practical advice and success stories regarding loan repayment. Collaboration among educational institutions, policymakers, and financial institutions is crucial in addressing the challenges faced by students with low self-efficacy. By working together, they can develop comprehensive support systems that include financial education, counseling services, policy reforms, and accessible resources. These initiatives can empower students, boost their self-efficacy, and foster positive attitudes towards loan repayment, leading to better financial outcomes and reduced financial stress among student borrowers.

CONCLUSION

Educational institutions, policymakers, and financial institutions have an important role to play in promoting self-efficacy and positive attitudes towards loan repayment among students. The question of how to pay off student loans has been widely discussed in recent years.[3] Although there is a wealth of data on the origins of loans, different kinds of loans, and the consequences of loans throughout repayment, relatively little data exists on how students feel about their debt. Most students don't understand the full extent of the debt they've incurred to finance their education. [14].Whether discussing how much money they've borrowed or how they plan to pay it back. While attending college, students do not worry about their financial situation. Organisations who want to offer a service that satisfies the demands of borrowers may find the results of this research, particularly those involving the constructions discouraging or boosting students' attitudes, to be essential and valuable.[6] Both academic academics interested in analysing the distinctive qualities of the constructs integrated in this study and experts at management levels, particularly in emerging countries with changing educational financing systems, may profit from this research. The findings may also be used to inform the selection of an appropriate approach for positively influencing students' attitudes, taking into account the plan's anticipated reception.

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PROSPECTS AND PROBLEMS IN MARKETING OF FOOD PRODUCTS; AN EMPIRICAL STUDY

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ABSTRACT

The marketing of food products is a dynamic and intricate endeavor that plays a pivotal role in shaping consumer preferences, driving economic growth, and fostering brand loyalty. In a world characterized by evolving tastes, diverse culinary cultures, and changing consumer behaviors, the strategies employed in the marketing of food products are crucial for success. This essay delves into the multifaceted aspects of food product marketing, examining its key components, challenges, and the strategies that businesses employ to capture the hearts and palates of consumers. In conclusion, the marketing of food products is a multifaceted undertaking that intertwines consumer preferences, branding, innovation, and communication strategies. As the culinary landscape evolves, businesses must adapt to shifting trends while addressing challenges related to health, regulation, and sustainability. Effective food product marketing not only drives sales but also shapes consumer choices and contributes to the larger dialogue about food, culture, and sustainability in today's interconnected world. The marketing of food products is a dynamic and intricate endeavor that plays a pivotal role in shaping consumer preferences, driving economic growth, and fostering brand loyalty. In a world characterized by evolving tastes, diverse culinary cultures, and changing consumer behaviors, the strategies employed in the marketing of food products are crucial for success. This essay delves into the multifaceted aspects of food product marketing, examining its key components, challenges, and the strategies that businesses employ to capture the hearts and palates of consumers.

Keywords: Marketing of Food Products**,** Digital Marketing, Sustainability Ethical Concerns and E-Commerce

INTRODUCTION

India is now ranked as the second largest global producer of food, following China. However, due to its robust food and agricultural industry, India possesses the potential to surpass China and become the leading producer in the world. The Indian bread business holds a prominent position within the processed food industry of the country. Bakery products, such as bread and biscuits, constitute the predominant category of baked goods, comprising more than 82% of the overall production of bakery products within the nation.[2] The country possesses a notable comparative advantage in the manufacturing sector, owing to its ample availability of main ingredients essential for the industry. Additionally, it holds the position of being the third-largest biscuit producing nation globally, trailing only the United States and China. The food processing sector plays a crucial role in mitigating agricultural raw material loss and enhancing the overall value of agricultural products. Additionally, it facilitates the creation of job possibilities and guarantees fair prices for farmers, while simultaneously ensuring cheap costs for consumers. Agriculture serves as a fundamental pillar of the Indian economy, exerting a significant influence on the nation's economic progress. The economic well-being of India is contingent upon the agriculture sector's prosperity. India possesses abundant agricultural raw materials and favourable agro-climatic conditions, rendering it conducive for the cultivation and production of various agricultural commodities. Agricultural products can be categorized into two main types: industrial commodities and consumer goods. The unprocessed agricultural commodities undergo processing in order to enhance their worth. The ultimate customers only utilize the end items subsequent to the agricultural products undergoing various manufacturing operations.[13] The aforementioned agricultural products are commonly referred to as industrial goods in academic discourse. Consumer goods refer to products that are utilised by individuals in their original state, devoid of any alterations or production procedures. Central to effective food product marketing is

a deep understanding of consumer behavior, preferences, and trends. This involves analyzing demographic information, cultural influences, and lifestyle choices to tailor product offerings to specific target audiences

RESEARCH BACKGROUND

The background of the study refers to the contextual information and rationale behind conducting the research. It provides an overview of the problem or issue being investigated, highlighting its significance and relevance within the academic field. In the context of a developing nation such as India, the food processing industry exhibits significant potential for generating employment opportunities by fostering the growth of Small Scale Industries (SSI). The Small Scale Industries (SSI) sector has exhibited a notable level of accomplishment surpassing the predetermined targets in recent years. The small-scale industry sector in India has significant magnitude, encompassing around 3 million small units and engaging a workforce of approximately 24 million individuals. Consumers serve as the ultimate beneficiaries and end-users of processed food products. Consumers play a crucial role in the success of every organisation as they serve as the primary source of revenue. The taste and choice of consumers play a crucial role in determining the success of the sector. Following the phenomenon of globalization, there has been a substantial influx of processed food items into both the Indian. The introduction of overseas products into our market has resulted in a transformation of customers' dietary preferences. The current study aims to uncover the primary determinants influencing consumers' purchasing decisions for processed food products, as well as their perceptions, expectations, and experiences as users of such products.

THE CHALLENGES AND OPPORTUNITIES OF FOOD PROCESSING SECTOR

The food processing sector encounters a range of challenges that shape its operational landscape. Inefficiencies in supply chain management, encompassing inadequate storage, transportation, and cold chain infrastructure, contribute to substantial post-harvest losses. Complex regulatory frameworks, encompassing food safety standards and labeling requirements, pose hurdles for businesses, particularly smaller enterprises, impacting compliance and market access. Maintaining consistent quality across batches of processed foods presents a challenge due to variations in raw materials and processing techniques. Access to reliable and standardized raw materials, alongside skilled labor shortages, further complicate production processes.[1] Navigating these challenges is imperative to ensure the sector's growth, enhance food security, and maximize economic benefits. The food industry is marked by continuous innovation to meet the demands of adventurous and health-conscious consumers. From novel flavors and textures to functional and sustainable ingredients, product development drives differentiation and competitiveness. The visual appeal of food products is critical in capturing consumers' attention. Thoughtful packaging design and branding can evoke emotions, convey product attributes, and create a memorable impression. Pricing strategies should align with perceived value and target market segments. Balancing quality, affordability, and value for money is essential to attract a diverse consumer base. The accessibility of food products is influenced by distribution channels, including supermarkets, convenience stores, and e-commerce platforms.[7] An effective distribution strategy ensures products reach consumers where they shop. Effective promotion involves creating engaging marketing campaigns, utilizing social media platforms, influencer collaborations, and traditional advertising methods to create brand awareness and stimulate consumer interest.

PROSPECTS AND PROBLEMS OF MARKETING OF FOOD PRODUCTS.

The marketing of food products is a complex and dynamic endeavor that involves a multitude of opportunities and challenges. As consumer preferences, technological advancements, and global trends continue to evolve, understanding the prospects and problems in this domain becomes crucial for businesses aiming to thrive in the competitive food industry.

PROSPECTS

1. **Health and Wellness Trends**: The growing emphasis on health and wellness presents a significant opportunity for marketing food products that align with consumers' desire for nutritious and wholesome options. Brands that can effectively communicate the nutritional benefits of their products are likely to attract health-conscious consumers.

2. **Innovative Product Offerings**: With advancements in food science and technology, there are numerous possibilities for creating innovative food products that cater to changing consumer preferences. This includes plant-based and alternative protein products, functional foods, and convenient meal solutions that meet the needs of busy lifestyles.
3. **Digital Marketing and E-Commerce**: The rise of e-commerce platforms and digital marketing channels provides food brands with the ability to reach a wider audience and personalize their marketing strategies. Direct-to-consumer models allow for greater control over branding, customer engagement, and data-driven insights.
4. **Globalization and Cultural Exchange**: As cultural boundaries continue to blur, there is an opportunity to market diverse food products that appeal to a multicultural consumer base. Ethnically diverse cuisine and fusion flavors can attract adventurous eaters looking to explore new culinary experiences.

PROBLEMS

1. **Food Safety and Quality Assurance**: Ensuring the safety and quality of food products is a paramount concern. Any instances of contamination, recalls, or quality issues can severely damage a brand's reputation and consumer trust.
2. **Regulatory Compliance**: The food industry is heavily regulated to ensure consumer safety and fair business practices. Navigating complex regulations, labeling requirements, and compliance standards can be challenging for businesses, especially smaller ones with limited resources.
3. **Sustainability and Ethical Concerns**: Consumers are increasingly demanding transparency and sustainable practices from food brands. Meeting these expectations, such as using environmentally friendly packaging or sourcing ingredients ethically, can pose logistical and cost challenges.
4. **Competition and Saturation**: The food industry is saturated with a wide range of products, making it challenging for new entrants to gain market share. Existing brands also face competition in terms of innovation, pricing, and differentiation.
5. **Changing Consumer Preferences**: Consumer tastes can change rapidly, making it essential for food brands to stay attuned to shifting preferences. Adapting to trends and preferences while maintaining brand identity can be a delicate balancing act.
6. **Supply Chain Disruptions**: Food production relies on complex supply chains that can be vulnerable to disruptions caused by factors like weather events, transportation issues, or global crises (e.g., pandemics).

PROBLEMS ASSOCIATED WITH MARKETING FOOD PRODUCTS

In recent years, several different companies have received considerable negative press coverage for marketing their food goods specifically to women. This is because, despite stereotypes to the contrary, men and women have a lot of the same taste preferences and sensitivities. In fact, the market for healthy food and supplements may be the only one where consumers are willing to buy products that are obviously marketed towards either gender. Regardless, people do not base their decisions to purchase such goods on how they taste or what flavours they may include. Many buyers are particularly sensitive to the "pink tax," the phenomenon by which almost identical products are priced more when marketed towards women rather than men. Producing food items and effectively bringing such things to market requires the development of novel strategies for finding markets. Knowledge of timing, commodities, efficiency, profit, and management are all essential for a successful marketing professional. The customer should understand how the product is made and be able to track its development as it strives for perfection. Understanding the key challenges makes it easier for a seller to grasp the specific market circumstances that have been created and take the necessary marketing measures. Despite having the necessary technological skill to produce amazing things, many firms fail to make it in today's market. Part of the problem is that businesses don't have the right strategy, which should focus on a defined segment of the market, distinct advantages over competitors, and promising growth opportunities. However, people are more open to the explicit marketing of various ingestible things when it comes to nutritional

supplements. This is the only industry where such a strategy may be successful (consider the vitamin, macronutrient, and micronutrient markets). There are a number of reasons why men and women have differing nutritional needs. Keep in mind, too, that the favour and taste of such products have zero bearing on how well they sell. So, although there are real differences between the sexes, it's feasible that these differences can only be used to successfully market to women if they're related to food. In an effort to capitalize on gender differences that do not exist in the realm of taste, we have the following. Glassware and food and drink containers have both been used in marketing campaigns before. The few effective interventions that have been attempted in this field so far seem to have opted for a far more clandestine strategy. To rephrase, whether products, packaging, or drinking vessels have been designed with women in mind, it is up to those buyers to determine for themselves if they will meet their requirements. This article delves further into the generally negative response that many food and drink suppliers have received over the last several years when they have made efforts to cater to the specific tastes of their customers.

SIGNIFICANCE OF THE RESEARCH

When it comes to world food production, India is second only to China. India ranks second globally in the production of seeds, fruits, vegetables, and fish products, but first in the production of milk and dairy products. India is the second biggest consumer in the world and accounts for almost 60 percent of the world's output of perishable fruits and vegetables. Both India's production and consumption potentials are enormous. Considering how quickly trends in customer desire for processed food items may shift, this research would concentrate on the domestic market. Every food factory should make an attempt to learn about the preferences of each individual consumer. This research attempts to assess the food processing facilities by discussing their challenges and potential, as well as the experiences and expectations of the people that patronize them. The research is to identify the challenges encountered by food processing facilities. This information will then be used to help fix issues at food processing facilities. The findings of this research will help policymakers and the government better support the growth of the food processing industry.

PROBLEM STATEMENT

The food processing sector contributes to the conservation of agricultural resources and the enhancement of the economic worth of agricultural output. It creates work opportunities, supports fair pricing for farmers, and keeps costs down for shoppers. The agricultural sector is vital to India's economy and to the country's overall progress. India's economic growth is directly tied to the state of its agriculture sector. India has a favourable agro-climatic environment and access to abundant supplies of agricultural raw resources. Both industrial and consumer commodities make up the agricultural output. Value is added to the agricultural inputs by processing. After agricultural goods go through many stages of production, only the finished products are used by customers. The term "industrial goods" is used to describe this category of agricultural items. Typically, customers utilize consumer products in their unaltered, non-manufactured states. This research, titled "Problems and Prospects of the Food Processing Industry attempts to examine the issues that have arisen in these areas: funding, production, sourcing, marketing, personnel, and overseas sales. The research also intends to look at how these issues have affected the business environment in food processing sector.

OBJECTIVES OF THE STUDY

1. To identify the problems faced by the food processing unit
2. To study prospects and problems of marketing of food products

FINDINGS, DISCUSSION AND CONCLUSION

Problem Faced by the Consumers

It's possible that customers may feel misrepresented by the marketing campaigns. The difficulties shoppers have in acquiring these foodstuffs are also examined. A five-point Likert scale is used to rate the issues, and the Friedman test is used to rank them. This motivates the following conjecture.

Table 1: Problems in Marketing of Food Products

Problems	Mean	Std. Deviation	Mean Rank
Food Safety and Quality Assurance	2.07	1.087	4.87
Regulatory Compliance	2.18	0.872	4.56
Sustainability and Ethical Concerns	2.23	1.314	4.53
Competition and Saturation	2.47	0.841	4.78
Changing Consumer Preferences	2.39	0.729	4.61
Supply Chain Disruptions	2.24	1.258	4.48
Infrastructure and Logistics	2.28	0.696	4.92
Product Development and Innovation	2.65	1.282	4.89

The Table 1 depicts that Infrastructure and Logistics are considered as big problem (4.92). Product Development and Innovation (4.89) and Food Safety and Quality Assurance (4.87) are ranked second and third among the 8 problems considered in the analysis. The significance in the difference in the rank is tested as below.

Table 2: Friedman Test

N	250
Chi-Square	22.198
df	7
Asy. Sig.	0.003

The result from the Friedman test proves a significant result in the ranking. The calculated Chi-Square value (22.198) for the degree of freedom 7 is more than expected value. The value of probability is 0.003 which is less than 0.01. Hence, the framed hypothesis is rejected.

PROBLEMS IN FOOD PROCESSING UNITS

Food processing, an essential bridge between raw agricultural produce and the final consumer product, has revolutionized the way we consume food. By converting raw ingredients into processed goods, these units extend shelf life, enhance taste, and ensure a consistent supply. However, the journey of transforming raw items into palatable delights is riddled with challenges. Let's delve deeper into the pressing problems faced by food processing units and their implications. Perhaps the most significant concern in food processing is ensuring safety and hygiene. Contaminants can find their way into the food at any stage - be it through unclean equipment, human handlers, or tainted raw materials. The repercussions of such contamination can range from minor food poisoning to life-threatening conditions or even fatal outbreaks

Table 3: Problems in food processing units

S.No	Problem	Mean	Rank	t Value	P
1	Supply-side bottlenecks	18.64	5	31.615	0.000*
2	Demand side bottle necks	20.07	2	32.896	0.000*
3	Infra-structure bottlenecks	19.59	3	35.154	0.000*
4	Deficiencies in regulatory environment	21.58	1	31.198	0.000*
5	Customer issues	18.92	4	29.865	0.000*

The table presented above illustrates that the issues pertaining to the food processing facilities are more prevalent across all areas. Among the 25 possible points (5 multiplied by 25), the averages have been determined to be approximately 20 or higher. Therefore, it may be inferred that food processing facilities are facing significant challenges in terms of procuring, processing, and marketing, financing, and managing their personnel. Among the means of the 5 problems, Deficiencies in regulatory environment (21.58) is higher, followed by problem of Demand side bottle necks (20.07). However, the findings of the one-sample t-test indicate that the problem scores exhibit a statistically significant elevation. The observed t values significantly exceed the critical t value of 1.96. Therefore, it may be inferred that the challenges faced by food processing facilities are more prevalent.

DISCUSSION

The food industry is marked by continuous innovation to meet the demands of adventurous and health-conscious consumers. From novel flavors and textures to functional and sustainable ingredients, product development

drives differentiation and competitiveness.[2] The visual appeal of food products is critical in capturing consumers' attention. Thoughtful packaging design and branding can evoke emotions, convey product attributes, and create a memorable impression. Pricing strategies should align with perceived value and target market segments. Balancing quality, affordability, and value for money is essential to attract a diverse consumer base. The accessibility of food products is influenced by distribution channels, including supermarkets, convenience stores, and e-commerce platforms.[8] An effective distribution strategy ensures products reach consumers where they shop. Effective promotion involves creating engaging marketing campaigns, utilizing social media platforms, influencer collaborations, and traditional advertising methods to create brand awareness and stimulate consumer interest.

CONCLUSION

Studying the intricacies of food processing units is of paramount importance, especially in today's globalized economy. The implications of such research are multifold. Firstly, understanding the challenges and efficiencies within these units can lead to better food safety protocols, ensuring the wellbeing of consumers.[12] An in-depth study can also highlight waste management strategies, enabling the industry to move towards more sustainable practices. Furthermore, it aids in identifying technological gaps, fostering innovation, and possibly leading to the development of new processing techniques. Ultimately, rigorous studies of food processing units not only promote industry growth but also bolster public health and environmental sustainability. In conclusion, the marketing of food products presents both promising prospects and daunting challenges. Capitalizing on trends like health consciousness and digitalization can lead to success, but navigating issues such as food safety, regulatory compliance, and competition requires careful planning and strategic execution. Businesses that can effectively address these prospects and problems will be better positioned to thrive in the ever-evolving landscape of food product marketing. As consumers become more health-conscious, marketing food products that align with nutritional requirements can be challenging, especially when addressing the balance between indulgence and healthfulness. Stringent regulations related to labeling, nutritional claims, and allergen information necessitate meticulous adherence to avoid legal issues and maintain consumer trust. Increasing awareness about environmental sustainability and ethical sourcing demands transparency in marketing efforts, necessitating alignment with responsible sourcing and packaging practices.[6] Marketing food products across diverse cultures and regions requires sensitivity to local tastes, preferences, and traditions, often necessitating adaptation and localization of strategies. Engaging narratives about the origin, craftsmanship, or inspiration behind a product can create a strong emotional connection with consumers.

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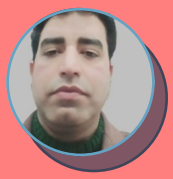
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SUSTAINABLE DEVELOPMENT : A MULTI- DIMENSIONAL PERSPECTIVE

Dr. Dilshad Shaik
Dr. N. Sofia

SUSTAINABLE DEVELOPMENT: A MULTI-DIMENSIONAL PERSPECTIVE

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SUSTAINABLE DEVELOPMENT AND CLIMATE CHANGE

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EMPOWERING WOMEN THROUGH THE WORKPLACE: A STUDY ON MENTAL HEALTH, EMPLOYEE WELLBEING AND HAPPINESS AT THE WORKPLACE

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3D PRINTING: ITS APPLICATIONS IN PEDIATRIC DENTAL PRACTICE

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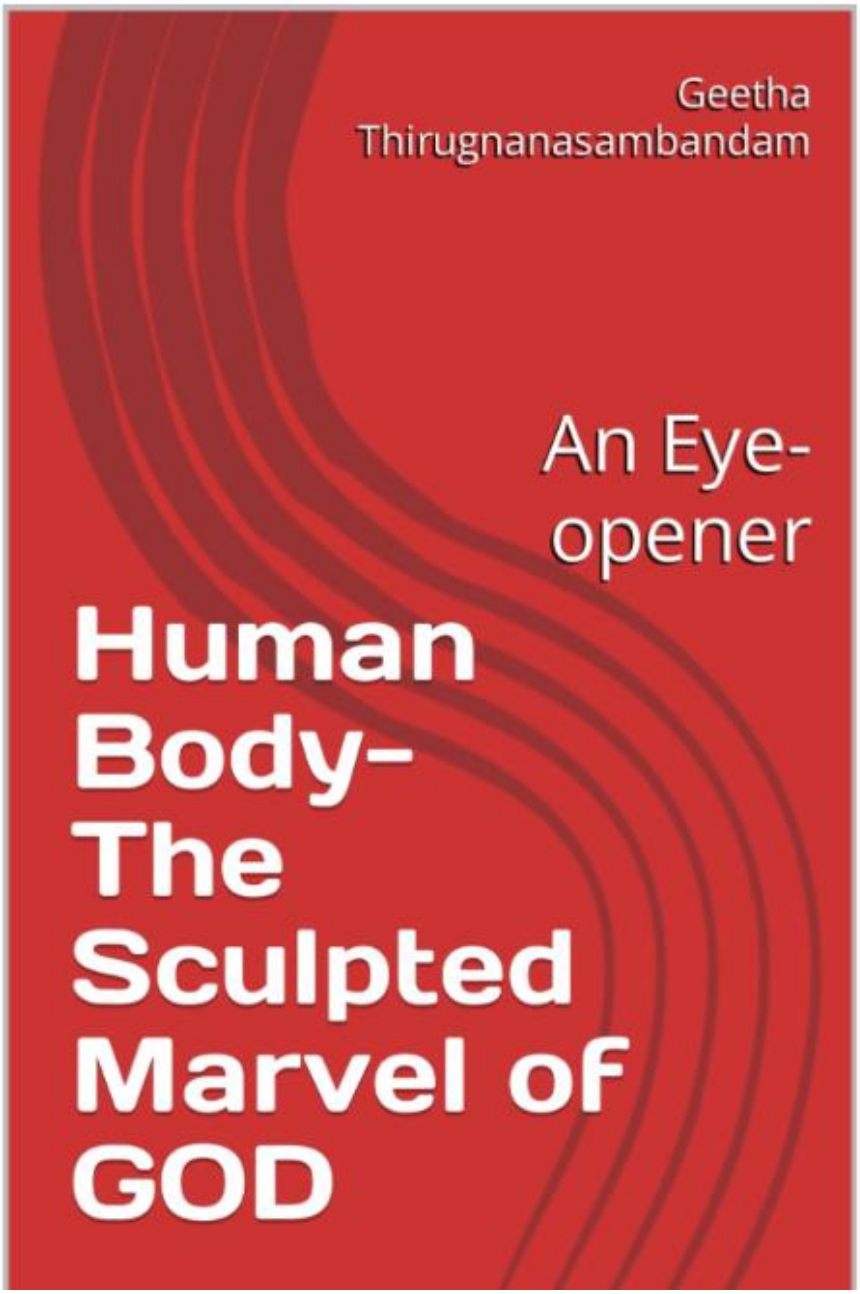
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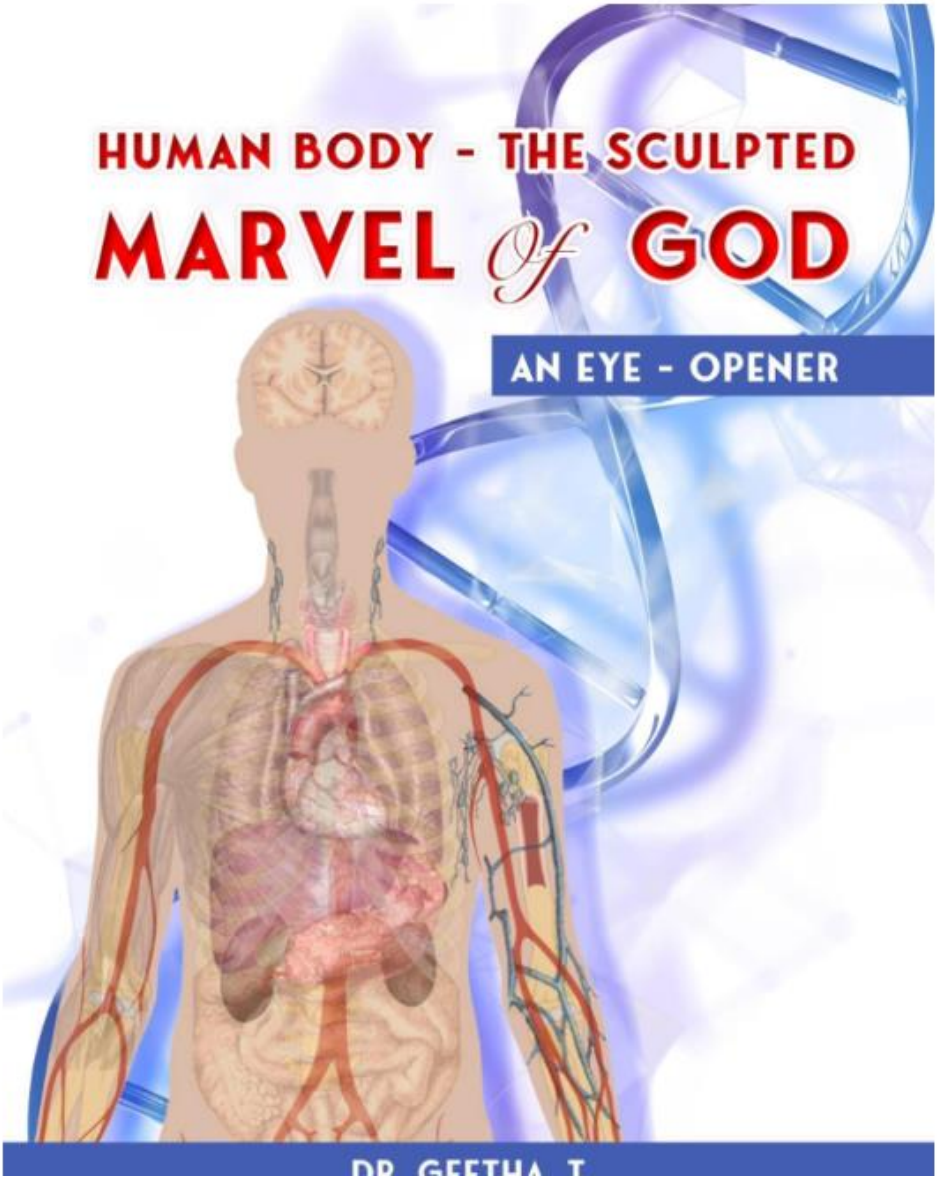
Abstract

Additive manufacturing, which uses digital data for production, has supplanted traditional manufacturing techniques in the digital age. The medical industry was first affected by this manufacturing revolution in the early 20th century.and has since extended its influence to encompass all areas of biomedical and allied healthcare, including dentistry. Additive manufacturing is rapidly emerging as a valuable tool in various branches of dentistry. What sets it apart from traditional formative and subtractive manufacturing methods is that it constructs objects layer by layer through the addition of building materials.
Because of its kid-friendly methodology, 3D printing has becoming more popular in pediatric dentistry, especially when intraoral scanners were introduced. This technology plays a multifaceted role in advancing pediatric dentistry into the digital era, ushering in a new era of customized, child-friendly, and painless holistic dental practices.

Keywords: Additive manufacturing, 3D printing, dentistry, pediatric

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An Eye-opener
Human Body- The Sculpted Marvel of GOD


HUMAN BODY - THE SCULPTED
MARVEL Of GOD
AN EYE - OPENER
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Principles of Biochemistry and Molecular Biology

Principles of Biochemistry and Molecular Biology

Dr. Smriti Khare
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About the Book :

Introducing the book **"Industrial Pharmacy-I"** is something that fills me with an incredible amount of joy. The content of this book has been meticulously crafted to adhere to the curriculum for Bachelor of Pharmacy students that has been outlined by the Pharmacy Council of India. An effort has been made to investigate the topic using terminology that is as straightforward as possible in order to make it more simply digestible for pupils. The book has a number of illustrations, such as flowcharts and diagrams that make it simple for students to comprehend complex ideas. It is the author's honest desire that both students and academicians would take something helpful away from reading this book.

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INDUSTRIAL PHARMACY-I

Dr. Rajkumar M Biradar | Dr. Senthil Rajan Dharmalingam
Dr. Amudha.S. | Prof. (Dr.) Varsha Deva | Prof. Kakasaheb. J. Kore

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A TEXTBOOK OF COSMETIC SCIENCE

Prof. (Dr.) Divya Juyal | Dr. Suneel Kumar Niranjan
Dr. Amudha. S. | Dr. Averineni Ravi Kumar | Dr. Ruchi Tiwari

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Dr. Amudha. S. | Dr. Averineni Ravi Kumar | Dr. Ruchi Tiwari

A Survey-Evaluation of the Nutritional Habits among Students

Y. Ismail [a++*] and V. Vijaya Kumar [b#]

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ABSTRACT

Nutrition refers to the quality &quantity of diet consumed in accordance to the nutritive value of the body. A healthy diet is an appropriate diet which is required to maintain the physical & mental activity. It is an essential component of optimal health. Nutrition education has a significant impact on public consciousness and, as a result, society's health. Nutritional and healthy diet awareness programmes will assist the public in eating a balanced diet. Some researchers found that, most of the students are not aware about the healthy foods, which are essential to our body functioning. The present survey is aimed to evaluate the nutritional habits of the students.

The survey was conducted to the various college students (300 subjects) who have aged between 17-22 years by using a self-administered questionnaire. The questionnaire was mainly related to their nutritional habits like how often they avoid meals, how often they consume a portion of fresh fruits and vegetables, and how much fat.

300 subjects in a total were involved in the study, among them 195(65%) were females and 105(35%) were males. It was observed that, 112 (37.33%) skipped their breakfast, 65(21.66%) skipped their Lunch and 123(41.00%) skipped their dinner. According to O'Dea in 2005, avoiding of meals specifically breakfast, disturb the body's metabolism and leads to diabetes. In this study 245(81.66%) of subjects usually eat different kinds of vegetables but few students 55(18.33%) among them eat fruits in each week. A majority of 231(77.00%) students opted for high-fat diet.

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Keywords: Nutritional habits; students; well balanced diet; improper nutritional effects.

1. INTRODUCTION

One of the most essential practical aspects is nutrition education. It has a significant impact on public consciousness and, as a result, society's health. Dietary balance and nutrition awareness camps will assist the general people in eating a healthy diet. Other studies, on the other hand, have indicated that most students are unaware of the healthy nutrients that their bodies require in various conditions, necessitating nutrition programmes. Majority of people have a custom of consuming quite so much more carbohydrate-rich foods and a shortage of protein-rich foods, resulting in an imbalanced diet. A well-balanced diet is a way of getting all the nutrients to our body, which contributes bones and skin that are in good shape, hair and levels of energy and lowers the possibility of malnutrition and anemia caused by iron deficiency [1-3]. Due to insufficient nutrition, people are more susceptible to disease, infection, weariness, and poor performance. The purpose of this study was to learn more about college students' eating habits. Nutrition refers to the amount of food consumed in accordance to the body's nutritional requirements [4-6]. An appropriate, well-balanced diet paired with frequent physical activity constitutes good nutrition. It is an important aspect of good health. Reduced immunity, higher vulnerability to disease, impaired physical and mental development, and decreased productivity can all result from poor nutrition. Many of us have a habit of consuming too many carbohydrate-rich foods and not enough protein-rich foods, resulting in an imbalanced diet [7-9]. Important socioeconomic changes in most industrialized countries have had an undeniable impact on residents' food patterns and levels of physical exercise in recent decades [10,11]. This trend is exemplified by the current rise in illnesses directly or indirectly linked to the growth in overweight and obesity. A lack of physical activity and a poor diet have been identified as key risk factors for a number of diseases. Several studies have found that any type of physical activity reduces the incidence of coronary heart disease, stroke, and a variety of metabolic diseases like hypertension and diabetes, as well as increasing patient quality of life [12,13]. From this survey, it was evaluated that most of teenager students have poor nutritional habits; this is due to a lack of knowledge about a healthy diet and their hectic schedules. This may be minimized if they were made more conscious of their eating habits. It is critical to eat a healthy diet in order to lower the chance of developing diseases in the future and to improve nutrition.

2. MATERIALS AND METHODS

The survey used a self-administered questionnaire to examine the nutritional condition of college students. This was done so that the participants could evaluate the nutritional value of their food. The poll was conducted among 300 people in various locations in Addanki, Prakasam district, Andhra Pradesh. The poll was done among people aged 17 to 22 years old, and the findings were estimated. Subjects were given a consent form to sign. The survey asked people about their eating habits, such as how often they skip meals, how often they eat

a portion of vegetables and fruits, and how much fats, sweets, starchy foods, salt, drinks, and alcohol they consume.

Table 1. Data pertains to nutritional habits among students

S. No	Parameter		Number	Percentage (%)
1	Subjects are divided into two groups based on their gender. (n=300)	Total	300	100.00
		Male	105	35.00
		Female	195	65.00
2	How frequently do they skip breakfast, lunch, and dinner? (n=300)	Breakfast	112	37.33
		Lunch	65	21.67
		Dinner	123	41.00
3	Fruits & Vegetables and how frequently they are included in their meals (n=300)	Fruits & vegetables	215	71.67
		Fruits	30	10.00
		Vegetables	55	18.33
4	Subjects were divided into groups based on their fat consumption habits. (n=300)	High fat	231	77.00
		Steamed food	34	11.33
		Meat with removed fat	35	11.67
5	Subjects were divided into groups based on their preference for starchy foods. (n=300)	Starchy food	268	89.33
		Whole grain cereals	32	10.67
6	Subjects were divided into groups based on their sugar consuming habits. (n=300)	Sweet drinks	228	76.00
		Choclates, cakes, biscuits	72	24.00

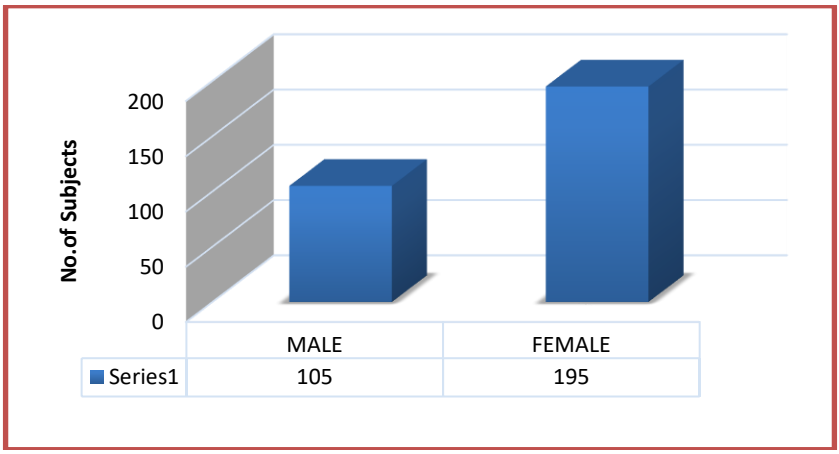


Fig. 1. Subjects according to their Genders

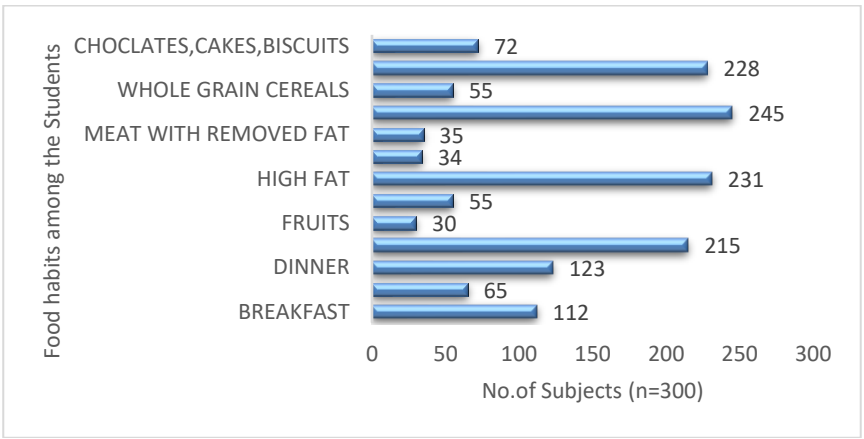


Fig. 2. Subjects with their food habits

3. RESULTS AND DISCUSSION

A total of 300 people took part in the study. Female participants accounted for 195 (65%) of the total, while male participants accounted for 105 (35 %). Out of 300 students, 160 students (37.33 %) skipped their breakfast, 123 students (41%) skipped their supper, 65 students (21.67 %) skipped their lunch on a regular basis, according to the findings of the current study. Skipping meals, particularly breakfast, throws off the body's metabolism and puts you at risk for diabetes.it was discovered that 11% of men and 23 % of women decline to have breakfast According to a study conducted by O'Dea in 2005 on teaching tactics

for improving body image and preventing eating disorders, 85 percent of men and 87 percent of women who are overweight decide to lose weight by going on a diet. It was also stated that students lacked the requisite knowledge and training in the areas of weight control, nutrition, and diet. In this study, 215 (71.67%) of individuals eat different types of vegetables &fruits on a weekly basis, yet only 30 (10.00%) of them eat fruits and 55 students (18.33%) only eat vegetables daily basis. A daily intake of at least 4 servings of fruits and vegetables can assist to lower the risk of coronary heart disease. In this study, 231 people (77.00%) choose a high-fat diet. In general, consuming too much fat may increase the risk of coronary heart disease.34 students (11.33 percent) picked steaming food over fiber food. Fiber, on the other hand, aids digestion and avoids intestinal issues such as constipation. 35 students (11.67 %) picked meat with removed fat. High blood cholesterol levels, which are linked to poor dietary habits, are linked to atherosclerosis, it has a has early warning signs that appear in childhood and adolescence.

Carbohydrates, which are found in starch meals, offer energy. According to this, 245 students (81.67%) chose starch-rich diets whereas 55 students (18.33%) chose whole grain cereals. There are several types of starches as well. Some foods are quickly digested, while others are eaten slowly and ferment in your digestive tract, promoting good gut bacteria. Refined white flour, white rice, and white potatoes are examples of quickly digested starch. While a high-processed-grain diet has been linked to health problems including obesity and inflammation, whole grains have the opposite effect. Consuming whole grains, on the other hand, has been associated to a reduced risk of diabetes, heart disease, and high blood pressure, among other things.

228 students (76 %) choose sugary foods and drinks such as soft drinks, which usually contains high synthetic sweetening agents have been linked to an elevated risk of diabetes. Sugary foods should be consumed mostly at mealtimes rather than in between meals to help prevent tooth decay. Taking proper diet is very much essential to reduce the risk of diseases in future and improve nourishment.

4. CONCLUSION

A well-balanced diet provides the body with the nutrients it requires to function effectively. To gain the correct nourishment from our food, we must consume big amounts of fresh fruits, vegetables, whole grains, and other whole grains. According to our data, the majority of students pick junk food due to their hectic schedules, which leads to obesity and an increased risk of coronary heart disease. Most students miss meals on a regular basis, which can disrupt body metabolism and raise the risk of diabetes in the future. Females are more likely to be malnourished due to their abstinence in eating habits in order to retain physical beauty. Finally, students do not maintain good nutritional habits due to a lack of information about diet. This can be mitigated by raising people's awareness to a minimum. It is critical to eat a healthy diet in order to lower the chance of developing diseases in the future and to improve nutrition.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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A REVIEW ON DIETARY SUGGESTIONS DURING COVID-19

Abstract

The review focused on the plant based foods for enhancing the immunity of all age groups against COVID-19. The world Health Organization (WHO) declared the COVID-19 as global pandemic, while thousands of infections and deaths are reported daily. This review provides insights about the properties of bioactive ingredients of foods and herbs for the support of the human immune system. There are a lot of traditional food items which can increase the immunity with an additional benefit of some antiviral properties. Dietary supplementation with vitamins C and D, as well as various minerals like zinc and selenium, was highlighted as potentially beneficial for individuals with, or at risk of, respiratory viral infections or for those in whom nutrient deficiency is detected. By the use of food rich in vitamins like C, D and E and bioactive ingredients like Turmeric, Ginger, Cinnamon, Garlic, Neem, Amla and probiotic yoghurt and minerals like zinc and magnesium these foods may increase immunity to control of COVID-19. In conclusion the plant-based products play a vital role to improve the immunity against COVID-19.

Keywords: COVID-19, Dietary requirement, Immunity modifiers & Vitamins

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I. INTRODUCTION

Human body have both innate immunity and acquired immunity. This immunity will fight against the foreign organisms like bacteria, virus and other microbes and save us from getting sick. When our immune system fails to fight against foreign organisms then it leads to disease conditions. People with weak immune system will easily get attacked by Corona virus (COVID 19) infection.[2] World Health Organization (WHO) declared COVID 19 as pandemic as it has been spreading to most of the countries through the World.[1] The effect of COVID 19 is severe in children and old aged people, which may cause death.[2] COVID 19 is caused by SARS Cov 2. COVID 19 was first observed in December 2019. After infected with COVID 19 the flu like symptoms starts with in 5 to 6 days and in some cases it may takes up to 14 days and other symptoms like sore throat, cough, shortness of breath, fever, body pains are observed.[20] As the is no cure and no vaccine exist to this COVID 19 we have to concentrate on immune booster died. There are some foods which can boost the immune system capacity and helps to fight against virus. In order to keep our mucous membranes moist and low body temperature drink plenty of water.[2] In the following review there discussed about some immune booster diets and their use in the time of COVID 19 pandemic. There are some foods like Curcumin, Papaya, Mushrooms, Cereals, Sunflower seeds, Almonds etc., which are rich in Vitamins. Vitamins may act as anti-oxidants which relieve oxidative stress from Reactive Oxygen Species (ROS).[1]

II. VITAMIN C

Vitamin C can be used for improving immunity in all age groups including kids and elderly people. This immunity is majorly acquired by neutrophils.[1] Generally vitamin C is majorly found in fruits and vegetables like papaya, kiwi, guava, oranges, spinach, mushrooms, beetroots etc.[2] Since spirulina and curcumin are rich in some minerals and vitamin C it is suggested to be consumed by elderly people.[3] Vitamin C deficiency causes Scurvy. During infections the activation of phagocytes leads to release of oxidizing agents also known as reactive oxygen species(ROS) which deactivates or destroy the viruses and bacteria.[5] Many ROS cause damage to host cells which play major role in pathogenesis to infections.[4] As vitamin C is antioxidant in nature, during oxidative stress effect of vitamin C may become prominent.[4] It also helps the immune system to stimulate the formation of antibodies.

III. VITAMIN D

The skin or skin layers contain pre-vitamin D_3 (7-dehydrocholesterol) which is converted to vitamin D_3 (cholecalciferol) upon exposure to UVB radiation in sunlight then this vitamin D_3 and dietary D_3 and D_2 (ergocalciferol) in liver converted to 25-hydroxyvitamin D_3 (calcitriol) and then through kidney and other organs it is get converted to 1,25-Dihydroxyvitamin D_3 (calcitriol).[2] Vitamin D plays a powerful role as immunomodulator.[1] Immune cells like T and B lymphocytes, monocytes, macrophages express the vitamin D receptors and also found that these cells may convert 25-hydroxyvitamin D_3 to 1,25-Dihydroxyvitamin D_3.[6] Monocytes and macrophages in the respiratory endothelial cells also express vitamin D receptors which have potential role in protecting patients with viral infections to respiratory tract.[1] A rhinovirus infected epithelial cells of bronchi with exogenous vitamin D shows implement in Antiviral defence by

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rhinovirus induced interferon stimulated genes.[7] Vitamin D supplementation improves the protective effects in patients with acute respiratory tract infections.[1] Fortified cereals and natural sunlight are some sources of vitamin D.

IV. VITAMIN E

In elderly people it was found that vitamin E is essential nutrient. It helps in maintaining immunity and overall health and can protect from various bacterial and viral infections as it is a powerful antioxidant.[2] In order to get the daily dose of vitamin E one should have to consume sunflower seeds. Soaked almond, peanut butter.[2] Lipoproteins and poly unsaturated fats in plasma membranes are protected by vitamin E majorly acts as radical peroxyl scavenger.[8] F_2 isoproston promote oxidative lipid destruction by producing free radical and b supplementation of vitamin E it was found that emission of free radicals decreased. Vitamin E supplementation raises tocopherol levels in plasma but have no effect on athletic muscle damage.[2]

V. VITAMIN A

It helps in regulating the immune system and provide protection against infection by proper maintenance of health of tissues. Generally, vitamin A is richly found in carrots, broccoli, red bell peppers, sweet potatoes.[9]

VI. ZINC AND MAGNESIUM

Due to presence of immunomodulatory effect to zinc it has a role in treatment of COVID-19. Combination of Zn^{2+} cations with Zn ionosphere pyrithione result in inhibition of SARS-Coronavirus RNA polymerase enzyme activity by reducing its replication. [10]

Magnesium is and electrolyte which helps in strengthening the lymphocytes and natural killer cells of our immune system. Magnesium acts as major source in generation of adenosine triphosphate (ATP) which is considered as energy to cells.[2] Whole grains, black beans, dark chocolate are some foods that are rich in magnesium.

VII. TURMERIC

Curcumin is a bioactive compound present in the turmeric acts as an anti-inflammatory agent.[11] Turmeric plus ginger acts as anti-inflammatory plus digestion. Turmeric plus mushroom acts as anti-inflammatory plus immunity. Turmeric plus ashwagandha acts as anti-inflammatory plus stress relief. Curcumin is being recognized and used worldwide in many different forms for multiple potential health benifits.[12] For example, in India turmeric containing curcumin has been used in curie. The anti-inflammatory and antioxidant properties of curcumin help as best benefits for COVID-19.

VIII. GINGER

The health promoting prospective of ginger are well known. It can treat a wide range of diseases via immune-nutrition and anti-inflammatory responses.[13] Gingerol is an important compound in ginger, gingerol acts as antiviral and anti-inflammatory.[14] In the time of these

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COVID-19 pandemic consume ginger in the form of ginger water, ginger tea, lemon ginger will help a lot to people.

IX. CINNAMON

Cinnamon acts as strong immune booster because it has medical properties like antibacterial, antioxidants, anti-inflammatory and helps to reduce the infections and makes a strong Immunity.[15] In addition to its proven ability to regulate blood pressure, cinnamon may also protect the body against coronavirus. You can simply soak cinnamon stick in water overnight a drink it in the next day morning.[16] Consume it as in cinnamon tea, cinnamon water, smoothie and sprinkle it in a breakfast cereal.

X. GARLIC

Garlic boosts immune power and helps in reducing stress. Garlic is a functional food well known for its immune modulatory, anti-inflammatory, ant mutagenic, anti-tumor properties.[17] Garlic maybe an acceptable preventive measure against COVID 19 infection to boost immune system cells.

XI. NEEM

Neem boosts the immune system and also lowers the risk of cancer and cardiovascular diseases. Neem has properties like antibacterial and antiviral properties purifying and cleaning the blood of harmful toxins and boosts immune system.[18]

XII. YOGHURT

Probiotic in yoghurt useful to control the respiratory infections Probiotic in yoghurt will lessen the impact of respiratory infections caused by the corona virus.[19]

XIII. CONCLUSION

Exploring and analysing origins of immunity reveals evolutionary and developmental ties to diet and nutrition foods are capable of influencing immune system function. Now a day due to these COVID-19, the global pandemic the people with low immune system were affected a lot. The foods which contains the bioactive ingredients like Turmeric which contains the curcumin as a bioactive compound acts as antiviral and anti-inflammatory agent, infection the gingerol acts as antiviral and anti-inflammatory agent, Cinnamon acts as strong immune booster because it has medical properties like antibacterial, antioxidant and anti-inflammatory activities, Garlic acts as immune modulator, antimicrobial, anti-inflammatory, anti-tumor properties, Black pepper has piperine acts as antioxidant and anti-bacterial, Neem boosts the immune system, Amla increases the body’s white blood cells. The probiotic (cohort) useful to control the respiratory problems and also various vitamins like C, D, E improve immunity. By the end we have to conclude that, the plant based foods play a vital role to enhance the immunity of people to control of COVID-19.

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3.4.6 Number of books and chapters in edited volumes published per teacher during the year

S. No	Name of the teacher	Title of the book/chapters published	Title of the paper	ISBN/ISSN number of the proceeding	Page No
1	Dr. James John	Human and Animal Microbiome Engineering	Oral Microbiome and Human Health	9780443223488	2
2	Dr. Gayathri. P	Protocols for Cyanobacteria Sampling and Detection of Cyanotoxin	Isolation of Toxin-Producing Cyanobacteria from Aquatic Samples with Nostoc sp.	978-981-99-4513-9/ 978-981-99-4514-6	3

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CHAPTER

8

Oral microbiome and human health

c0008 [AU1] [AU2] [AU3] [AU4] [AU5]

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s0010 1. Introduction

p0010 Oral microflora, oral microbiota, and more recently, oral microbiome are terms used to describe the bacteria that inhabit the human oral cavity. Joshua Lederberg created the word "microbiome" "to signify the ecological community of commensal, symbiotic, and pathogenic microorganisms that literally share our body space and have been all but ignored as determinants of health and disease". The Human Microbiome Project and researchers who feel it is impossible to completely comprehend the collective microbiome/human "superorganism" without first comprehending human health and disease have embraced the term microbiome. This article outlines how oral microbiota affect human health.

p0015 The Dutchman Antony van Leeuwenhoek was the first to identify the oral microbiota using a custom-built microscope. He informed the British Royal Society in the latter half of the 1670s that plaque on tooth surfaces included a variety of bacteria. He was incredibly interested by the kineticism of the microbiome and made this observation at a period before bacteriology was well established. Although he did not specifically mention it in his paper, he understood that individual variances in the oral microbiota affected the health of the oral cavity. Sadly, it would take another 200 years for us to come up with a comprehensive theory that explained how the oral microbiota and disease are connected.

p0020 In a little lab in Berlin in the late 19th century, the American dentist W.D. Miller researched the connection between oral microorganisms and oral illnesses. R. Koch, who at roughly the same time had been revealing cutting-edge findings in investigations of the connection between germs and infectious diseases, served as his inspiration. The "chemicoparasitic theory" was put forth by Miller in his book *The Microorganisms in the Human Mouth*. This theory claimed that acid produced by oral microorganisms from sugar in diet was the primary

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Isolation of Toxin Producing Cyanobacteria from Aquatic Samples with *Nostoc* sp.

13

Rajasekar Thirunavukkarasu, P. Gayathri, and V. Jeyanthi

Abstract

Cyanotoxins are secondary metabolites produced by cyanobacteria, a group of photosynthetic prokaryotes that are mostly found in freshwater. Cyanobacteria form the algae blooms in the aquatic ecosystems and potential release of cyanotoxins. Bioaccumulate toxins and spread them up the food chain to people and other animals, toxins pose a new threat to aquatic life. Cyanotoxin poisoning is most frequently transported on by consuming contaminated water by human. Hepatotoxins known as microcystins (MCs) are widely distributed. The most dangerous toxins are found in water supplies. Several cyanobacterial genera, including Microcystis, Anabaena, Nostoc, and Planktothrix, were found to produce MCs. In the present aim to isolation of toxin producing *Nostoc sp.* from aquatic samples with using molecular studies.

Keywords

Nostoc · Cytotoxin · Microcystins

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"SOUNDS OF CINEMA: A COMPREHENSIVE STUDY ON THE INFLUENCE OF TAMIL FILM MUSIC GENRES AMONG CHENNAI'S MUSIC ENTHUSIASTS"

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ABSTRACT:

Tamil cinema music encompasses a wide range of musical genres. From classical compositions that infuse Indian ragas and rhythm patterns to contemporary sounds incorporating Western elements, Tamil film music is incredibly diverse. Songs often span genres like classical, folk, Western pop, and hip-hop, catering to a broad audience. Tamil cinema, renowned for its vibrant musical traditions, has consistently captivated audiences with a diverse range of music genres. This research paper, titled "Sounds of Cinema: A Comprehensive Study on the Influence of Tamil Film Music Genres among Chennai's Music Enthusiasts," delves into the profound impact of Tamil film music genres on the discerning listeners of Chennai. The study employs a comprehensive approach, combining surveys and interviews to explore the preferences and influences of music enthusiasts in Chennai, a city known as the heartland of Tamil cinema. It examines the evolution of music genres in Tamil cinema and their historical significance, tracing their journey from the golden era of M.S. Viswanathan and Ilaiyaraaja to the contemporary compositions of A.R. Rahman. Through an extensive survey, this research paper investigates the preferred music genres among Chennai's music enthusiasts, shedding light on how these genres affect their emotional experiences and cultural connections. The paper also explores the role of lyrics, instrumentation, and cultural relevance in shaping the influence of Tamil film music. The findings of this study provide valuable insights into the dynamic interplay between music and culture, emphasizing the enduring significance of Tamil film music in the lives of Chennai's music connoisseurs and its role in shaping the cultural landscape of the region. This research contributes to a deeper understanding of the enduring legacy of Tamil cinema music, transcending time and borders.

1. INTRODUCTION:

Tamil music, often known as "Isai" or "Isai Thamizh," which bears witness to centuries of artistic history and has a strong relationship to the heritage of the Tamil-speaking people, is a rich tapestry woven into the cultural fabric of South India. Tamil music has evolved over time, evolving and adapting to the shifting socio-cultural

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25

TRADITIONAL FOLK FORMS OF MEDIA IN TAMIL NADU: AN EXPLORATION OF YOUTH ENGAGEMENT IN VILLUPURAM DISTRICT

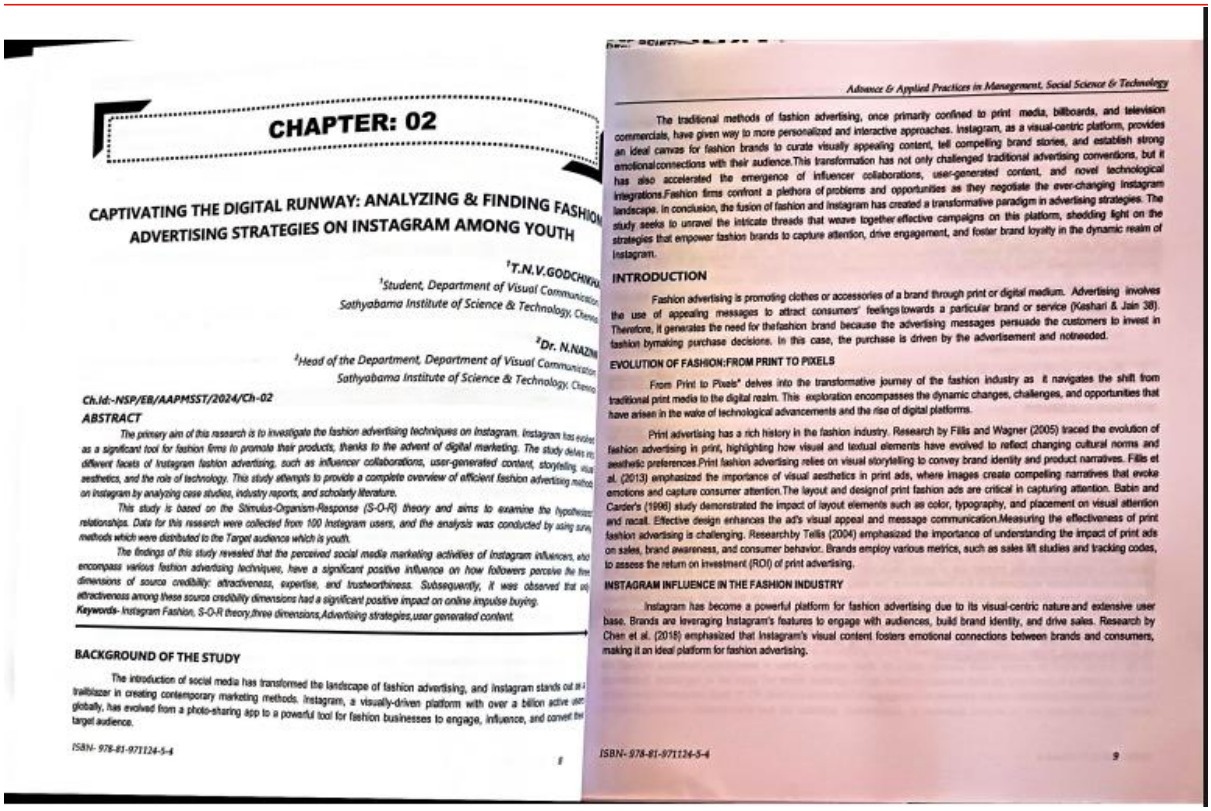
R. Sriram
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Introduction

In recent years, traditional folk media has been overshadowed by modern communication technologies. Despite this, traditional folk media remains a vital component of cultural expression and serves as an important link to the past. In particular, traditional folk forms provide insights into the history and heritage of a region, and reflect the beliefs, customs, and traditions of a community. This study aims to investigate the attraction and cultural significance of traditional folk media among contemporary youth, specifically college students in Villupuram, Tamil Nadu. The study seeks to understand the popularity of various folk forms, and the efforts made by institutions and folk artists to promote and revive traditional folk culture. The study is significant because it provides insights into the relevance of traditional folk media in the 21st century, when advanced mass communication technologies dominate. Additionally, the study sheds light on the efforts to preserve and promote traditional folk culture in the region, and highlights the role of institutions and artists in this process.

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CHAPTER: 02

CAPTIVATING THE DIGITAL RUNWAY: ANALYZING & FINDING FASHION ADVERTISING STRATEGIES ON INSTAGRAM AMONG YOUTH

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ABSTRACT

The primary aim of this research is to investigate the fashion advertising techniques on Instagram. Instagram has evolve as a significant tool for fashion firms to promote their products, thanks to the advent of digital marketing. The study delves in different facets of Instagram fashion advertising, such as influencer collaborations, user-generated content, storytelling, visu aesthetics, and the role of technology. This study attempts to provide a complete overview of efficient fashion advertising method on Instagram by analyzing case studies, industry reports, and scholarly literature.

This study is based on the Stimulus-Organism-Response (S-O-R) theory and aims to examine the hypothesize relationships. Data for this research were collected from 100 Instagram users, and the analysis was conducted by using surve methods which were distributed to the Target audience which is youth.

The findings of this study revealed that the perceived social media marketing activities of Instagram influencers, whic encompass various fashion advertising techniques, have a significant positive influence on how followers perceive the three dimensions of source credibility: attractiveness, expertise, and trustworthiness. Subsequently, it was observed that vis attractiveness among these source credibility dimensions had a significant positive impact on online impulse buying.

Keywords- Instagram Fashion, S-O-R theory,three dimensions,Advertising strategies,user generated content.

BACKGROUND OF THE STUDY

The introduction of social media has transformed the landscape of fashion advertising, and Instagram stands out as a trailblazer in creating contemporary marketing methods. Instagram, a visually-driven platform with over a billion active user globally, has evolved from a photo-sharing app to a powerful tool for fashion businesses to engage, influence, and connect the target audience.

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The traditional methods of fashion advertising, once primarily confined to print media, billboards, and television commercials, have given way to more personalized and interactive approaches. Instagram, as a visual-centric platform, provides an ideal canvas for fashion brands to curate visually appealing content, tell compelling brand stories, and establish strong emotional connections with their audience.This transformation has not only challenged traditional advertising conventions, but it has also accelerated the emergence of influencer collaborations, user-generated content, and novel technological integrations.Fashion firms confront a plethora of problems and opportunities as they negotiate the ever-changing Instagram landscape. In conclusion, the fusion of fashion and Instagram has created a transformative paradigm in advertising strategies. The study seeks to unravel the intricate threads that weave together effective campaigns on this platform, shedding light on the strategies that empower fashion brands to capture attention, drive engagement, and foster brand loyalty in the dynamic realm of Instagram.

INTRODUCTION

Fashion advertising is promoting clothes or accessories of a brand through print or digital medium. Advertising involves the use of appealing messages to attract consumers' feelings towards a particular brand or service (Keshari & Jain 38). Therefore, it generates the need for thefashion brand because the advertising messages persuade the customers to invest in fashion bymaking purchase decisions. In this case, the purchase is driven by the advertisement and notneeded.

EVOLUTION OF FASHION:FROM PRINT TO PIXELS

From Print to Pixels" delves into the transformative journey of the fashion industry as it navigates the shift from traditional print media to the digital realm. This exploration encompasses the dynamic changes, challenges, and opportunities that have arisen in the wake of technological advancements and the rise of digital platforms.

Print advertising has a rich history in the fashion industry. Research by Fills and Wagner (2005) traced the evolution of fashion advertising in print, highlighting how visual and textual elements have evolved to reflect changing cultural norms and aesthetic preferences.Print fashion advertising relies on visual storytelling to convey brand identity and product narratives. Fills et al. (2013) emphasized the importance of visual aesthetics in print ads, where images create compelling narratives that evoke emotions and capture consumer attention.The layout and designof print fashion ads are critical in capturing attention. Babin and Carder's (1996) study demonstrated the impact of layout elements such as color, typography, and placement on visual attention and recall. Effective design enhances the ad's visual appeal and message communication.Measuring the effectiveness of print fashion advertising is challenging. Researchby Tellis (2004) emphasized the importance of understanding the impact of print ads on sales, brand awareness, and consumer behavior. Brands employ various metrics, such as sales lift studies and tracking codes, to assess the return on investment (ROI) of print advertising.

INSTAGRAM INFLUENCE IN THE FASHION INDUSTRY

Instagram has become a powerful platform for fashion advertising due to its visual-centric nature and extensive user base. Brands are leveraging Instagram's features to engage with audiences, build brand identity, and drive sales. Research by Chen et al. (2018) emphasized that Instagram's visual content fosters emotional connections between brands and consumers, making it an ideal platform for fashion advertising.

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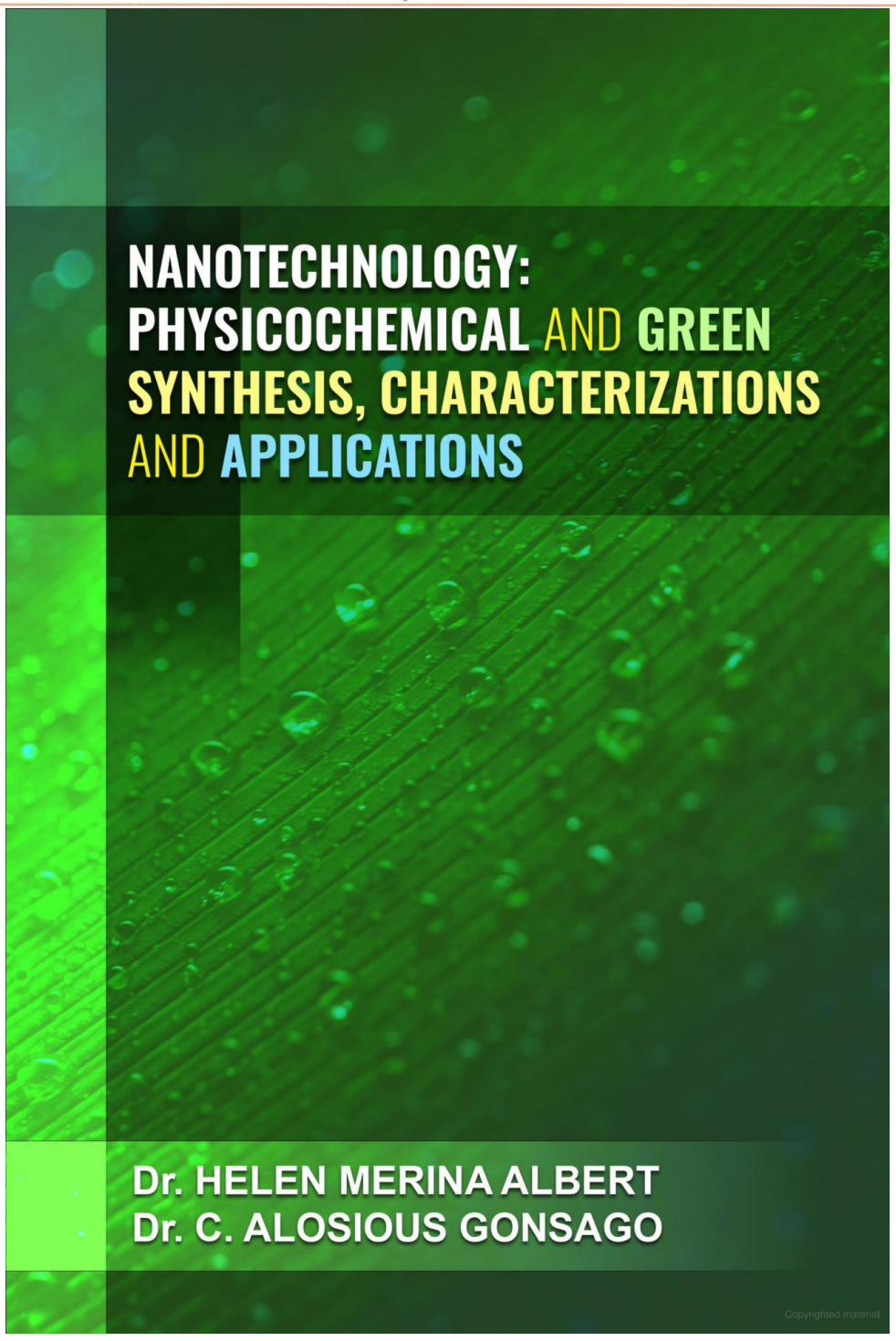
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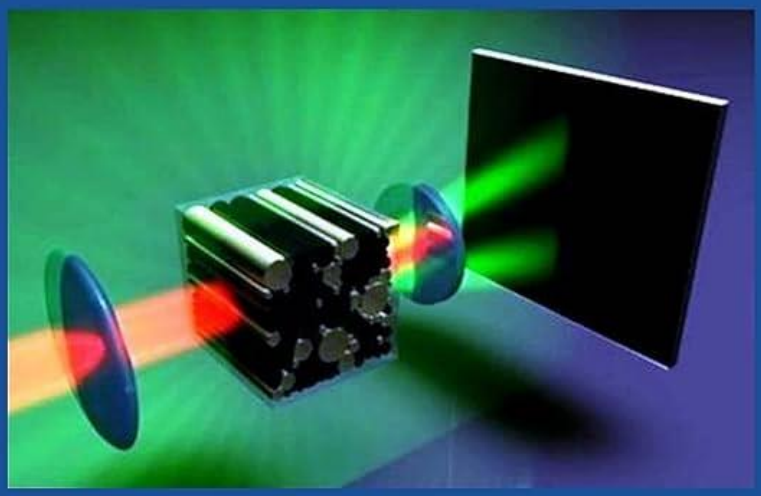
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GROWTH ASPECTS OF NONLINEAR OPTICAL CRYSTALS AND CHARACTERIZATION TECHNIQUES



Dr. HELEN MERINA ALBERT
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This book serves as an introduction to the growth phenomena, specifics of growth processes, nonlinear optical phenomena, and characterization methods that are being used for the analysis. The book is divided into three chapters: The first chapter focuses on the experimental techniques of crystal growth. The optimization methods for growing high-quality single crystals are thoroughly presented. The benefits and drawbacks of methods of growth are reviewed. The second chapter explains the theory of nonlinear optical phenomena. The selection criteria for nonlinear optical materials are reviewed. The history of nonlinear optics and the various types of nonlinear optical materials are discussed. The role of amino acids in the formation of nonlinear optical crystals is well explained. The third chapter discusses characterization procedures that are essential in determining the quality of crystals.



Dr. Helen Merina Albert has been a professor in the Department of Physics at the Sathyabama Institute of Science and Technology, Chennai, India, since August 1995 to date. She obtained her Ph.D. degree from Anna University, Chennai, in December 2008. She has published more than 35 research papers.

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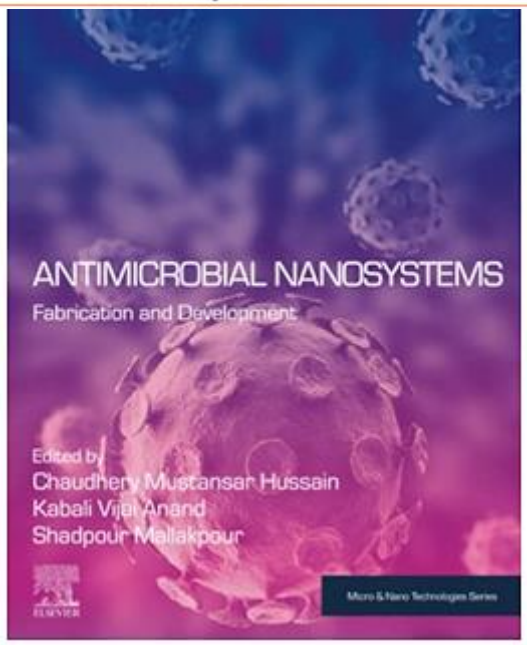
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32 **Detection of Cyanotoxins Using Bacterial Bioassays** 227
Thenmozhli Geetha Saravanan, Kishore Kumar Annamalai, Abirami Baskaran, Ranjani Singaraj, Radhakrishnan Manikkam, and Manigundan Kaari

33 **Detection of Cyanotoxins: Bioassay Using Plants** 233
Neelam Mishra and Sheetal Gupta

34 **In Vitro Assay for Determining Cyanotoxin Using Serological Methods** 243
Sakshi R. Varshney, V. Z. Misbah Rehman, and Lokesh Ravi

35 **In Vitro Assay for Determining Cyanotoxin Using Cell Line Method: Hepatotoxicity (Cell Lines—HepG2, Caco-2, and V79)** . . . 253
H. A. S. N. Abeysiri, K. T. Dilrukshi, S. A. Kulasooriya, and P. M. Manage

36 **In Vitro Assay for Determining Cyanotoxin Using Cell Line Method: Neurotoxicity (Neuro-2a Neuroblastoma Cell)** 259
M. Haripriyaa and K. Suthindhiran

37 **Genotoxicity of Cyanotoxins** 265
H. D. D. Sadeepa, K. R. V. Bandara, G. Y. Liyanage, P. M. Manage, and S. A. Kulasooriya

38 **In Silico Analysis of Cyanotoxin Using Computational Tools** 273
Santhiya Panchalingam, Govindaraju Kasivelu, and Raja Muthuramalingam Thangavelu

Part III Cyanobacterial Toxin Extraction, Detection and Quantification

39 **Extraction of Cyanotoxins Using Filtration and Other Methods** . . . 285
K. P. A. Imanthi, P. A. B. P. Abeyrathne, P. A. K. C. Wijerathna, G. Y. Liyanage, P. M. Manage, and S. A. Kulasooriya

40 **Extraction of Cyanotoxins by Filtration and Other Methods from Biological Materials (Animal Tissue: Fish and Mussels)** 295
Milena Bruno, Valentina Messineo, Ilaria Di Marco Pisciottano, and Pasquale Gallo

41 **Extraction and Quantification of Nodularins from Fish Samples by LC-MS/MS** 303
Guhanraj Radhamanalan and D. Dhanasekaran

42 **Extraction and Quantification of Nodularins from Shrimp Samples by ELISA** 309
Guhanraj Radhamanalan and D. Dhanasekaran

43 **Extraction and Quantification of Cylindrospermopsins from Aquatic Samples by ELISA** 315
Milena Bruno and Valentina Messineo

In Silico Analysis of Cyanotoxin Using Computational Tools

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Abstract

Danger lurks in the waters: Cyanobacteria, or blue-green algae, can produce toxic cyanotoxins that pose serious risks to human health, as well as to plants, aquatic organisms, and animals. These toxins, which include Microcystins, Cylindrospermopsin, Anatoxins, and Saxitoxins, can bind to host proteases and cause infection. In this study, we used computational methods like molecular docking and molecular dynamics simulation to uncover the binding site and structure of these toxins, and to understand how they interact with their hosts. Our findings highlight the harmful effects of cyanotoxins and the need for new approaches to combat them. Dive into the research and discover the power of in silico predictions to protect against these aquatic dangers.

RECENT ADVANCES IN THE APPLICATION OF MARINE NATURAL PRODUCTS AS ANTIMICROBIAL AGENTS



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Recent Advances in the Application of Marine Natural Products as Antimicrobial Agents

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Marine Natural Products as Tools for Discovering New Antimicrobial Targets

Author(s): Issac Abraham Sybiya Vasantha Packiavathy*, Danaraj Jeyapragash, Dharmadhas Jeba Sweetly and Arumugam Veera Ravi

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Abstract

The discovery of drugs for human ailments has been greatly attributed to nature ever since the existence of mankind. Continuous isolation of metabolites from terrestrial resources leads to a bargaining effect on the synthesis of novel compounds. Remarkably, marine biotope, one of nature's resources, accommodates approximately 75% of the global surface. To acclimatize in a marine environment characterized by unique circumstances that diverge from the individuals present in other habitation, marine organisms occasionally accumulate structurally distinctive bioactive secondary metabolites that are deficient in terrestrial organisms. Marine metabolites are currently employed as the key components in pharmacological research and drug discovery, acting as drugs and active lead molecules towards the development of novel

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BIOACCUMULATION DYNAMICS OF SELENIUM NANOPARTICLES: INSIGHTS INTO TROPHIC TRANSFER MECHANISMS

C.M. Vineeth Kumar[1], V. Karthick[1, *]

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Advancements in nanotechnology have ushered us in innovative solutions across various fields, ranging from medicine to energy. However, the rapid proliferation of nanomaterials raises concerns about their potential environmental threats, as their bioremediation and impact on ecosystems remain complex and yet to be addressed fully. The challenge lies in balancing the transformative benefits of nanotechnology with responsible environmental stewardship to ensure a sustainable and safe integration of the ecosystem into our increasingly nano-enabled world. Within this context, the utilization of selenium nanoparticles in various applications further underscores the need to address their environmental accessibility and potential ecological impacts. In this regard, the study on the bioaccumulation of selenium nanoparticles in *Chaetoceros gracilis* microalgae was carried out, which revealed a peak consumption and accumulation of 0.213 ìg/mg. Subsequently, zooplankton samples (*Dioithona rigida*), upon consuming bioaccumulated microalgae, exhibited an accumulation of 0.093 ìg/mg. Imaging of selenium nanoparticles accumulation and its apoptotic effects on *D. rigida* depicted cell deterioration around the gut region. Notably, other biochemical parameters like reactive oxygen production and lactose dehydrogenase enzyme maintained normal levels, given the condition, when minimal concentrations were used. The egg-hatching rate experienced a 23% reduction, indicating a chronic effect of selenium nanoparticle consumption and its internalization effect in subsequent generations. This investigation underscores the importance of controlling the trophic level transfer of selenium at the point of release.

Keywords: Selenium nanoparticle; bioaccumulation; trophic transfer; chronic toxicity.

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Pankaj Kumar
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Multifunctional Microbial Biosurfactants

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Lipopeptide and Rhamnolipid Biosurfactant as Biopesticides

S. Nalini, S. Sathiyamurthi, T. Stalin Dhas, and M. Revathi

1 Introduction

Biosurfactants (BS) are surface-active compounds, which are derived from various microorganisms (such as bacteria, fungi, yeasts) and have ability to reduce the surface and interfacial tension between immiscible fluids. There are different types of BS categorized based on their molecular weight, physico-chemical properties, such as glycolipid, lipopeptide, phospholipids, neutral lipids, fatty acids, polymeric and particulate biosurfactant. Among the glycolipid biosurfactants, the best known are rhamnolipids (RLs), trehalose lipids, and sophrolipids (Desai and Banat 1997).

RLs are the most studied glycolipid biosurfactants. Rhamnolipid (RL) biosurfactant is comprised of β hydroxy fatty acid linked by the carboxyl end of the rhamnose sugar molecule. The RLs are also produced by various species such as *P. plantarii*, *P. putida*, *P. chlororaphis*, and *P. fluorescens*. Lipopeptides (LPs) are cyclic compounds, produced by *Bacillus* and *Pseudomonas species*. In 1968, Arima and his co workers isolated surfactin BS. Lipopeptide (LP) BS mainly contains 7–10

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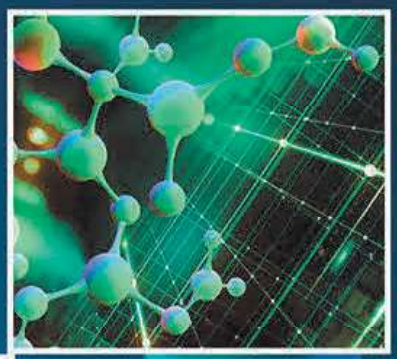
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PROCESSING, CHARACTERIZATION, AND APPLICATIONS

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CHAPTER

8

Green-synthesized nanoparticle-based polymer nanocomposites: synthesis, characterizations, and applications

Antony V. Samrot[1], Subramanian Saigeetha[2], Nagarajan Shobana[3] and Kumar Chandrasekaran[4]

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Chapter Outline

8.1 Introduction 242
8.2 Green-synthesized nanoparticles 242
8.3 Production of nanoparticles from plants 243
8.4 Green synthesis of nanoparticles using microorganism and algae 245
8.5 Production of polymer nanocomposites 246
8.6 Characterization of green-synthesized nanoparticle-based polymer nanocomposites 251
8.6.1 Fourier transform infrared spectroscopy 252
8.6.2 Scanning electron microscopy 252
8.6.3 Transmission electron microscopy 253
8.6.4 X-ray diffraction spectroscopy 253
8.6.5 Thermogravimetric analysis 254
8.7 Applications of green-synthesized nanoparticle-based polymer nanocomposites 254
8.7.1 Food packaging 255
8.7.2 Environmental applications 256
8.7.3 Bioactivity and pharmacological applications 257
8.7.4 Other biosensing and supercapacitor applications 258
8.8 Conclusion 259
References 259

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TEXTBOOK OF BIOTECHNOLOGY



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Description

This book provides an in-depth overview of marine greens and their environmental and biotechnological applications. It addresses concepts such as the niche adaptation strategies of marine greens in their natural habitats, as well as their global distribution, and factors affecting their distribution and proliferation.

Marine greens are posited as an alternative to fossil fuels, mitigating global climate change and thereby fostering future environmental sustainability. In addition, the book explains the remediation of xenobiotics, wastewater, microplastics, marine debris and marine green contamination. Expert authors from around the world explore the industrial and agricultural applications of marine greens in the production of enzymes and marine bioenergy, and what is needed to improve its production potential.

This is important reading for government and non-governmental organizations as well as industries and research institutions looking

for ways to combat current industrial and environmental challenges.

Table of Contents

Section 1: ENVIRONMENTAL APPLICATIONS

Chapter 1: Marine Greens: types, habitat, growth and global distribution
Idris Abdullahi Dabban, Alfa Suleiman, Abdullahi Muhammed

Chapter 2: Marine Greens: abilities in remediation of contaminants
Musa, O.I, Samuel J.O., Ilyasu, U.S., Akande S.A, Tiamiyyu, A.T, Ijah, U.J.J, Abioye, O.P, Maude, A.

Chapter 3: Microplastics, marine debris and marine green contaminations: matter arising
Babafemi Raphael Babaniyi1, Joshua Ibukun Adebomi, Bukola Rukayat Olowoyeye, Oluwatosin Emmanuel Daramola

Chapter 4: Marine Greens roles in climatic change and global warming mitigations
Umm-kulthum Abubakar Gimba, Sesan Abiodun Aransiola, Oluwafemi Adebayo Oyewole, Naga Raju Maddela

Chapter 5: Marine Green Nanotechnology for Remediation of Wastewater
O.D. Ogundele, J.O. Jayeola, O.S. Ilesanmi, D.A. Oyegoke, O.F. Adedugbe and V.A. Olagunju
Section 2: AGRICULTURAL APPLICATIONS
Chapter 6: Applications of Marine Greens in Aquaculture
Gabriel Gbenga BABANIYI, Ulelu Jessica AKOR, Ademola BISI-OMOTOSHO

Chapter 7: Marine Greens as a source of Biofertilizer
Ramat Onyeneoyiza Raji, Catherine Ohunene Olaitan, Zainab Azeez, David Adeiza Zakari, Oluwafemi Adebayo Oyewole, Rasaq Olajide Akinsola

Chapter 8: Marine Green macroalgae biomass production and application
Srinivasan Kameswaran, Bellemkonda Ramesh, Sudhakara Gujjala

Chapter 9: Marine Green Microalgae Biomass Production and Applications
Isibor Patrick Omoregie, Kayode-Edwards Ifeoluwa Ihotu, and Agbontaen David Osagie

Chapter 10: Edible marine greens: Uses and Limitations

Oyegbade Samuel Adeniyi, Abiodun Eniola Opeyemi, Muritada Babatunde Oshinuga,

Chapter 11: Marine green as nutritious healthy foods.
Fadekemi O. Akinhanmi, Oluwadurotimi S. Aworunse, Opeyemi I. Ayanda, & Emmanuel Agiriga

Section 3: INDUSTRIAL APPLICATIONS

Chapter 12: Biotechnological potentials of marine bacteria in the production of enzymes
Idris Abdullahi Dabban, Oluwafemi Adebayo Oyewole, Habiba Iliyasu Atta, Adejoh Suleiman Ocholi, Musa Bishir and Ibrahim Isiaka Hussein

Chapter 13: Marine Greens in biorefinery
Comfort Okoji, Musa, S.I., Nathan Moses, Harrison Ogala, Ifeoma Sonia Onukwu, Ekene Chidozie, Okorie Maria Ezinne and Sheila Ojie

Chapter 14: *Potentials of Marine Greens for Biofuel Production*
O.D. Ogundele, I.A. Amoo, A.O. Adesina and V.A. Olagunju

Section 4: BIOMEDICAL APPLICATIONS
Chapter 15: Potential therapeutic role of marine greens for liver diseases
Thiyagarajan Gopal and Madan Kumar Arumugam
Chapter 16. Bioactive metabolites from marine greens and their health benefits
Madan Kumar Arumugam
Chapter 17. Modulatory and neuroprotective effects of marine green spirulina on the brain and neurodegeneration
Asuku Abraham O, Ayinla Mariam T, Ajibare Johnson A, Ramar Krishna Murthy
Chapter 18: Marine Green biotechnology advances as bioactive compounds for medical use
Odeseye Abdulhameed A, Olasore Abiodun Amos, Israel Emiezi Agarry
Chapter 19: Potentially toxic metals in Africa fresh and marine environment: marine green contamination, ecological and human health risk
A.J. Adewumi, O.D. Ogundele and I.S. Emumejakpor

Chapter 20: Bioactive molecules of medicinal value in the Marine Green Algae
Adekunle Babajide Rowaiye, Ugonna Morikwe, Solomon Oni, Grace Onyukwo Abakpa, Itoroabasi Joseph Okon, Olubukunola Osisami, Gordon C Ibeanu

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Back To Top

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Chapter

Investigations on Rare Earth Elements in Sediments from South Vellar Estuary along Bay of Bengal and Palk Strait, Tamil Nadu, India

Puliyakurichi Mookkan Velmurugan, Krishnan Vijayaprabhakaran, Periyathambi Thangappan Devika and Mohammad Suhail Meer

Abstract

The rare earth elements (REEs) in the sediments of the South Vellar estuary on the eastern coast of India were measured using thermal ionization mass spectrometry (TIMS). Lanthanides (La-Lu) and a number of other elements (Cr, Ni, Zn, Pb, Ag, Co, Cd, and V) were studied in bed sediment samples. The estuary's total REE content (REE) ranges from 73.30 to 360.50 g/g. Continental weathering has a substantial impact on the distribution of REEs. Using factor analysis on the elemental data, two important groups of elements were identified: (a) LREEs, HREEs, Pb, Ag, and Cd, revealing an association with river detritals; and (b) Co, Ni, Zn, Cr, and V, indicating complex estuary processes. Because of the silicate weathering of crustal materials and the resultant increase in LREEs in detritals, LREEs are more enriched than HREEs. We get to the conclusion that 30% of HREE flux and 70% of LREE flux to the Bay of Bengal are provided by the estuarine system.

Keywords: Bay of Bengal, rare earth element, sediment, South Vellar Estuary, TIMS

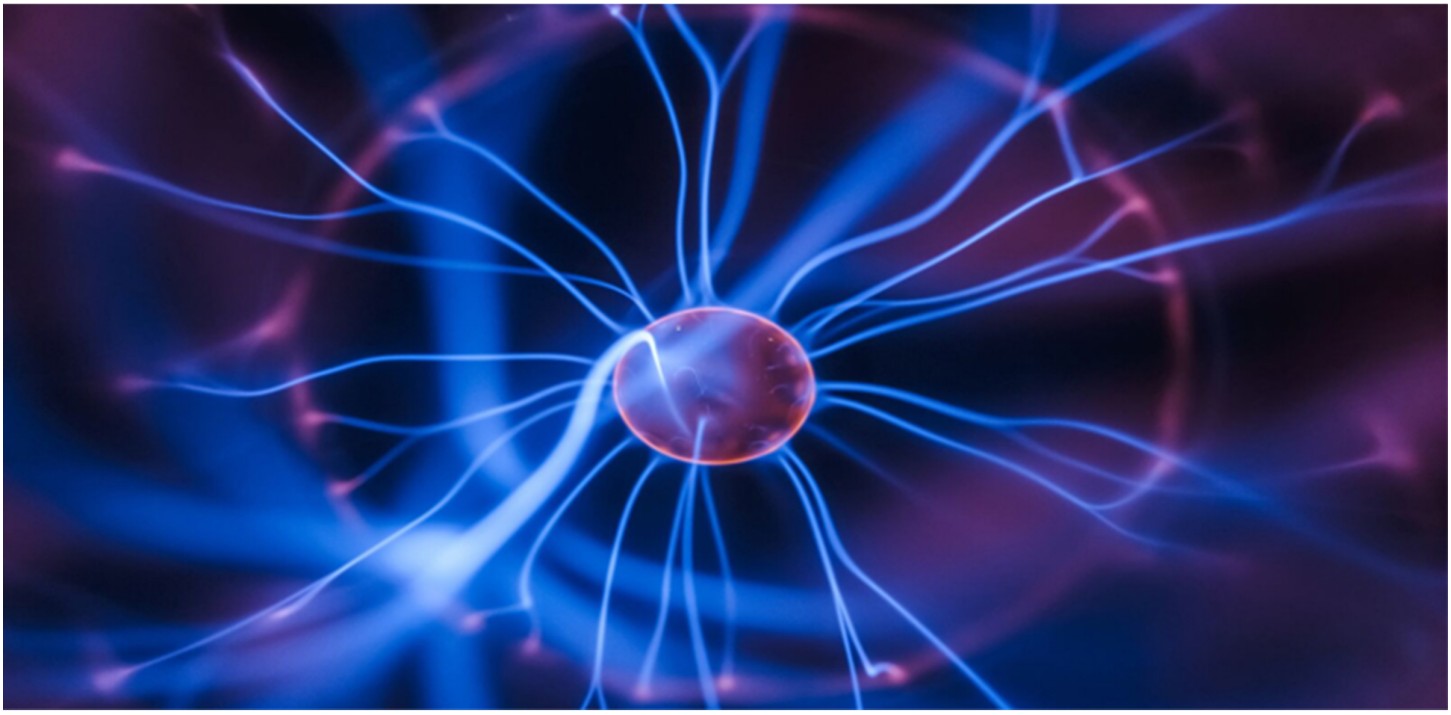
1. Introduction

Rare earth elements (REEs) are frequently employed as geochemical tracers for provenance studies due to their distinct and chemically coherent behavior [1]. Extensive studies have been reported on the distribution of REE in sediments, suspended particulate matter, and natural waters. Our understanding of REE distribution in the sediments has advanced significantly. For instance, earlier research had found that "REEs as a group are insoluble elements, exhibiting limited fractionation throughout the earth surface processes." The premise is that the REE are fractionated and mobilized during weathering in all climatic conditions in estuaries [2]. In addition, organic compounds, colloidal particles, and Fe-Mn oxyhydroxides may serve as hosts for REE and their presence in sediments may affect the total concentration of REE.

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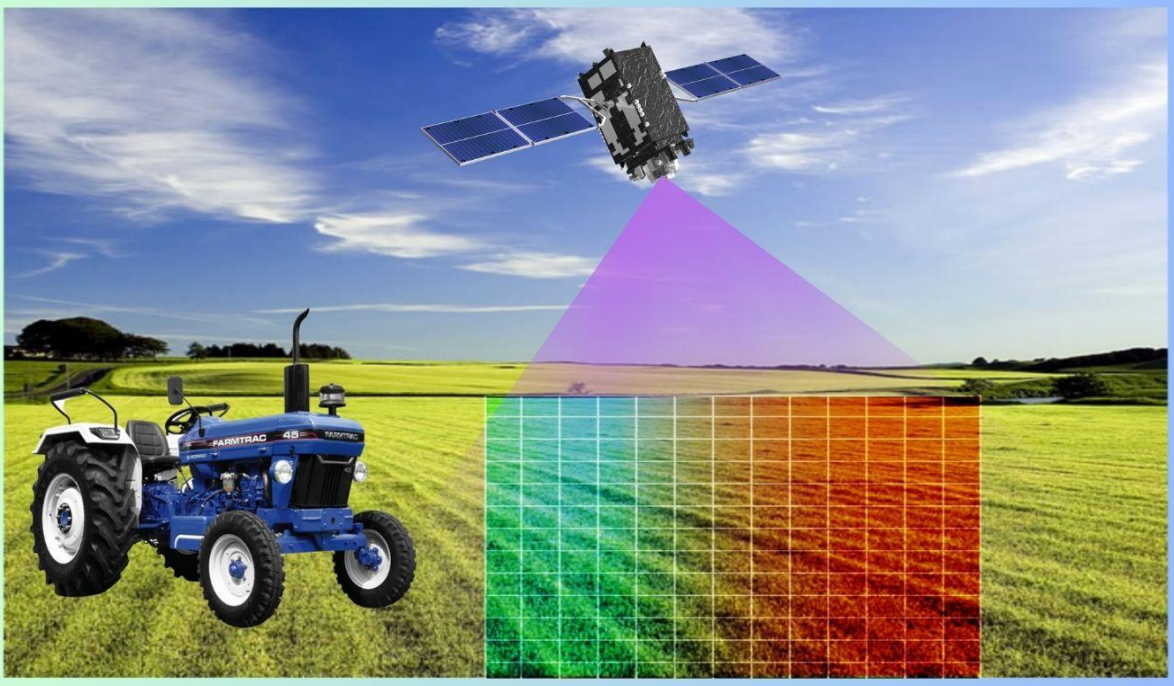
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Water is the vital and fundamental natural compound that is essentially required for the basic survival of life on Earth, as all scientists, management professionals, and administrators unanimously concur. In today's world, the process of transitions/transformations from one form to another is a continual phenomenon. The prevalence of such alterations has been found to be rapid in recent decades, with a significant impact on water quality/quantity.

The main goal of the present research is to determine the extent of groundwater contamination and the effect of land use/land cover on the region's agronomical practices. In order to achieve the objective, Geochemical and Chemometric techniques are applied on the analytical data and the results from Remote sensing, Geographical Information system are advertently integrated to evaluate and characterize the water quality and agronomic practices of the region.





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CONTENTS

PART 1	PAGE NO.
Chapter 1 RELATIONSHIP BETWEEN SOCIAL DESIRABILITY, SOCIAL ANXIETY AND SOCIAL MEDIA USAGE OF SECONDARY AND HIGHER SECONDARY SCHOOL STUDENTS OF PURULIA TOWN	**1-17**
Chapter 2 THE EFFECT OF DURATION OF TIME SPENT ON PLAYING VIDEO GAMES ON COGNITIVE ABILITIES AND IMPULSIVITY AMONG ADOLESCENTS……	**18-29**
Chapter 3 HOW PET PREFERENCE VARIESWITH THE VARIATION IN TRUST& OTHER PERSONALITY FACTOR……	**30-41**
Chapter 4 THE EFFECT OF ATTACHMENT STYLE ON INTERPERSONAL COMMUNICATION AND ACHIEVEMENT MOTIVATION OF ADOLESCENT (SINGLE CHILD/CHILD WITH SIBLINGS) ……	**42-61**
Chapter 5 ANXIETY AND DEPRESSION AMONG UNMARRIED WOMEN (YOUNG ADULTS) WITH PCOS AND THOSE WITHOUT PCOS……	**62-76**
Chapter 6 “RELATIONSHIP BETWEEN PERCEIVED PARENTING STYLES AND SOCIAL ANXIETY AMONG ADOLESCENTS”…… ……	**77-89**
Chapter 7 RELATIONSHIP BETWEEN SELF-ESTEEM AND EMOTIONAL REGULATION AMONG YOUNG ADULTS RESIDING IN KOLKATA…….…….	**90-104**
PART 2	
Chapter 1 AN ANALYTICAL STUDY OF NON-FARM ACTIVITIES IN RURAL TANK OF TAMILNADU INDIA ……..……..…….	**105-115**
Chapter 2 ENHANCING AGRICULTURAL RESILIENCE: EXPLORING THE ROLE OF INSURANCE AND RISK MITIGATION STRATEGIES IN SUSTAINABLE FARMING…….	**116-133**

Chapter 3
EMBRACING THE DIGITAL ERA: TRANSFORMING CORPORATE GOVERNANCE…… **134-146**

Chapter 4
ARTIFICIAL INTELLIGENCE REVOLUTION IN LAW: SHAPING JUSTICE FOR TOMORROW…… **147- 158**

PART 3

Chapter 1
DEVELOPING BUYING BEHAVIOUR AMONG THE YOUNG GENERATION: PSYCHOLOGICAL AND ECONOMICAL PERSPECTIVE…….. **159-165**

Chapter 2
A STUDY ON NEEDS OF SPECIAL TRAIN TEACHERS AND EQUIPMENTS TO TEACH SPECIALLY OR DIFFERENTLY ABLED CHILDREN TO MAKE CLASSROOM INCLUSIVE……. **166-174**

Chapter 3
NEED OF SKILL DEVELOPMENT PROGRAM TO EMPOWERING WOMEN: AN INITIATIVE OF SKILL INDIA MISSION……. **175-181**

Chapter 4
EMPOWERING EDUCATION IN THE DIGITAL AGE: MANAGING THE TEACHING AND LEARNING PROCESS……..…… **182-191**

Chapter 5
SUSTAINABLE DEVELOPMENT AND TRADITIONAL INDUSTRIES: EMBRACING EPISTEMIC SYNCRETISM IN SILK INDUSTRY FOR SUCCESS……..... **192-202**

PART 4

Chapter 1
FACTORS INFLUENCING TRIBAL EDUCATION…… **203-218**

PART 5

Chapter 1
IMPACT OF RUSSIA-UKRAINE WAR ON INDIA'S FOREIGN POLICY…… **219-222**

Chapter 2
A COMPARATIVE STUDY OF ANXIETY AND SELF-CONFIDENCE BETWEEN UNDER-GRADUATE AND POST-GRADUATE PHYSICAL EDUCATION STUDENTS……. **223-229**

Chapter 3
THE SOUND MACHINE PANDORA THAT LED TO THE OTHER WORLD…… **230-237**

Chapter 4
A STUDY OF INDIAN GOVERNMENT POLICIES AND PLANNING IN IMPLEMENTING IN-SERVICE TEACHER TRAINING PROGRAMS…….. **238-248**

Chapter 5
UP APPROACH TO EXTENSION –FARMERSINTEREST GROUP (FIG) ……... **249-263**

Chapter 6
OVERVIEW OF ICT INTEGRATED PEDAGOGICAL TRAINING PROGRAMME AND TEACHERS' ADOPTION CAPABILITY, EXPERIENCE, AND INTEREST……. **264-272**

Chapter 7
PUBLIC PRIVATE PARTNERSHIP: FOSTERING EXTENSION SERVICES…… **273-285**

Chapter 8
INDIA'S BILATERAL TRADE WITH VIETNAM: A STUDY OF SOME SELECTED AGRICULTURAL COMMODITIES…… **286-299**

Chapter 9
CASTE IN INDIA: IS IT A RITUALISTIC HIERARCHY OR A MATERIALIST CONCEPT? …….. **300-305**

Chapter 10
DANCE MOVEMENT THERAPY – A SHIFT IN FOCUS FROM TRADITIONAL COMMUNICATIVE THERAPY TO A PROJECTIVE INTERVENTION STRATEGY…… **306-315**

Chapter 11
THE IMPACT OF COVID-19 ON MYANMAR TOURISM…… **316-337**

Chapter 12
STRESS… POST PANDEMIC! …… **338-346**

Chapter 13
EXTENSION OF PSYCHOLOGICAL MEMORY MODEL OF HUMANS TO INCLUDE CONCEPT OF CHIDAKASHA…… **347-352**

Chapter 14
SPIRITUAL SOUND AS THE ESSENCE OF CONSCIOUSNESS IN DIFFERENT WORLD RELIGIONS- A FUTURISTIC APPROACH FOR A UNIFIED WORLD RELIGION…… **353-361**

Chapter 15
A STUDY ON PROBLEMS FACED BY CONSTRUCTION WORKERS IN COIMBATORE CITY……. **362-365**

Chapter 16
READING LANDSCAPES: AN EXPLORATION OF RANIKHET IN THE FOLDED EARTH BY ANURADHA ROY…… **366-375**

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Deep-Learning-Based Convective Boundary Layer Determination for Aerosol and Wind Profiles Observed by Wind LiDAR

Chih-Wen Su, Wei-Nai Chen, Wei-Yao Chang, and M. Roja Raman

Abstract Modified stacked hourglass network is used to capture the height of convective boundary layer (CBLH) from radial wind speed and aerosol backscatter measured by a Doppler wind LiDAR. We collected a year's LiDAR data and generated over 30,000 maps for training. The results show that the data set of 4-directional wind speeds and aerosol backscatters (without vertical component), the mean absolute error (MAE) of the CBLH estimated by the proposed deep learning methods, is about 60 m. If only aerosol backscatter is used to train the model, the MAEs of CBLH are about 91 m and 86 m for daytime and nighttime measurements, respectively. This chapter shows the advantage of proposed deep learning method in better estimation of CBLH.

Keywords Doppler LiDAR · Deep learning · Convective boundary layer

13.1 Introduction

The planetary boundary layer (PBL) is a thin layer near the Earth's surface concentrating atmospheric aerosols and is directly influenced by the atmospheric processes. This layer typically responds to surface forcing mechanisms with a

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Chapter 68
Efficiency Assessment of Single-Cell Raman Gas Mixture for DIAL Ozone Lidar

M. Roja Raman and Wei-Nai Chen

Abstract The conversion efficiency and flexibility of using single Raman cell with a mixture of high-pressure Raman active gases H_2 and CH_4 have been tested and reported in this chapter. Though the higher conversion efficiency could be achieved with independent gases, the pre-mixed gas combination could emit a coaxial beam of two wavelengths 288.4 nm and 299.1 nm with a total conversion efficiency of about 45% along with the residual 266 nm coaxial beam. However, a suitable gas mixing ratio needs to be selected to avoid carbon particle formation inside the cell which attenuates the laser energy. In the present case, a volume mixing ratio of 2:1 (H_2+CH_4) at a total cell pressure of 18 bar is found optimum for the generation of required wavelengths with almost equal energies. This configuration of generating coaxial beam of multiple SRSs with a single Raman cell greatly reduces the optical configuration and makes the DIAL system compact for mobile operations for ozone profiling.

Keywords Stimulated Raman Scattering · Raman cell · Mixture gases · Ozone

68.1 Introduction

Differential Absorption Lidar (DIAL) technique has been extensively used by various authors for the determination of the vertical profiles of atmospheric gases. Out of various gaseous species, ozone in the lower and upper atmosphere has been one of the major greenhouse gases being observed owing to its great influence on

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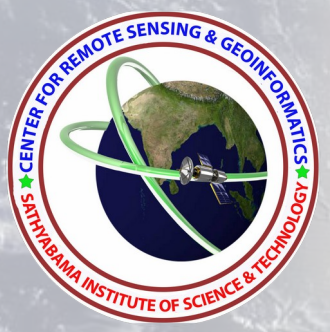
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Water is the vital and fundamental natural compound that is essentially required for the basic survival of life on Earth, as all scientists, management professionals, and administrators unanimously concur. In today's world, the process of transitions/transformations from one form to another is a continual phenomenon. The prevalence of such alterations has been found to be rapid in recent decades, with a significant impact on water quality/quantity.

The main goal of the present research is to determine the extent of groundwater contamination and the effect of land use/land cover on the region's agronomical practices. In order to achieve the objective, Geochemical and Chemometric techniques are applied on the analytical data and the results from Remote sensing, Geographical Information system are advertently integrated to evaluate and characterize the water quality and agronomic practices of the region.



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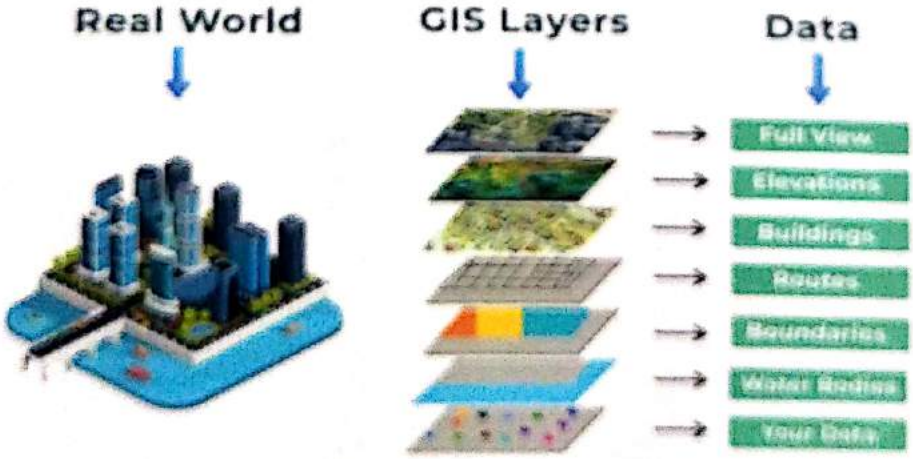
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REMOTE SENSING AND GIS APPLICATIONS IN ENVIRONMENTAL MANAGEMENT



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Dr. P. MOHANA
Dr. ASHOK JAYAVANTA DUSHING
Dr. RAJESH BHASKAR SURVASE

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FIRST EDITION

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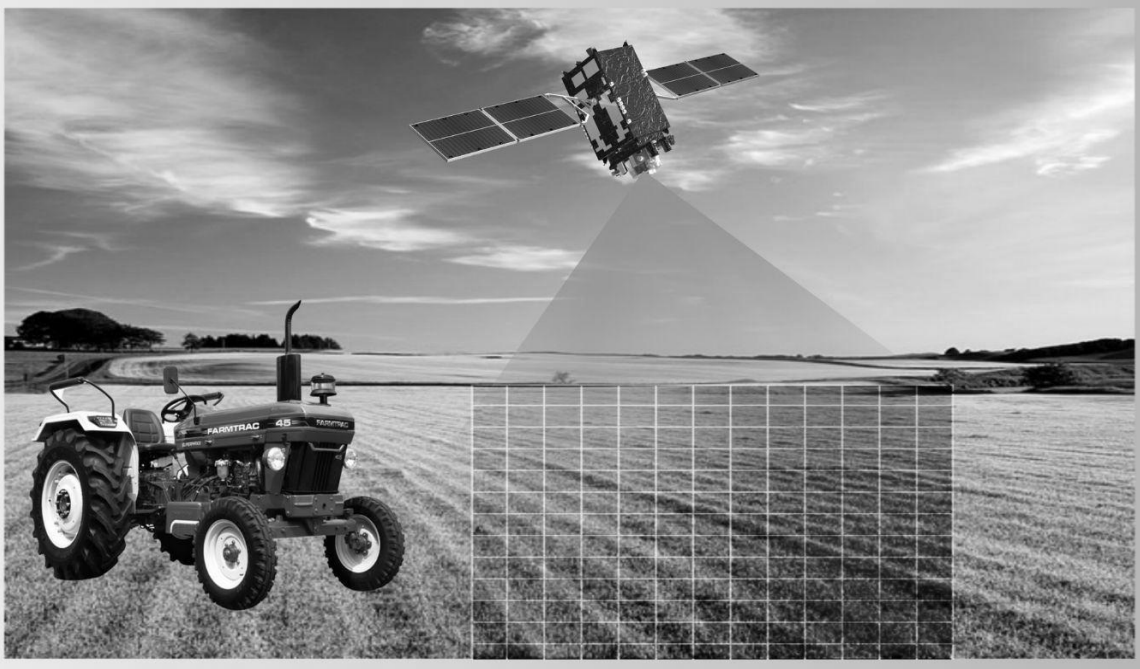
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Agriculture and Food Science Book series aims to bring together leading academic scientists, researchers and research scholars to publish their experiences and research results on all aspects of Agriculture and Food Science. It also provides a premier interdisciplinary platform for researchers, practitioners and educators to present and discuss the most recent innovations, trends, and concerns as well as practical challenges encountered and solutions adopted in the fields of Agriculture and Food Science. High quality research contributions describing original and unpublished results of conceptual, constructive, empirical, experimental, or theoretical work in all areas of Agriculture and Food Science are cordially invited for publication. It also focuses on a range of issues but not limited to

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CLIMATE INDUCED URBANIZATION IMPACT ON URBAN FLOOD HAZARD USING GIS AND REMOTE SENSING

Abstract

Flooding is one of the most common natural disasters that afflict people all over the world. It is a serious natural hazard in Velachery that arises every year. Floods in Velachery are distinguished for their unusually huge volume, widespread devastation, and frequency. Velachery suffers from a flood generated by Velachery Lake. The primary cause of flood in that area is the topographic condition, accelerated rate of deforestation, high intensity of rainfall, explosive increase of people, large amount of land use, and so on. Despite the fact that it is an age-old phenomenon in the Velachery lake, the level of destruction inflicted by the flood has expanded dramatically in recent years. It caused massive devastation and irreversible harm to the local inhabitants. It has a negative impact on human life and property, transportation and communication, and so on, resulting in massive economic losses each year. This article discusses the state's considerable economic losses as a result of flooding.

Floods are uncontrollable natural disasters that cause loss of life and property destruction. Flood water must be controlled so that it can be used for a variety of purposes. Remote sensing and GIS (Geographic Information System) techniques can be used to estimate the area and depth of flooding. This study will concentrate on the issue of field investigation in conjunction with GIS to recreate a flood event in order to estimate the flood volume and extent. According to field investigations, the Velachery neighbourhood of Chennai, India, is prone to catastrophic flooding. Through field inquiry in the Velachery area, this study

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Chapter 3

DIGITAL IMAGE PROCESSING

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INTRODUCTION

Satellite Remote Sensing data has been used as basic inputs for the inventory and mapping of natural resources of the earth surface like agriculture, soils, forestry, geology etc. Remote sensing images are recorded in digital forms and then processed by the computers to produce images for interpretation purposes. Images are available in two forms - photographic film form and digital form. A digital image is an array of numbers depicting spatial distribution of a certain field parameters (such as reflectivity of EM radiation, emissivity, temperature or some geophysical or topographical elevation. Digital image consists of discrete picture elements called pixels. Associated with each pixel is a number represented as DN (Digital Number) that depicts the average radiance of relatively small area within a scene. The range of DN values being normally 0 to 255. The size of this area effects the reproduction of details within the scene. As the pixel size is reduced more scene detail is preserved in digital representation. Variations in the scene characteristics are represented as variations in brightness on photographic films. A particular part of scene reflecting more energy will appear bright while a different part of the same scene that reflecting less energy will appear black.

DATA FORMATS FOR DIGITAL SATELLITE IMAGERY

Digital data from the various satellite systems supplied to the user in the form of computer readable tapes or CD-ROM. The CEOS (Committee on Earth Observation Satellites) format is becoming accepted as the standard. Digital remote sensing data are often organized using one of the three common formats used to organize image data. For an instance an image consisting of four spectral channels, which can be visualized as four superimposed images, with corresponding pixels in one band registering exactly to those in the other bands. These common formats are:

- Band Interleaved by Pixel (BIP)
- Band Interleaved by Line (BIL)
- Band Sequential (BQ)

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Chapter 4

REMOTE SENSING AND GIS IN AGRICULTURAL MANAGEMENT

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INTRODUCTION

Remote Sensing and GIS for Land Resources Development

In the context of finding additional land resources, space remote sensing and GIS has proved to be extremely useful in identifying different classes of wasteland and degraded land, considerable part of which can be reclaimed by application of appropriate agricultural practices. For example in India, using satellite remote sensing and GIS, 13 categories of wastelands, amounting to 54 million hectares, have been identified, almost half of which could be reclaimed for productive purposes. Lands thus identified for immediate reclamation are scrublands, gullied/ravenous areas, marginally saline affected lands and areas under shifting cultivation which with the application of appropriate agricultural practices and conservation measures could be made agriculturally productive to augment the total food production. The fact that about 20 per cent of most of the Asian countries have similar scenario clearly indicates the role that space can play in identifying, categorizing and finally facilitating reclamation of a considerable part of such land for productive purposes.

Likewise, satellite remote sensing and GIS has been made to map the current land use at micro level so as to identify areas under single-crop, double-crop and residual fallows. This information could be gainfully used to determine the cropping intensity and explore the dormant potential for increasing agricultural production.

Increasingly, satellite imagery are being used for preparing reconnaissance level soil maps showing soil associations and land capability units that are agro climatically coherent and having common characteristics (slopes, soil depths, textures, water holding capacity). Such maps

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ASSESSMENT OF MICROPLASTIC CONTAMINATION IN THE SEDIMENTS OF ADYAR RIVER, CHENNAI: DISTRIBUTION AND SOURCE IDENTIFICATION

Abstract

Plastic pollution, including the insidious presence of microplastics, has emerged as one of the most pressing and alarming global issues affecting aquatic ecosystems worldwide. The rapid increase in plastic waste, particularly in the form of microplastics, is posing a significant threat to the health and sustainability of marine and freshwater environments. The present study is aimed to assess microplastic contamination in sediment samples collected from the Adyar River in Chennai, India. A total of 10 Sediment samples were collected from different locations all along the river for Microplastic analysis. The identification of microplastics was carried out utilizing a stereomicroscope. The present study reveals the mean concentration of MPs in the sediment sample was.1977± 137(Average ± Standard Error, n=10). MP/kg, of dry weight of the sediment sample. The prominent shape types of MPs in the sediments were into fibers (47%), films (21%), fragments (18%), pellets (10%), foam (2%), and beads (2%)., The colour of the MP was mostly, transparent (34.45%), followed by red (20.40%), white (18.75%), blue (14.52 %), orange (6.08%), green (2.19%), yellow (2.19%), and black (1.35%) Furthermore, Raman spectroscopy was employed to investigate and characterize the polymer compositions of the MPs. Raman Spectroscopy results showed the predominant abundance of microplastics, such as nylon, polypropylene, polymethyl (methacrylate), and polystyrene. Showing textiles,Plastic Litter, wastewater as sources of

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ASSESSMENT OF WATER QUALITY INDEX USING GIS METHOD IN KALUGUMALAI, THOOTHUKUDI

Abstract

The present study aimed to attempt the subsurface groundwater quality contamination and utility for agriculture purposes. The scientific approach to subsurface groundwater quality study was identified with cation-anion parameters and WHO standards. The collected samples were systematically analyzed in the geochemistry lab and obtained over the limit of Cl^-, So^{-4} parameter. The rock-water interaction plays a major role to control water quality. The infiltration of water moves through subsurface soil and rock-dissolved chemical constitutes reflect in the geochemical studies. The GIS techniques are applied to the WQI interpolation map display clearly seen in geochemical distribution and variation. In this study, much more amount of clay is enriched to continuous rainfall and evaporation processes to form the calcrete or kankar rock formation. The calcrete is a much more amount of Cl^- enrich reflects in the geochemical data.

Keywords: Geochemistry, WQI, GIS, Groundwater, Kalugumalai.

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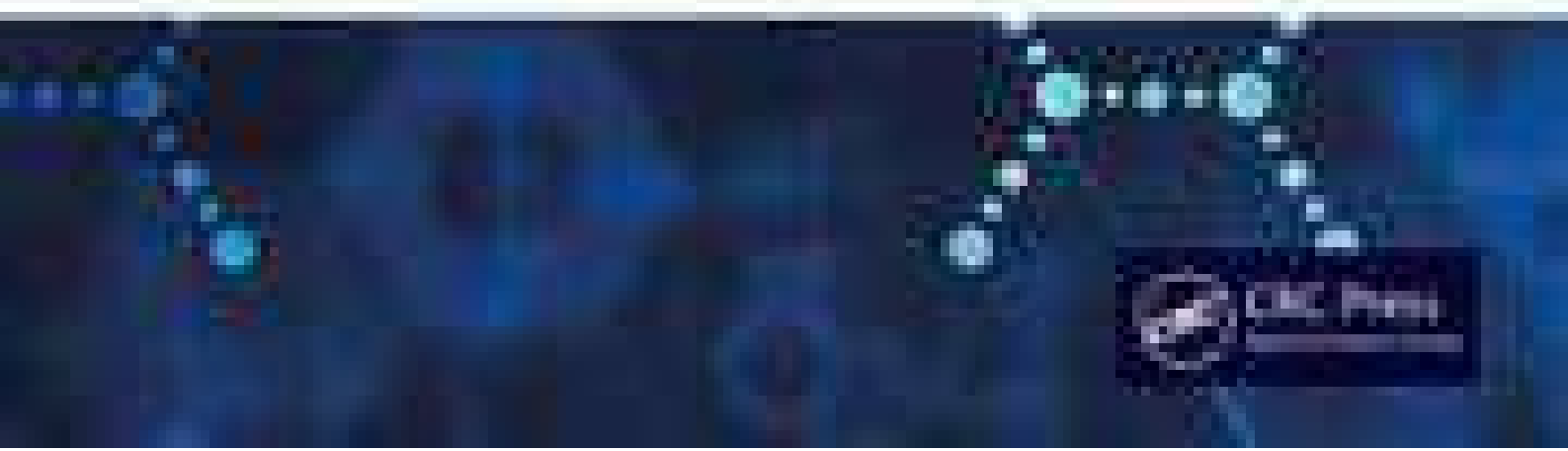
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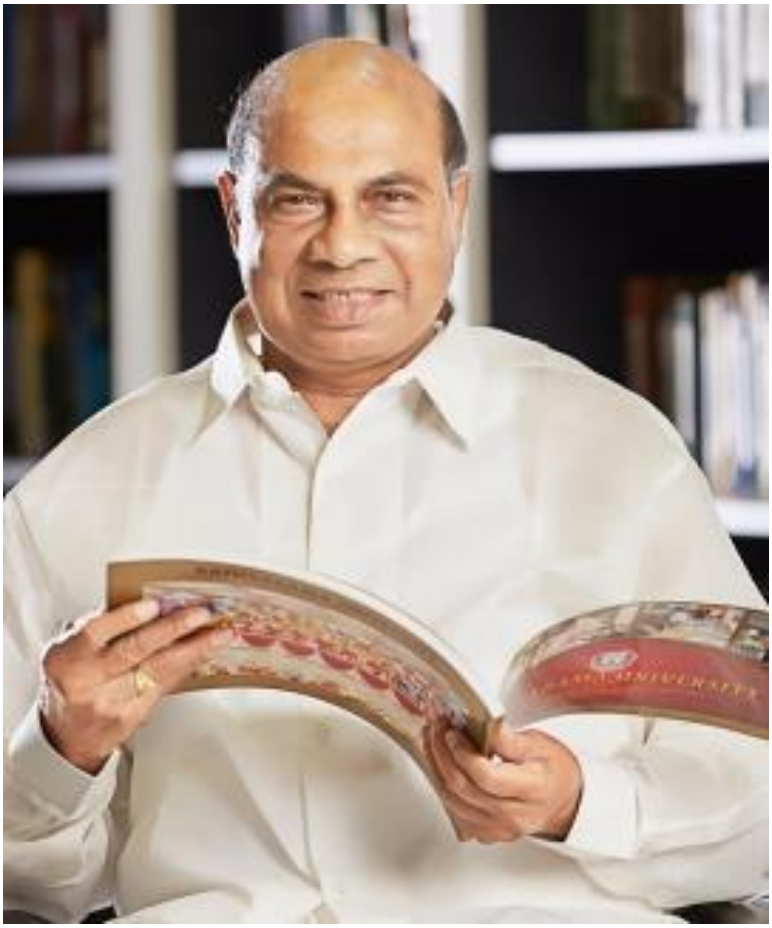
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CHANCELLOR AND PRESIDENT MESSAGE

We feel enthralled on this gracious occasion to welcome you to the Second National Event for the Marine Biology Enthusiasts "Marine Biology Research Symposium – MBRS 2024" organized by the Centre for Climate Change Studies from 23 to 25 January 2024 at Sathyabama Institute of Science and Technology, Chennai.

The symposium provides ample opportunity to the marine biology researchers across the country to transmit the knowledge generated through their research. We are also glad to learn that many academicians, eminent scientists, students and other industry partners from India and all over the world have shown interest to participate in this symposium. We are sure this symposium will quench the knowledge of thirst of research activists and share their knowledge and valuable experience and time in the field of taxonomy, biodiversity and conservation, blue carbon, marine pollution, climate change, marine microbial and molecular ecology and coastal aquaculture.

Finally, we would like to thank all the authors, the reviewers, editors and the delegates for their contributions and participation. The symposium will not be a success without your expertise and active participation. On behalf of the organizing committee, we thank you for making this conference a great success.

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MESSAGE FROM VICE CHANCELLOR

I take the privilege to welcome the eminent scientists, researchers and the students for the Second National Event "Marine Biology Research Symposium - MBRS 2024" org organized by the Centre for Climate Change Studies from 23 to 25 January 2024 at Sathyabama Institute of Science and Technology, Chennai.

I expect it to be a great opportunity and an inspiring occasion for learning. I hope that the symposium will provide a better platform to interact and share their remarkable knowledge and experience with the eminent speakers on the cutting-edge themes of Marine Biology.



Dr. T. SASIPRABA
Vice Chancellor,
Sathyabama Institute of Science and Technology.

Preface

On behalf of the MBRS 2024 organizing committee and Sathyabama Institute of Science and Technology, Chennai I cordially invite you for the Second National Event "Marine Biology Research Symposium MBRS 2024" organized by the Centre for Climate Change Studies from 23 to 25 January 2024 at Sathyabama Institute of Science and Technology, Chennai.

So far, we have received 49 abstracts and 78 participants from various central, state government, and private research institutions and universities, NGO's and Industries from India and all over the world. Twenty-one full length articles have been received for peer review and publishing in the form of proceedings. Over the 3 days of symposium, abstracts have been distributed under 6 thematic sessions for both Oral and Poster presentations. The quality and the credibility of the symposium goes to the dedicated conveners (Dr. S. Prakash and Dr. Amit Kumar) and the co-organizers Ms. K. Kunjulakshmi, Mr. D. Kavin and Ms. Silpa MS.

I take this immense opportunity to express my heartfelt thanks and gratitude to the management of SATHYABAMA especially our Honorable Chancellor Dr. Mariazeena Johnson, our president Dr. Marie Johnson, and Vice Presidents Ms. Maria Bernadette Tamilarasi Johnson, Mr. J. Arul Selvan, Ms. Maria Catherine Jayapriya, without whose guidance and support this event could not reached this level.

I wish to convey my earnest wishes to our internal organizing committee of our university. Indeed, I am deeply moved by the selfless dedication and commitment of the Conveners whose hard work has contributed to the success of this conference.

Organizing Secretary,
Dr. T. Sasipraba,
Vice Chancellor
Sathyabama Institute of Science and Technology,
Chennai 600119.

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About Sathyabama Institute of Science and Technology

(Deemed to be University)



Sathyabama is a prestigious institution which excels in the fields of Engineering, Science and Technology for more than three successful decades. It offers multi-disciplinary academic programmes in various fields of Engineering, Science, Technology, law, Dental Science, Pharmacy, Nursing, Management, Arts and Science and Allied Health Sciences. It is established under Sec.3 of UGC Act, 1956 and is been Accredited with 'A++' Grade by the National Accreditation and Assessment council. Recently, university received "Category 1" status by UGC. The Institution persistently seeks and adopts innovative methods to improve the quality of higher education and is responsive to the changes taking place in the field of education on a global scale. The Institution has a team of dynamic and outstanding faculty, innovative pedagogical practices, state of the art infrastructure and world class Research Facilities. This glorious Institution is functioning under the dynamic leadership of Dr. Mariazeena Johnson, Chancellor, Dr. Marie Johnson, President and Ms. Maria Bernadette Tamilarasi Johnson, Vice President.

Sathyabama has a good presence in rankings and ratings at National and International level. The Institution has been ranked one among the top 50 Universities for five consecutive years. Sathyabama is ranked among the Top 5 Institutions in the Country for Innovation by ATAL ranking of Institution for Innovation Achievements, Govt. of India. Times Higher Education and QS has ranked Sathyabama among the top Institutions worldwide. Sathyabama Institute of Science & Technology has alliances with leading Universities and research establishments at National and International Level. It is a research-intensive University with world class laboratories and research facilities and is involved in research in the emerging areas of Science and Technology. Sathyabama has undertaken various sponsored and collaborative R&D projects funded by National and International Organizations. Sathyabama has written a special page in the history of space research on 22nd June 2016 with the launch of "SATHYABAMASAT" in association with ISRO.

Sathyabama has emerged as a leading Institution and achieved excellence in higher education to international standards owing to its research and academic excellence.

About Centre for Climate Change Studies (CCCS)



The **Centre for Climate Change Studies (CCCS)** was established in the January 2014 at International Research Centre (IRC) with the primary mandate of investigating the impact of predicted climate change on marine organisms associated to various ecosystems like coral reefs, seagrass meadows, seaweeds, intertidal zones and mangrove ecosystems etc.

At present, in the CCCS, the following research activities are going on: (i) Implications of climate change on natural life history traits of coral reef caridean shrimps; (ii) Response of micro-planktons to elevated temperature and decreased pH using multidisciplinary approach including proteomics, biochemical and physiological assays; (iii) Contribution of seaweeds towards sustainable future by playing a role in climate change mitigation and adaptation; (iv) Diversity and status of coral reef shrimps in Gulf of Mannar Biosphere Reserve, Tamil Nadu and Lakshadweep and (iv) Plant-insect interaction under climate change scenario. Besides, the Centre is also instrumental in spreading awareness about conservation of marine ecosystem to schools and teachers through citizen science program.

Researchers at CCCS have been actively working at Sathyabama Marine Research Station (SMRS), recently established at Rameswaram to encourage research on cutting-edge marine ecology and climate change to sustainably use, manage, and conserve natural ecosystems for the benefit of the coastal communities of Gulf of Mannar and Palk Bay regions.



About Marine Biology Research Symposium – MBRS 2024

Being a young researcher, we have a time-sensitive academic path, and the current pandemic may affect our research career. At the same time, the pandemic has challenged and demanded us to revise the research strategies to manage the current difficulties as well as to overcome similar bottlenecks in the future.

In view of the above, the second National Event ***"Marine Biology Research Symposium"*** mainly focuses in bringing budding Marine Biology enthusiasts and researchers all over India and rest of the world to share their research ideas, meet with subject experts, and discuss collaborations in the cutting-edge research themes. The main aim of this symposium is to provide platform to gain new experience, to interact with experts from diverse disciplines and to build the network of like-minded people for Marine Biology Research in India.

The agenda of the symposium were designated under SIX thematic areas:

- Taxonomy, Biodiversity and Conservation (Code: TBC)
- Blue Carbon and Coastal Ecosystems (Code: BCCE)
- Physiology of Marine Organisms to Climate Change (Code: PMCC)
- Marine Pollution and Impact (MPI)
- Marine Microbial Ecology & Bioprospecting (Code: MMEB)
- Coastal and Ornamental Aquaculture (Code: COA)

The symposium features eminent keynote speakers under the above areas followed by presentation by students, and researchers all over the country and rest of the world.



List of speakers



Dr. T.T. AJITH KUMAR
Principal Scientist & Head
Centre for Peninsular Aquatic Genetic Resources
ICAR - National Bureau of Fish Genetic Resources
Kochi, India

Title - Marine Ornamental Aquaculture: Is it an option for bridging conservation and community upliftment in coastal and island regions?



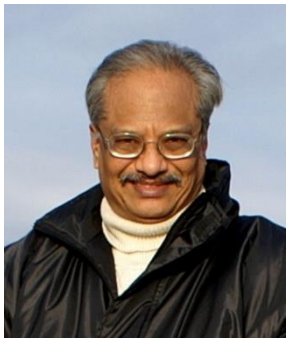
Dr. PUNYASLOKE BHADURY
Professor,
Department of Biological Sciences
IISER Kolkata, India

Title - Climate Change and Blue Economy with special reference to Sundarbans



Dr. N. MARIMUTHU
Scientist E
Officer-in-Charge (General Non-chordata section)
Zoological Survey of India (MoEF&CC)
Kolkata, India

Title - Methods, validation limits and prerequisites on coral reef habitat assessment and their restoration processes



Dr. T. S. SURYANARAYANAN
Director
Vivekananda Institute of Tropical Mycology (VINSTROM)
A Unit of the Ramakrishna Mission Vidyapith
Chennai, India

Title - Unraveling the marine fungal endosymbionts for their diversity and technological potential



Dr. K. SIVAKUMAR
Professor
Department of Ecology and Environmental Sciences
Pondicherry University
Pondicherry, India

Title - SDG 14 and India's action towards Dugong, Whale shark and Turtle Conservation



Dr. G. SEGHAL KIRAN
Professor
Department of Food Science and Technology
Pondicherry University
Pondicherry, India

Title - Marine Microbial Bioprospection



Dr. GURDEEP RASTOGI
Senior Scientist
Wetland Research and Training Centre
Chilika Development Authority
Pokhriput Road, Bhubaneswar – 751020, Odisha

Title - Molecular microbial ecology of Chilika, a brackish coastal lagoon of India

Organized by Centre for Climate Change Studies
Sathyabama Institute of Science and Technology, Chennai
Contact us: training.cccs@gmail.com

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New distributional record of *Pontocaris affinis affinis* (Alcock, 1901) (Decapoda: Caridea: Crangonidae) from the Gujarat coast, North-eastern Arabian Sea

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ABSTRACT

Crangonid shrimp occurrence is generally rare as they inhabit 250-300 metres of depth. During the regular sampling day at Veraval fishing harbour (**20º 50' N and 70º 28' E**), Gujarat, Northwest coast of India two male specimens (n=2) of *Pontocaris affinis affinis* (Alcock, 1901) belonging to the family Crangonidae were collected from the bycatch of demersal trawler targeted for commercial crustaceans. From Indian coast the crangonid shrimp, *P. affinis affinis* was previously recorded from Maharashtra, Kerala and Bay of Bengal regions. The morphometric character of the observed specimens was 10-11 mm carapace length and 7-8 mm carapace width. The documentation of the species in the coastal region may be due to the decline in commercial fishery has led to the exploitation of the deep-sea resources or this species is already occurring in this coast which is not scientifically overlooked or collected due to the lack of taxonomical notes. The present study provided detailed morphological description and taxonomic illustration with photograph of the fresh specimen further adding a new fauna to the crustacean diversity of Gujarat.

KEYWORDS

Deep-Sea, Crangonid shrimp, *Pontocaris*, Taxonomy

INTRODUCTION

Prawns/Shrimps are known as one of the popular decapod crustaceans which are available in all kinds of habitats around every region of the world from the equator to the poles,

in freshwater to marine water they have life form from shallow water to deep-water regions, some of the species are even found at a depth of 5700 meters (De Grave and Fransen, 2010). Other than penaeid shrimps, few species of caridean shrimps belonging to family Crangonidae, Pandalidae, and Palaemonidae show commercial importance in some regions. The crangonid shrimps are purely found in marine habitat and some are recorded in deeper habitat beyond 500 m depth. The Family Crangonidae contains a total of 26 valid genera (DecaNet, 2024). Of which, Genus *Pontocaris* can be distinguished by presence of 7 or more number of dorsal teeth on carapace and lateral carina III continuous with pterygostomian spine; barchiostegal spine comparatively large and exceeding the 2/3 portion of scaphocerite (Chan, 1996). Below the genus *Pontocaris*, a total of 10 valid species were reported globally (DecaNet, 2024). Of which, one species *Pontocaris affinis affinis* (Alcock, 1901) was reported from Indian waters. Earlier this *P. affinis affinis* was reported from Mumbai coast, Kerala coast and in Bay of Bengal (Samuel et al., 2016; Purushothaman et al., 2018).

Hitherto there is no proper record of Crangonid shrimp from the Gujarat coastal region. Hence, present study documents the first report of *P. affinis affinis* from the Gujarat, Northwest coast of India.

MATERIAL AND METHODS

The Crangonid shrimp, *Pontocaris affinis affinis* (n=2) was collected from the crustacean bycatch landings at Veraval fishing harbour (**20º 50' N and 70º 28' E**), Gujarat, Northwest coast of India (Fig. 1) in October, 2022. The specimen was harvested along the west of Gujarat coastal region by deep-sea shrimp trawler operated at a depth of 250 to 350 m. The collected specimens were identified as *P. affinis affinis* using the taxonomic literature (Chan, 1996) and morphometric measurements were made using Vernier calipers (VC) with an accuracy of 0.1 mm. Photographs of the fresh specimen and formalin preserved specimen were captured using a Nikon D-5300 camera. The specimen was preserved using 10% formalin and deposited in the Museum of the College of Fisheries Science, Veraval, India (Museum deposit No.: KU/COF/PAA.1). Standard literature and software were used for taxonomical description and illustrations (Sureandiran et al., 2023a). Abbreviations used in the descriptions are: CW, Carapace Width, and CL, Carapace Length.

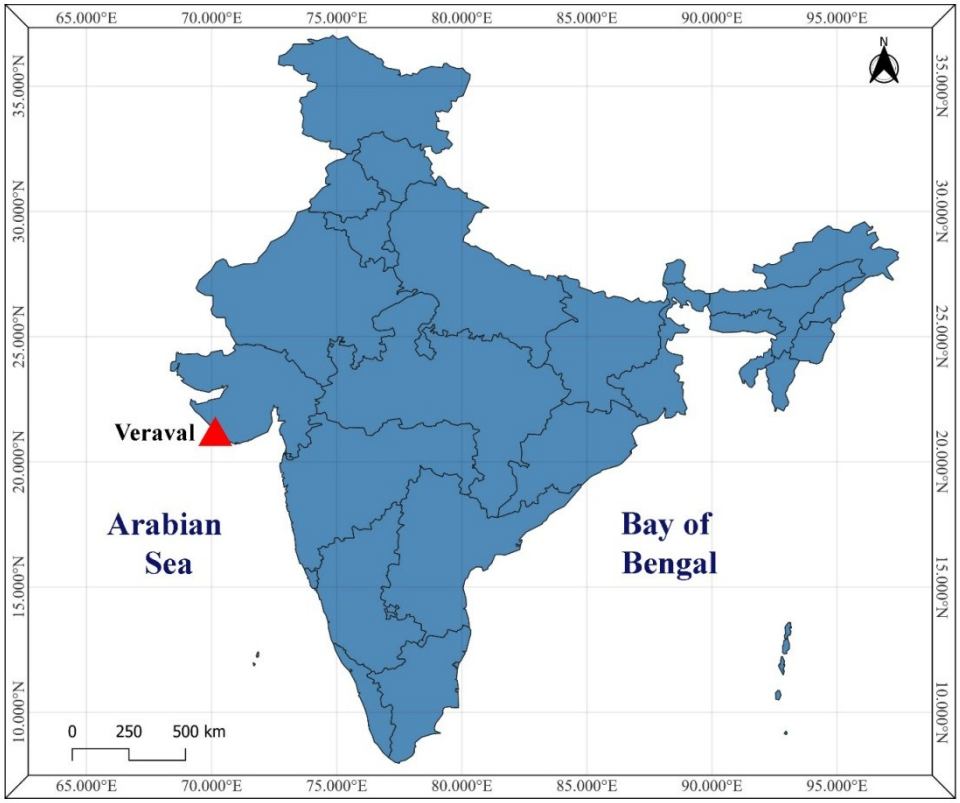


Fig. 1 Location of the study area Veraval fishing harbour (red mark), Gujarat, North-eastern Arabian Sea

RESULTS

Systematic Position

Infraorder: Caridea Dana, 1852

Order: Decapoda Latreille, 1802

Family: Crangonidae Haworth, 1825

Genus: *Pontocaris* Spence Bate, 1888

Species: *Pontocaris affinis affinis* (Alcock, 1901)

Materials examined

Crangonid shrimp, *Pontocaris affinis affinis* (Fig. 2, 3 & 4), (carapace length range x carapace width range is 10-11 mm x 7-8 mm; coll. N. K. Suyani; 5th October, 2022 from the Veraval fishing harbour, Gujarat (**20º 50' N and 70º 28' E**).

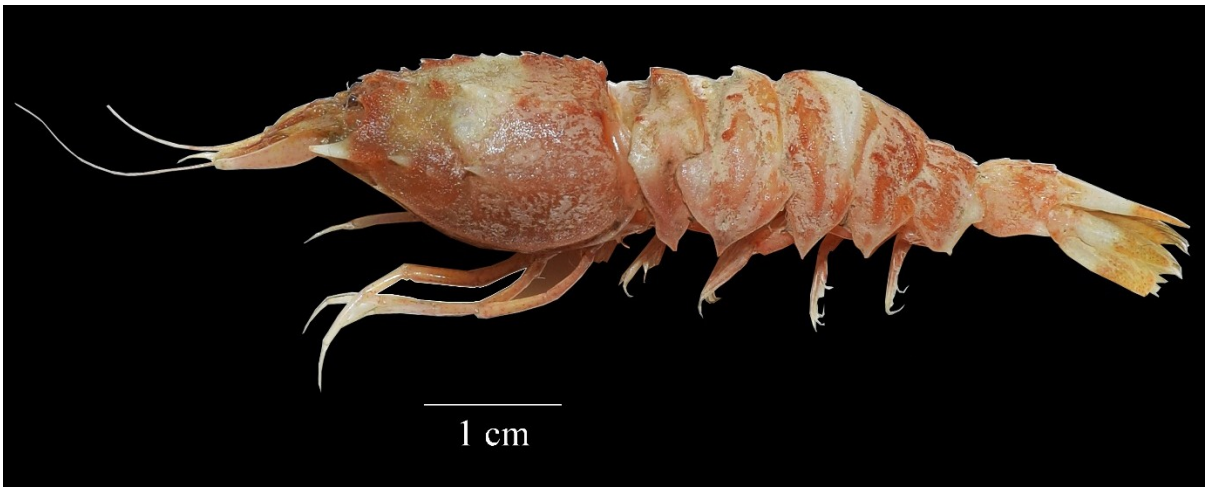


Fig. 2 Crangonid shrimp, *Pontocaris affinis affinis* (Alcock, 1901) from Gujarat, North-eastern Arabian Sea (Fresh specimen).

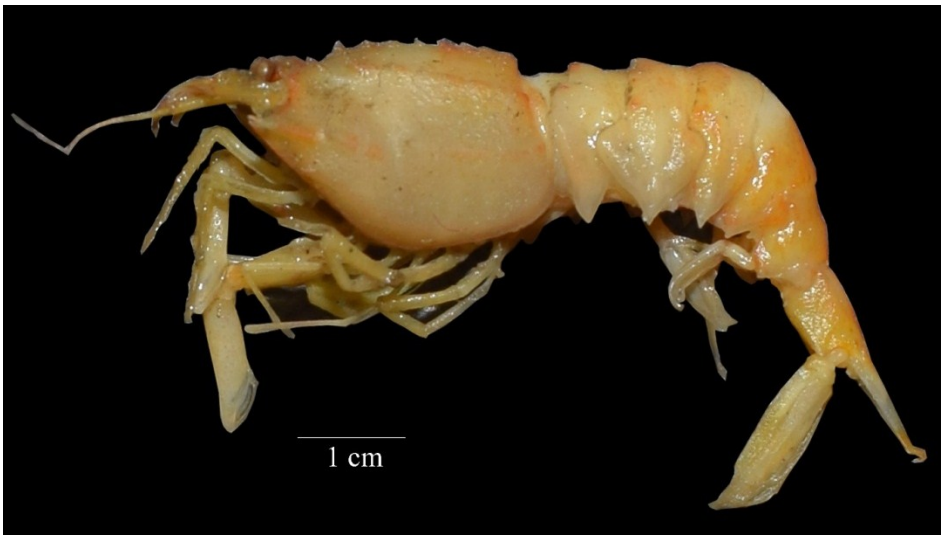


Fig. 3 Crangonid shrimp, *Pontocaris affinis affinis* (Alcock, 1901) from Gujarat, North-eastern Arabian Sea (10% formalin preserved specimen)

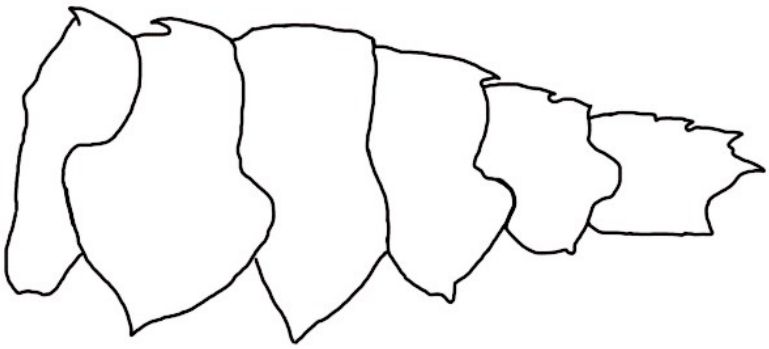


Fig. 4 Crangonid shrimp, *Pontocaris affinis affinis* (Alcock, 1901): Abdominal segment

Diagnosis

Rostrum teeth short, visible under microscope with tip noticeably divided; dorsal surface of carapace lateral carina I carinated with 8 to 10 teeth; lateral carina II carinated with 2 teeth on front portion and 4 to 7 teeth on the backward portion; lateral carina III with 1 to 11 unique tubercles. Brachiostegal spine elongated like wings, exceeding the 3/4 portion of scaphocerite. Pterygostomian spine is somewhat bigger than antennal spine and shorter than tip of the branchiostegal spine. Abdominal structures sculptured and unique in manner. Tergite I possess single pair of dorsal spine; tergite II possess an intermittent structure with 1 dorsal spine; tergite III & IV possess a box-like structure in the upper region; tergite V possess 2 pair of spine and tergite VI consists of 3 pair of spine. Position of the telson is equal to uropods.

Remarks

Alcock (1901) clearly differentiated that last three abdominal tergite portions are strongly carinated in *P. pennata* and which is not observed in *P. affinis affinis*. But the specimen collected from the Andhra Pradesh by Lalitha Devi (1986) stated *Pontocaris affinis affinis* need to be treated as the junior synonym of *P. pennata*. Later (Chan, 1996) clarified that *P. affinis affinis* and *P. pennata* they can be differentiated though lateral sinous ridge on abdominal tergite III being continuous in *P. affinis affinis* instead (*vs.* interrupted lateral sinous ridge on abdominal tergite III in *P. pennata*). Furthermore, Chan (1996) provided the remark and mentioned that thoracic sternites shows the difference between *P. affinis affinis* and *P. pennata*.

DISCUSSION

Crangonid shrimps are generally regarded as the deep-sea shrimps found at the depth of 250-350 m. Syntypes of Alcock (1901) specimens were harvested at depth of 102-106 m. Around 100 years before Alcock (1901) collected the specimen from Bombay coast but Gujarat is located far away from Bombay after these much years the occurrence of *Pontocaris affinis affinis* is noted which shows the distribution of *P. affinis affinis* around the northwest coast of India. Purushothaman et al. (2018) observed the crangonid shrimp, *P. affinis affinis* during September, 2014 from Kerala coast at depth range of 250-350 m depth (similar to the present study). As per IUCN (2023) the species is categorized as Not Evaluated (NE) because the species is rarely observed in the fishery along the coast. The encounter of the species in the Gujarat region may be related to a decline of pelagic and demersal fishery resources resulted in the

exploitation of deep-sea resources, or this species is already present along the coast but has not been scientifically ignored or collected owing to a lack of taxonomical records. Also the dynamic water circulation between the deeper and surface water may resulted in accidental catch of this species (Sureandiran et al., 2023b).

CONCLUSION

The current study documents the first record of *Pontocaris affinis affinis* (Alcock, 1901) from the coastal waters of Gujarat. The present study thus increases the crustacean diversity of the marine resources of the Gujarat state.

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Sureandiran, B., Dave, T. H., Solanki, J. B., Karuppasamy, K., Suyani, N. K., & Vidhya, V. (2023b). First record of the pebble crab, *Liagore rubromaculata* (De Haan, 1835) (Decapoda, Brachyura, Xanthidae) from the west coast of India. *Crustaceana*, *96*(11-12), 1085-1093.

Sureandiran, B., Dave, T. H., Suyani, N. K., Karuppasamy, K., & Vidhya, V. (2023a). First record of two cylindrical crab species of the genus *Ixa* (Decapoda, Brachyura, Leucosiidae) from the eastern Arabian Sea, with a key to the species of *Ixa* recorded from the Indian coast. *Crustaceana*, *96*(10), 1035-1042.

Diversity of Brackish Water Ornamental Shrimps of Coastal Karnataka

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ABSTRACT

The estuaries and backwaters provide ideal homes for many shrimp species. A total of 19 species of brackish water shrimps belonging to 4 families are reported from the estuaries of Karnataka. They are vastly harvested due to commercial value such as human diet, manure production and ornamental trade. The status of the exploitation and the need for their conservation are highlighted in this paper. The study also brings out the first records of the shrimps with ornamental potential from Netravati and Nandini River near Mangaluru district, Karnataka coast. The findings of the present study will serve as baseline information to know the temporal changes taking place in shrimp diversity of Coastal Karnataka as a result of the anthropological activities in estuarine marine ecosystems.

KEYWORDS

Karnataka, Brackish water, Shrimps, Atyidae, Palaemonidae

INTRODUCTION

India has consistently been one of the primary contributors to global marine crustacean production. Among crustaceans, shrimps are the most commercially exploited group and they hold premier rank by virtue of their importance as an esteemed food of gourmets and because of their high export value (Dineshbabu et al, 2011). Shrimp cultivation has become increasingly significant in recent years, driven by rising demand both in the global and domestic markets. Ecuador is the world's top shrimp producer, with 30 percent (6.72 Million tonnes) of total

shrimp production, followed by India with 24 percent (5.38 Million tonnes) (Santhosha & Naik, 2022).

Karnataka is a prime state in India where shrimps are extremely harvested for trade and diet. Karnataka's coast (**Figure 1**) stretches across approximately 320 kilometres in the districts of Dakshina Kannada (62 km of coastline), Udupi (98 km) and Uttara Kannada (160 km) (ENVIS database, 2022). The coastal plains comprise narrow stretches of estuarine and marine plains of a width between 50 km and 80 km (ENVIS database, 2022). Karnataka brackish water ecosystem serves as essential breeding, resting, and nursery grounds for diverse organisms, including brackish water and diadromous vertebrate and invertebrate species.

Despite the abundance of natural resources, research in this region has been limited to edible prawns, with no significant work done on shrimps with ornamental potential from the families Atyidae (Genus Caridina), Palaemonidae (Genus Macrobrachium & Palaemon), and Alpheidae(Genus Potamalpheos & Alpheus). With rapid urbanization and an increase in urban population, many of these ecosystems will either disappear or become unfit for aquatic life. As a result, gathering baseline data on these species diversity is critical. The current study covers a wide range of themes, including species diversity, molecular taxonomy, habitat distribution, research challenges and conservation techniques for ornamental shrimps of coastal Karnataka.

In this investigation, five specific locations were chosen for sampling along the banks of the Netravati and Nandini rivers in Mangalore, Karnataka. The study successfully identified a total of 9 shrimp species, including three species under the genus *Caridina*, two under the genus *Macrobrachium*, two under the genus *Palaemon*, one species of *Alpheus* and one from the genus *Potamalpheops*. These findings offer crucial insights into the intricate dynamics of brackish water shrimp populations within the Netravati and Nandini rivers, contributing to a more comprehensive understanding of the aquatic ecosystem. The implications of these results extend to the formulation of effective conservation and management strategies, crucial for the sustainable preservation of brackish shrimp biodiversity in the region.

MATERIALS AND METHOD

Shrimps were collected from banks of rivers, under small rocks, leaf litter & half immersed vegetation etc. using a 12-inch & 2 feet depth dip and scoop nets that were gently dragged from the bottom to collect the shrimp specimens. Further, the live specimens were packed in airtight oxygenated polythene bags and carefully transported to the home aquaria at

Mangalore and photographed. Finally, the specimens were stored in 95% of molecular grade ethanol for further identification. The preserved samples were sent to the facility at Centre for Climate Change Studies, Sathyabama Institute of Science and Technology, Chennai for morphological identification. The specimens were dissected and examined under a stereo zoom microscope (Nikon SMZ25, Japan) equipped with a digital camera (DS-Fi3). The measurements were made using NIS-D elements software attached with the microscope camera. Illustrations on the body parts were drawn in GIMP-GINU Image Manipulation Program (The GIMP Development Team, GIMP 2.8.30, www.gimp.org 1997–2022) using 10moons 1060Plus Professional graphic tablet. Further, the examined materials were deposited as a voucher specimen in the Invertebrate collection Museum in the Centre for Climate Change Studies, Sathyabama Institute of Science and Technology, Chennai.

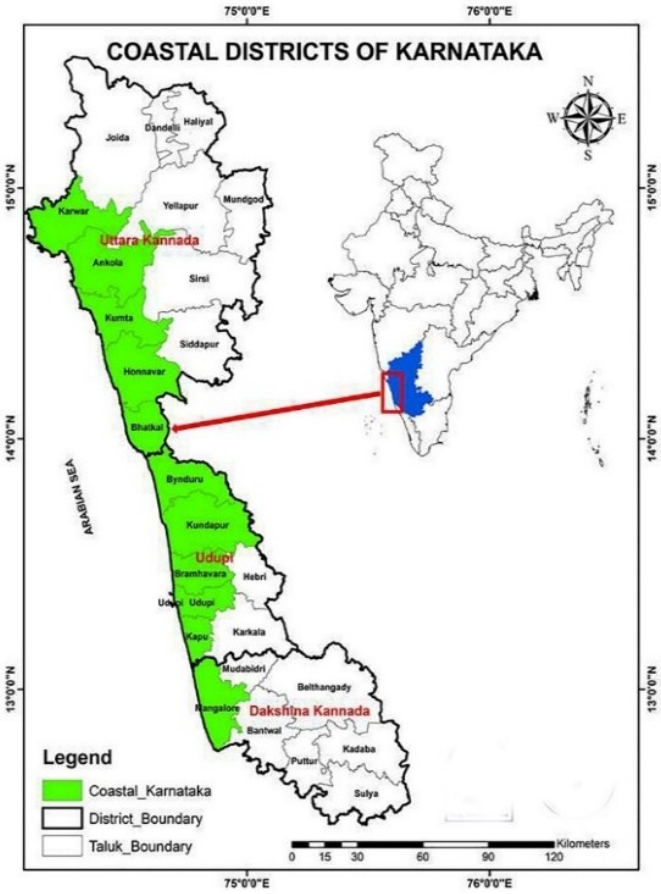


Figure 1: Map of coastal Karnataka (ENVIS, 2022)

Molecular identification: Total genomic DNA was extracted from ethanol-preserved adductor muscle using a commercial kit (OMEGA BIO-TEK E.Z.N.A. Blood & Tissue DNA Kit, USA) following the manufacturer's protocol. PCR amplification for the cytochrome oxidase subunit I (COXI) gene was carried out using LCO-1490 (5′ GGTCAACAAATCATAAAGATATTGG-3′) and HCO-2198 (5′-TAAACTTCAGGGTGACCAAAAAATCA-3′) primers (Folmer et al., 1994). Each PCR contained 12.5µL 2X PCR master mix (Amplicon, Denmark), 2.5µL each of the two primers (10nM), and 2.5µL of template DNA and nuclease-free water to make a final volume of 25µL. PCR conditions were as follows: initial denaturation at 95°C for 10 min, 35 cycles of 95°C for 45 sec, 45°C for 45 sec, and 72°C for 1 min, and final extension at 72°C for 10 min. PCR products were then visualized on 1% agarose and products with the high-intensity

band were sequenced with ABI Prism 3730 Genetic Analyzer based on BigDye® Terminator Chemistry. Chromatograms were visualized in BioEdit (Hall, 1999) and contigs were prepared. Blastn (https://blast.ncbi.nlm.nih.gov/Blast.cgi) was used to compare the sample COXI gene with published COXI sequences of related taxa from NCBI GenBank.

RESULTS

Systematic Accounts

Macrobrachium lamarrei (H. Milne Edwards, 1837)

Infraorder Caridea Dana, 1852

Family Palaemonidae Rafinesque, 1815

Genus *Macrobrachium* Spence Bate, 1868

***Macrobrachium lamarrei* (H. Milne Edwards, 1837) (Figure 2.A)**

Material examined: 4 specimens from Shasihithlu, Nandini River, Mangaluru, Karnataka (13°01'28.5"N;74°47'45.0"E), Coll: M.A.S

Diagnostic characters: Rostrum longer than antennular peduncle and longer than or equal to the antennal scale. Rostral formula 4-7+ 1-2/4-9 (1-2). In the upper margin of the rostrum a proximal group of 4-7 teeth are widely separated from the distal sub-terminal tooth. Rostrum exhibits considerable variation in length, number and arrangement of teeth. Carapace smooth with antennal and hepatic spine and is about 0.75 to 1.0 times as long as the rostrum. The second pereiopods are simple and similar in both the sexes. In this the finger is shorter than the palm (Finger/Palm=0.63-1.0); chela nearly 1/2 of the carpus (Chela/Carpus= 0.55-0.57 in males and 0.55-0.67 in females); merus longer than chela but shorter than carpus; ischium slightly longer than chela and more less equal to the merus. The appendix masculina of this species is peculiar and differs from other species by it longer appendix masculina which is subequal to or longer than the endopod. Exopod of the uropod lacks accessory sub apical spine. The berried females carried 38 to 289 eggs ranging from 0.85-1.2x1.0-1.6 mm.

Distribution: This species occurs in Fresh and Brackish water sometimes it is subterranean (Holthius, 1950). It is commonly available in Rivers, lakes and tanks in India.

Macrobrachium equidens (Dana, 1852)

Infraorder Caridea Dana, 1852

Family Palaemonidae Rafinesque, 1815

Genus *Macrobrachium* Spence Bate, 1868

***Macrobrachium equidens* (Dana, 1852) (Figure 2.B, C)**

Material examined: 4 specimens collected from Netravati river banks, Mangalore, Karnataka. (12°50'31.5"N; 74°51'36.9"E), Coll: M.A.S

Diagnostic characters: Rostral formula: (2-4) 9-12 / 4-7. Abdomen smooth, posteroventral angle of the fifth abdominal segment sharp; sixth abdominal segment 1.6 times longer than the fifth segment. Telson with 2 pairs of dorsal spines; posterior margin with sharp median extremity and 2 pairs of lateral spines, the inner spines surpassing the median extremity; presence of numerous plumose setae (approximately 14) on the posterior margin, among the internal spines. Basal segment of the antennular peduncle wide; stylocerite slightly sharpened, almost reaching half the length of the basal segment; anterolateral tooth reaching approximately the middle of the second segment, which is as long as the third segment. Scaphocerite 3.4 times longer than its width. Bilobed epistome with rounded lobes. First pereiopod narrower than the second, distal portion of the carpus longer than the scaphocerite; palm cylindrical, 1.3 times the dactyl length; carpus 3.7 times the palm length and 1.2 times longer than the merus. Second pereiopod with merus longer than the anterior portion of the scaphocerite and numerous rows of longitudinal spines in all articulations; both fingers of the chelae covered by a pappose setal pubescence; distal portion of the mobile finger of the chelae smooth, sharpened margin of the finger with 2 well-defined proximal teeth on the dactyl and one on the fixed finger, followed by 3 basal denticles; palm cylindrical slightly longer than fingers; carpus 1.5 times palm length and 1.7 times longer than the merus. Third pereiopod extends beyond the distal portion of the scaphocerite; propod with a longitudinal row of 6 spines on the inner margin, 3.5 times as long beyond the distal extremity of the scaphocerite and bears a longitudinal row of 6 spines on the inner margin, almost 3.4 times as long as the dactyl and the merus, 1.6 times the length of the carpus. The last three pereiopods are covered completely with small setae. Male appendage twice as long as the inner appendage and bearing numerous, irregular setae. *Macrobrachium equidens* exhibits two distinct color patterns. One features elongated yellowish-brown stripes extending across the translucent body, while the other displays numerous greenish-yellow spots distributed throughout the body.

Distribution: *Macrobrachium equidens* is native of the Indo-Pacific Region, although it has also been recorded as an exotic species in West Africa (Powell 1986). Atlantic coast of South America and Al- Mashaab river, East Al- Hammar Marsh, Southern Iraq.

Caridina gracilirostris (De Man, 1892) **(Figure 2.D)**

Infraorder Caridea Dana, 1852

Family Atyidae De Haan, 1849

Genus *Caridina* H. Milne Edwards, 1837

***Caridina gracilirostris* (De Man, 1892)**

Material examined: 10 specimens collected from Infant Jesus Church, Pavoor Uliya Island, Netravati river (12°51'33.8″N; 74°55'52.3"E) and 6 specimens from Shasihithlu, Nandini River, Mangalore, Karnataka (13°01'28.5"N;74°47'45.0"E), Coll: M.A.S

Description: Rostrum long, slender, distally upturned and distinctly overreaching antennal scale. Rostral formula (1 or 2) 5 to 8 + 1 or 2/ 26 to 29 dorsal teeth occupying proximal l/3rd region while distal 2/3rd portion unarmed; ventral teeth closely set and arranged almost up to tip. Carapace without pterygostomial spine but with a well-developed antennal spine. Cornea well pigmented. Antennular carina feebly developed, stylocerite long and slender, reaching 3/4th of the basal segment; antero-lateral tooth long and pointed; aesthetasc bearing segments 20 to 25 in females and 38 to 45 in males. Antennal scale long and about 4 times as long as broad. Mouthparts normal; mandibles asymmetrical and without palp, third maxilliped with an epipod and extending up to 2nd segment of antennular peduncle; exopod reaching middle of the 2nd segment of endopod. First chelipeds extending up to basal segment of antennular peduncle; carpus only slightly excavated anteriorly. Second chelipeds slender and extending up to antennular peduncle; carpus slender and without anterior excavation. Third pereiopod extending up to 2nd segment of antennular peduncle; dactylus with 8 to 11 (mostly 8 or 9) spines; merus bearing 3 stout spines along its inner border. Fourth pereiopod similar to third, while fifth extending up to basal segment of antennular peduncle; dactylus with 33 to 45 (mostly 33 to 38) comb-like spinules; merus with 2 stout spines along inner margin. Epipod present on first 4 pereiopods while all 5 pereiopods bear 1 or 2 setobranchs. Abdomen slender, with a dorsal hump on 3rd segment. Endopod of first pleopod of male 2.90 to 3.30 times as long as broad, 0.18 to 0.27 times exopod and without bearing an appendix interna Appendix masculina 0.31 to 0.36 times endopod and 1.50 to 2.00 times appendix interna. Telson with 4 or 5 (mostly 4) pairs of dorsal spines and 3 pairs of posterior processes that are sparsely plumose excepting outermost pair. Uropod diaeresis with 6 to 10 (mostly 6 or 8) spinules. Eggs and development: Eggs

slightly yellowish, small measuring 0.26 to 0.37 x 0.47 to 0.58 mm. Fecundity 150 to 750. Development prolonged with 6 larval stages.

Distribution: River near Maros, Sulawesi (Celebes), Indonesia, Cochin backwaters, Karnataka, Pondicherry, Kolkata, Philippines, Australia and Solomon Islands.

Caridina gracilipes (De Man, 1892)

Infraorder Caridea Dana, 1852

Family Atyidae De Haan, 1849

Genus *Caridina* H. Milne Edwards, 1837

***Caridina gracilipes* (De Man, 1892) (Figure 2.E)**

Material examined: 10 specimens collected from Infant Jesus Church, Pavoor Uliya Island, Netravati River (12°51'33.8″N; 74°55'52.3"E) and Shasihithlu, Nandini River, Mangalore, Karnataka (13°01'28.5"N;74°47'45.0"E), Coll: M.A.S

Description: Rostrum straight, equal to or slightly longer than antennal scale. Rostral formula (1 or 2) 10 to 24 + 0 to 2 / 11 to 22 mostly and 17 to 20 + 1 or 2 /14 to 17 dorsal margins with a distal gap which may rarely be interrupted by 1 or 2 intermediate teeth. Carapace without pterygostomial spine but with a prominent antennal spine at orbital expansion. Cornea round and well pigmented. Antennular carina poorly developed; stylocerite reaching 3/4th of basal segment; anterolateral tooth sharply pointed and reaching proximal l/3rd of 2nd segment. Aesthetascs bearing segments 24 to 33 in' females while 45 to 50 in males. Antennal scale about 3-4 times as long as broad. Mouthparts as in figure. Third maxilliped with an epipod and extending up to 2nd segment of antennular peduncle. First chelipeds extending up to base of antennular peduncle; carpus slightly excavated anteriorly. Second chelipeds slender and extending up to 2nd segment of antennular peduncle; carpus comparatively slender and without anterior excavation; Third perieopod extending up to tip of antennular peduncle; dactylus with 7 to 10 (mostly 8 or 9) spines; merus with 2 to 4 big spines and ischium with a single big spine along inner margin. Fourth pereiopod almost similar to third. Fifth pereiopod extending up to 2nd segment of antennular peduncle; dactylus bearing 50 to 70 spinules on posterior margin giving a comb-like appearance; merus almost double of carpus and with 2 or 3 stout spines but ischium without any spine. All five pereiopods with 2 setobranchs each while only first four pereiopods possess epipods. Abdomen with a prominent hump on 3rd segment. Endopod of first

pleopod of male 0.25 to 0.30 times exopod, 2.0 to 2.5 times as long as broad and with a distinct appendix interna. Appendix masculina 0.3 to 0.4 times as long as endopod and 1.5 to 1.8 times appendix interna Preanal carina with a strong spine and with a few setae. Telson posteriorly either with a triangular median point flanked by 3 pairs of processes or blunt bearing 3 or 4 + 1+ 3 or 4 processes. Uropod diaeresis with 9 to 12 (mostly 10 or 11) spinules. Eggs and Development: Eggs yellowish, small, measuring 0.24 to 0.38 x 0.38 to 0.55 mm. Fecundity: 200 to 850. Development prolonged with 7 larval stages before post larvae.

Distribution: Port Canning in Dhappa, Calcutta, Tamil Nadu, Cochin backwater, Karnataka Celebs, Indonesia, Mindoro Island of Philippines.

Caridina multidentata (Stimpson, 1860)

Infraorder Caridea Dana, 1852

Family Atyidae De Haan, 1849

Genus *Caridina* H. Milne Edwards, 1837

***Caridina multidentata* (Stimpson, 1860) (Figure 2.F)**

Material examined: 2 specimen collected from Infant Jesus Church, Pavoor, Uliya Island, Netravati River (12°51'33.8″N; 74°55'52.3"E). Coll: M.A.S

Description: The rostrum reaching the middle of the joint of the last peduncle of the antennae; dorsal ridge lamellate-expanded, arched, above the bases of the eyes to the east and serrated with 20-30 denticles; extremity robust, sharp, scarcely denticulate; lower margin 14-toothed. The anterior margin of the carapace is armed with an antennal spine. Feet of the second pair surpassing the pedicel of the antennae; the wrist with a longer hand; fingers depressed, brushes dense, broad, almost fan-shaped. Dactyls of the hind feet short, not exceeding the seventh part of the length of the penultimate joint. The caudal segment is not concave on the back, furnished with five pairs of spines; lateral lamellae large, nearly twice as long as the caudal segment, subtriangular ducts.

Distribution: Indonesia, Japan, Madagascar, India.

Remarks: This is the first reported sighting of the species in India, and it may have escaped from ornamental trade. Further investigation is in process.

Palaemon styliferus (H. Milne Edwards, 1840)

Infraorder Caridea Dana, 1852

Family Palaemonidae Rafinesque, 1815

Genus *Palaemon* Weber, 1795

***Palaemon styliferus* (H. Milne Edwards, 1840) (Figure 2.G)**

Material examined: 5 specimens collected from Netravati river (12°50'10.9"N 74°51'32.7"E). Coll: M.A.S

Description: The rostrum is long, reaching beyond the apex of the antennal scale by a distance varying from one third to three fifths of its length. The proximal portion is strongly elevated dorsally forming a well-marked basal crest which bears 5 to 7 (usually" 6) procu rved teeth. Lower mar gin bears 6 to 10 teeth. The carapace bears a small and inconspicuous antennal spine. The basal segment of the antennular peduncle bears a small spine on the lower surface near the middle of its internal margin. The first pereiopods reach almost or quite to the end of the antennal scale. The merus and carpus are about equal; the chela is barely three fifths the length of the carpus and the fingers are only a trifle longer than the palm. The last three pairs of legs are slender and usually bear short setae on the posterior margins of the ischium, merus, carpus and propodus. The second pereiopods vary considerably in length. It will be noticed that the ischium, merus, carpus and palm decrease successively in length, but that in very large males the carpus is sometimes equal to, or a little longer than the merus. The last three pairs of legs are slender and usually bear short setae on the posterior margins of the ischium, merus, carpus and propodus.

Distribution: Northern coast of Borneo and Indonesia westward via Thailand and India to Pakistan, southwestern Iraq and Kuwait adjacent to the Persian Gulf, Iranian locality, Abadan.

Palaemon sp. (Weber, 1795)

Infraorder Caridea Dana, 1852

Family Palaemonidae Rafinesque, 1815

Genus *Palaemon* Weber, 1795

***Palaemon* sp. (Figure 2.H)**

Material examined: 8 specimen collected from banks of Netravati river (12°50'10.9"N 74°51'32.7"E) Coll: M.A.S

Description: Rostrum straight, slightly curved upwards distally, reaching distal margin of third antennular peduncle. Dorsal margin with 9 teeth. Ventral margin slightly curved upwards, with 2-3 teeth. Antennular peduncle three segmented. Middle segment is the shortest. Basal segment of antennular peduncle broad, 4.75 times as longer than middle and 2.64 times as long as the terminal segment. Two branches of outer flagellum of antennule fused basally for 9 segments. Antennular peduncle three segmented. Middle segment is the shortest. Basal segment of antennular peduncle broad, 4.75 times as longer than middle and 2.64 times as long as the terminal segment. Two branches of outer flagellum of antennule fused basally for 9 segments. Telson conical and slender with two pair of dorsal spines. First and second pair of dorsal spines are located at 1.38 um and 1.95 um from the anterior region of telson. Second pleopods with well-developed appendix interna, almost reaching middle of endopod. First pereiopod slender; ischium, shorter than merus; carpus 1.5 times longer than propodus, 2.95 times than dactyl and 1.12 times than merus. Palm cylindrical, equal length to fingers; fingers slender Second pereiopods unequal, dorsal surfaces of dactyl, propodus, carpus, merus and ischium. Ischium 1.47 times as long as merus; merus subequal to 1.26 times of carpus; carpus about 0.8 times as long as propodus; propodus 2.95 times as long as dactyl. Third to firth pereiopods nearly equal sized, slender and smooth. The propodus of pereiopods have 4 prominent spines on the ventral margin.

Live colour pattern in wild, the carapace is pale brown. A yellow-dots are found on the dorsal surface from the rostral tip up to the 5th abdominal segment. Lateral sides of the abdomen brown with sparsely scattered yellow dots. first to fifth pereiopods are translucent. In aquarium, the colour fades over time until the body appears translucent. Dorsal body spotted with brown dots from carapace to last abdomen segment.

Distribution: Known only from banks of Netravati river, Dakshina Kannada District, Western ghats (Karnataka), India.

Remark: The specimens from Netravati river are here referred to *Palaemon* sp., further investigation is in progress.

Alpheus sp. (Fabricius, 1798)

Infraorder Caridea Dana, 1852

Family Alpheidae Rafinesque, 1815

Genus *Alpheus* Fabricius, 1798

***Alpheus* sp. (Figure 2.I)**

Material examined: Single specimen collected from Netravati river (12°50'10.9"N 74°51'32.7"E). Coll: M.A.S

Description: Rostrum carinate in dorsal midline, with V-shaped post-rostral plate. No tooth or tubercle on midline of carapace. Lateral margin of the rostrum straight. Setae are absent on the margins of rostrum. Orbital hoods unarmed. Frontal margin between rostrum and orbital hoods more deeply notched No tooth or tubercle on midline of carapace Ventrolateral tooth on basal segment of antennal peduncle distinctly overreaching stylocerite. Scaphocerite with distal tooth distinctly overreaching end of antennular peduncle.

Fingers of minor chela strongly curved in vertical plane. Minor first chela with balaeniceps setae. Palm of major chela without sharp tooth at lateral articulation with dactylus. Palm notched both dorsally and ventrally. Dactylus of major chela more bulbous distally; transverse notch on mesiodorsal surface of palm of major chela broader and less sharply defined. Dactylus plunger as long as broad. Distal margin of pollex of major chela with rounded ending. Palm of the minor first chela distinctly longer than broad (fingers as long as palm). Merus of first chelipeds armed with sharp tooth at distal end of ventromesial margin. Uropodal exopod with one sharp tooth on posterolateral margin, lateral to spiniform setae.

Distribution: Known only from banks of Netravati river, Dakshina Kannada District, Western ghats (Karnataka), India

Remark: The specimens from Netravati river are here referred to *Alpheups* sp., further investigation is in progress.

Potamalpheops sp. (Powell, 1979)

Infraorder Caridea Dana, 1852

Family Alpheidae Rafinesque, 1815

Genus *Potamalpheops* Powell, 1979

***Potamalpheops* sp. (Figure 2.J)**

Material examined: Two specimen collected from Shasihithlu, Nandini River, Mangaluru, Karnataka (13°01'28.5"N;74°47'45.0"E), Coll: M.A.S

Description: Rostrum acutely pointed and very short, failing to attain midlength of 1st segment of antennular peduncle. Extra-corneal spine well developed; infra-orbital projection broad and shallow. Carapace not covering eyes dorsally; cardiac notch present on posterior margin. Eye with setae on anteromesial margin. Antennular peduncle long, with 2nd segment at least as long as 1st, and usually over twice as long as 3rd. Scaphocerite with long lateral spine. Chelae of 1st legs smooth, subequal, carried either extended or flexed, fitting into shallow groove in merus if carried fully flexed; cutting edges of fingers straight or with a few blunt teeth not closely interfitting. Carpus of 2nd leg with five articles. Third to 5th legs with movable spines on merus; dactyli simple. Sixth abdominal pleura articulated. Posterior margin of telson rounded, with one or two pairs of spines; anal tubercle absent. Uropodal exopod with outer part of anterior margin of diaeresis produced posteriorly as a toothed lamella. Branchial formula: 5 pleurobranchs, 1 arthrobranch (on 3rd maxilliped) and 8 epipods (compound ones on 1st-4th legs, setobranch alone on 5th leg). Live colouration: Body generally semi-translucent, with reddish or violet chromatophores.

Distribution: South America, West Africa, South and southeastern Asia, Karnataka

Remark: The specimens from Nandhini river are here referred to *Potamalpheops* sp., further investigation is in progress. This is the first record of this genus from India.

DISCUSSION

Due to the existence of four major rivers (Nethravati, Gurupura, Nandini and Shambhavi) and its proximity to the sea, Mangalore (Dakshina Kannada District, Karnataka) is home to a diverse range of brackish water species. Despite the abundance of natural resources, exploration into ornamental shrimp varieties has been notably limited. Research in this region has primarily focused on edible shrimps, with no significant work done on the families Atyidae (Genus *Caridina*), Palaemonidae (Genus *Macrobrachium* and *Palaemon*) and Alpheidae (*Potamalpheops* and *Alpheus*).

In the present study, 9 species are collected from Karnataka. *Macrobrachium lamarrei, Macrobrachium equidens, Caridina gracilirostris, Caridina gracilipes, Caridina multidentata, Palaemon styliferus*, *Palaemon* sp., *Alpheus* sp., *Potamalpheops* sp. *Potamalpheops* specimens collected from Karnataka is the first report of the genus from India. *Caridina multidentate*, which is widely available in trade is collected from Netravati river in Karnataka. Trade is more focused

in these regions, that hobbyist or aquarists might have released *Caridina multidentata* to wild expecting it to multiply in the waterbodies. This could lead to competition among other species co-existing in the same habitat (Blaha, 2022).

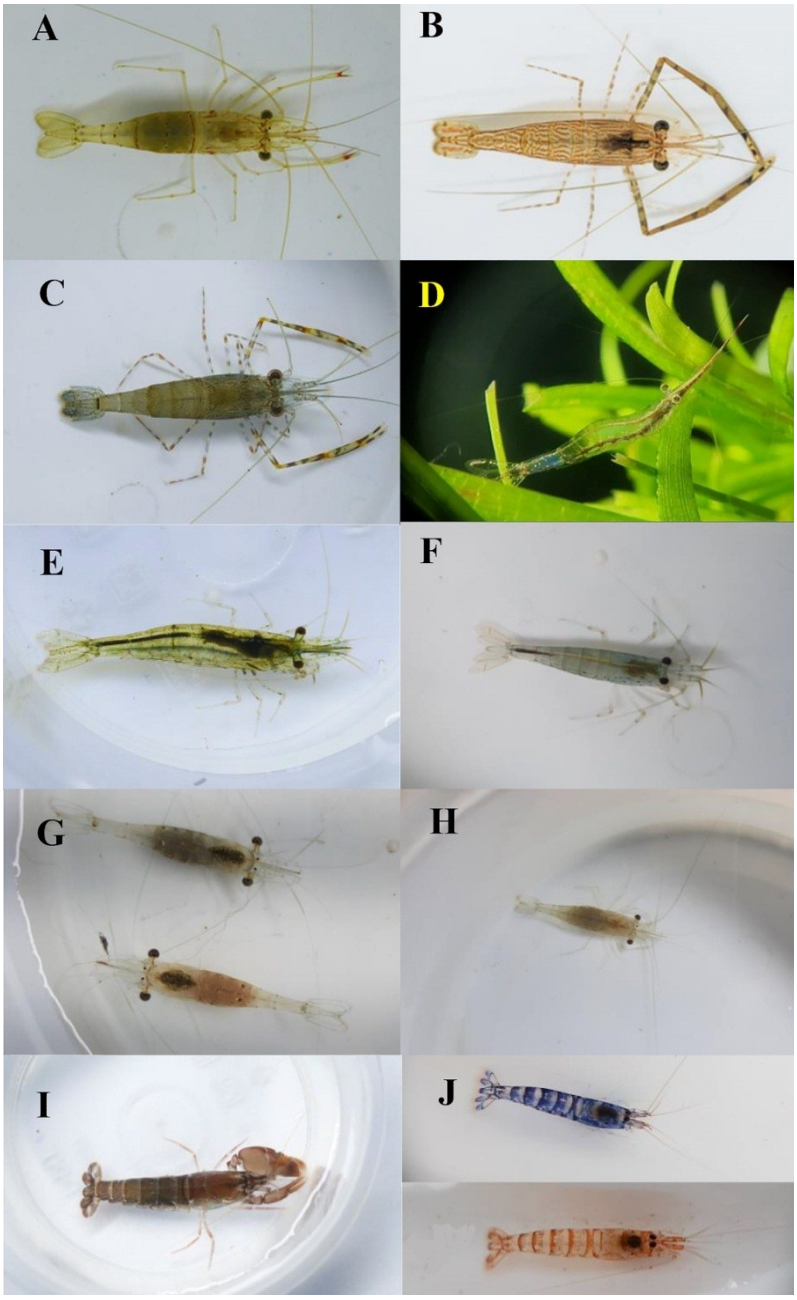


Figure 2. A. *Macrobrachium lamarrei*, **B &** C. *M. equidens*, **D.** *Caridina gracilirostris*, **E.** *Caridina gracilipes*, **F.** *Caridina multidentata*, **G.** *Palaemon styliferus*, **H.** *Palaemon* sp. **I.** *Alpheus* sp., **J.** *Potamalpheops* sp.

Furthermore, the river interlinking project in India would establish connectivity routes and help expand the range of potentially invasive species, especially in areas rich in threatened endemic species, such as the Western Ghats. Three species of *Alphues* shrimps are reported from Karnataka so far. The *Alpheus* specimen collected from Netravati river exhibit several morphological variations compared to the existing ones. Many more species of different taxa is yet to be explored from the coasts of Karnataka. Rapid urbanization and a growing urban population are jeopardizing ecosystems, causing their disappearance or unsuitability for aquatic life.

Recently the National Water Development Agency (NWDA) has been entrusted with the work of inter-linking of rivers under National Perspective Plan (NPP). Under the Peninsular Rivers Development Component of NPP, river links are designed in Karnataka as Bedti - Varda link and Netravati – Hemavati link. The proposed interlinking of rivers in India, coupled with various existing threats to local ecosystems such as dam construction (Kano et al., 2016), habitat modification, loss of natural habitats (Li et al., 2020), the blooming ornamental trade and the introduction of non-native species and alterations in river flow (Lakra et al., 2011) can have far-reaching consequences. These impacts include disrupting the migratory patterns of native species, reducing habitat availability for native aquatic fauna, altering breeding grounds, and changing water temperature (Lakra et al., 2011; Morales-Marin et al., 2019). It is crucial to recognize these potential consequences as they pose significant challenges to the conservation and management of India's aquatic ecosystems in the context of river linking. However, river linking can introduce these species into sensitive zones, leading to negative impacts on the local biodiversity. The interlinking of rivers has the potential to connect vulnerable areas that harbour threatened species to invasive alien species hotspots.

CONCLUSION

The present study investigates the status of exploitation of ornamental shrimps of the Central Western Ghats. Because the exploitation of shrimps of the family Atyidae and Palaemonidae for the ornamental trade is more concentrated in this region in terms of demand and supply. The exact number of species that are currently available in the trade is not known due to the disorganised, multifaceted and fragmented supply system. Such continuous exploitation of Data Deficient species may cause population decline and ecological imbalance, given a lack of laws to protect shrimps harvested for the ornamental trade. The absence of a

regulatory framework that effectively prevents the entry and dispersal of invasive alien species among different water bodies in India could significantly aggravate the impacts of river linking (Banerjee et al., 2021). This concern is compounded by the ever-increasing aquaculture trade and the implementation of biocontrol programs, both of which continue to introduce exotic species into local water bodies. Consequently, as river linking progress, new regions are at risk of invasion. Inter-basin water transfers such as river interlinking are recognised as major pathways for the expansion of aquatic invasive species.

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Computational approach-based identification of potential urease inhibitors from macro-algae

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ABSTRACT

The urease enzyme has gained recognition in causing severe diseases to humankind, like, *Helicobacter pylori* infection. Besides the bacterial ureases, fungal ureases have also been listed in the current list. The present study identifies the potential inhibitors of ureases for two fungal pathogens namely, *Aphanomyces astaci* and *Aspergillus sydowii* from seaweed (macro-algae) through structure-based virtual screening, where several compounds were analyzed that have drug-like properties. Molecular docking using the CB-dock online tool, followed by identifying available FDA-approved drugs using Swiss similarity, yielded few molecules that can be employed for the diseases associated with these fungal ureases. From the docking results followed by Swiss similarity, Eckstolonl and 4'-Chlorostypotriol triacetate can be used but demands further studies before marketed. This computational study thus concluded the efficient employment of seaweed metabolites as effective urease inhibitors. Still, it also demands high-throughput screening assays and *in vitro* studies.

KEYWORDS

Fungal diseases; urease inhibitors; seaweed; molecular docking; Swissimilarity.

INTRODUCTION

Urease (urea amidohydrolase; E.C. 3.5.1.5) is a metalloenzyme containing nickel (Ni^{2+}) that carries out the urea hydrolysis into carbon dioxide, ammonia, along with carbamate (Zimmer 2000), at last disintegrates to form another ammonia molecule and bicarbonate (Mobley and Hausinger 1989). It is also found in many plant seeds, animal tissues, and microorganisms (Konieczna et al. 2012). Irrespective of their advantages in the environment, their higher enzymatic activity can become a reason for various pathogenic conditions in human beings, plants, animals, and marine organisms. In human beings, it causes urinary and gastrointestinal tract infections, peptic ulcers, gastric cancer, kidney stone formation, pyelonephritis, encrustation

in the catheter, atherosclerosis, ammonia encephalopathy, tuberculosis, hepatic coma, cardiovascular disease, and many other prolonged-lasting diseases (Collins and D'Orazio 1993; Jang et al. 2008; Mobley and Hausinger 1995).

Recently, the urease enzyme has gained attention due to its positive and negative impacts on human health (Collins and D'Orazio 1993; Rutherford 2014), the environment (Anbu et al. 2016; Glibert et al. 2006; Jalilvand et al. 2020; Marín et al. 2021), and agriculture (Allende-Montalbán et al. 2021; Bremner 1995; Dawar et al. 2012; Dewi et al. 2018). The urease enzyme has been found to function as a potent factor for the virulence among many bacterial pathogens, like *Helicobacter pylori* (Mobley 1996), as well as fungal pathogens such as *Cryptococcus* spp. (Cox et al. 2000) and *Coccidioides posadasii* (Mirbod-Donovan 2006). Other than these widely reported ureolytic pathogens, other fungi that secret urease enzymes also threaten the animal kingdom. *Aspergillus sydowii* (also called *Emericella sydowii*) is a prominent fungal pathogen of marine corals as well as humans, which causes adverse effects in humans (causes Aspergillosis, Onychomycosis, Keratomycosis, Black grain mycetoma, etc.) plants (causes contamination of food like wheat especially Qu and in the brewing of rice wine) and aquatic organisms (reported to cause the death of many corals in the Caribbean Sea and also many marine organisms like *Gorgonia ventalina* (sea fan), *Gorgonia flabellum* (sea fan), and Flamingo tongue snail (sea snail) (Hayashi et al. 2016). The first reported from humans were in the USA isolated from integumentary system (e.g., skin and nails) infections in 1989 (Summerbell et al. 1989), and very recently in an HIV positive individual's fingernail proximal subungual onychomycosis (Borgohain et al. 2019).

The acceleration in the growth of these mammalian pathogens, which are urease producers, is by the consumption of urea evenly distributed throughout the human body (Rutherford 2014). As a result of this tremendous medical significance, potential inhibitors of urease with ameliorated stability and little toxicity should be appreciated as an effective remedy to cure diseases caused by pathogens that are ureolytic (Rego et al. 2018). In human beings, Aspergillosis is responsible for 24% of all invasive fungal infections, with one out of every five patients developing deadly invasive illnesses (Rodriguez-Palacios et al. 2016). Similarly, *Aphanomyces astaci* is a fungus that uses crayfish (European *Astacus*) as a host and can cause crayfish plague, which dies within a few weeks after being infected. *A. astaci* belongs to the group of organisms called water molds. When it infects the naive population of highly vulnerable

crayfish species, most of them die within a short time, causing the bottoms of lakes, rivers, and streams to become infested (Filipová et al. 2013). The uncontrolled expansion of plague-carrying crayfish species has made humans the most important vector for dispersal and transmission (Diéguez-Uribeondo 2006). Despite the fact that *A. astaci* has been discovered to have no direct effect on other biotas except crayfish, they may have an indirect effect on the abundance of different animal and plant species because crayfish is a critical species in the food web structure (Nyström 2002; Vrålstad et al. 2011).

Researchers can find novel compounds that can recognize and bind to a specific receptor thanks to the widespread recognition and accessibility of hundreds of chemical databases, allowing for a rational investigation through virtual screening, which aids in filtering several compounds based on virtual model specifications end-users. Earlier, this task was done manually by medicinal chemists in the absence of the current virtual methods that can handle numerous compounds (Leelananda and Lindert 2016). Since rational drug design technique nowadays is achieved by the structure and ligand-based computer-aided drug design (Floresta et al. 2018a; Floresta et al. 2018b; Floresta et al. 2018c; Floresta et al. 2018d; Greish et al. 2018; Salerno et al. 2018), a similar method was used in the current investigation to find novel compounds that are both virtually powerful and selective in their interactions with the receptors of interest. After replacing historical high-throughput screening, which was accompanied by high costs and low efficiency, *in-silico* virtual screening (VS) has attracted considerable attention for hit discovery and fundamental technologies in drug research and development (HTS) (Kar and Roy 2013; Khanna 2012; Mishra et al. 2008; Wang et al. 2020). A common routine technique in structure-based virtual screening is molecular docking, which has been widely utilized to discover prospective hits from a chemical library, better comprehend the binding modes between proteins and ligands, and estimate their binding affinities (Ye et al. 2020). The usage of potent urease inhibitors for a particular disease may be efficient for drug development (Konieczna et al. 2012).

The current study prospects identifying urease inhibitors from macro-algae against two fungal ureases of *A. sydowii* and *A. astaci*. A broad recognition has been achieved in the bioprospecting aspect by cataloguing marine chemicals due to their applications in drug development from marine sources. The present study employed the publicly accessible Seaweed Metabolite Database (SWMD), which contains detailed information on all known chemicals as well as their biological function. Ultimately, the similar drug molecules, which can be employed

as potential urease inhibitors, are also addressed in the current study using SwissSimilarity, an online, simple yet powerful ligand-based virtual screening (LBVS) tool for the rapid screening of compounds. Further docking studies of the selected FDA-approved drugs with both ureases have provided detailed information for determining the potential urease inhibitors, which can be further screened and studied *in vitro* for considering them as a drug molecule.

MATERIALS AND METHODS

Protein model generation and quality assessment

Sequences of urease enzymes of *A. sydowii* (A0A1L9T0Q0) and *A. astaci* (A0A397FEZ9) were obtained from the UniProtKB (https://www.uniprot.org/uniprot/). For the computational prediction of their structures, template searches were carried out using Phyre2 (http://www.sbg.bio.ic.ac.uk/~phyre2/html/page.cgi?id=index) (Kelley et al. 2015) and against the Swiss-model template library (https://swissmodel.expasy.org/) (Arnold et al. 2006). After giving the sequence input, the Swiss model gives a predicted model as an output through homology modelling with a matching template. The QMEAN scoring function was used to evaluate the global and per-residue model quality (Benkert et al. 2011). The template with the preferable sequence identity and resolution obtained from the Swiss model server was 4g7e.1.A with an identity of 56.27% for *A. sydowii* and 65.10% for *A. astaci* (Studer et al. 2020; Waterhouse et al. 2018).

Protein structure analysis

The secondary structure analysis, stereochemical properties, and Ramachandran plot of both urease structures were generated by Molprobity server (http://molprobity.biochem.duke.edu/) (Chen et al. 2010; Williams et al. 2018) and Protparam (Gasteiger et al. 2005). The web server VADAR 1.8 was used to predict the protein architecture and statistical percentage values of receptor proteins helices, beta-sheets, coils, and turns (Willard et al. 2003). The active sites for both the enzymes were predicted using the online server 3DLigand site. The catalytic region of the urease enzyme includes both hydrophilic and hydrophobic residues, which were identified using a solvent hydrophobicity graph generated using Discovery studio 2.1.0.

Prediction of ligand binding site

The 3DLigandSite server was used to determine the ligand-binding site in the simulated protein structure (http://www.sbg.bio.ic.ac.uk/3dligandsite/) (Wass et al. 2010).

Ligand selection

SeaWeed Metabolite Database (SWMD) is a database that has active small molecules and inhibitors(https://www.swmd.co.in/). There are no known clinically approved drugs reported from Seaweeds identified as potential urease inhibitors (Al Sharie et al. 2020; Davis et al. 2011). Hence, these seaweed metabolites were screened for possible inhibitory effects on the urease subunit. Thus, 1110 compounds from SWDM were retrieved in MOL format. These drug compounds were screened using Autodock Vina against the active site of urease.

Toxicity prediction

In drug design development, toxicity prediction of compounds holds an important part. The toxicity of 1110 compounds from the SeaWeed Metabolite Database was analyzed using the ProTox II server (https://tox-new.charite.de/protox_II/), a virtual platform that enables to predict toxicities of molecules that are smaller in size. The server classifies the metabolites ranging from one to six, six being the best non-toxic molecule and one being the toxic one. To get better results, non-toxic metabolites are selected based on Lipinski's rule of five (https://en.wikipedia.org/wiki/Lipinski%27s_rule_of_five). Comparing the metabolites with these two factors, 28 ligands were finalized for screening (Banerjee et al. 2018).

Virtual Screening

Virtual Screening (VS), which is based on molecular docking, is a useful tool for finding new hit compounds in drug development that analyses small molecule libraries for structures that are most capable of binding to a therapeutic target, typically a protein receptor. CB-Dock (http://cao.labshare.cn/cb-dock/) basically uses docking software Autodock Vina to molecularly dock key active chemicals with core targets (Liu et al. 2020).

Molecular Docking

CB-Dock, a commonly used blind docking method coupled with AutoDock Vina that estimates the center and size of the cavity, predicts the binding activities of proteins to well-designed compounds Liu et al. 2020). To generate a set of points representing the solvent-accessible surface and a ranking chart of the cavities based on their sizes, this user-friendly tool requires PDB formats of the proteins and a ligand file in the MOL2 or SDF formats. The ligand and receptor styles were selected and set to "spacefill" and "cartoon," respectively. "Element" and "chain" were used to choose the ligand and receptor colour. The minimized enzyme models of *A. sydowii* and *A. astacii* were created using Discovery Studio 2.1.0 and were given to CB-

dock as input receptor molecules. The 28 ligands of Class 6 toxicity obtained through toxicity prediction were the inputs for ligand molecules. Following that, a docking box was customized to exclude as many irrelevant positions as possible. The centres and sizes of the binding sites were calculated using a unique curvature-based cavity detection technique. Autodock Vina is used to dock the ligands, and it reveals the binding affinity through binding activities and the Vina score. The stability of the ligand-receptor binding is determined by the Vina score, in which the ligand-receptor binding is more stable when the Vina score is negative (Liu et al. 2020; Liu et al. 2021). For all of the docked ligand-protein complexes, Discovery Studio 2.1.0 was used to create a three-dimensional representation.

SWISS similarity search for FDA approved drugs

The similarity of the highly interacting ligands with both ureases was screened using Swiss similarity (http://www.swisssimilarity.ch/). This online tool screens the ligand-based molecules of large libraries using 2D molecular fingerprints and 3D similarity methodology. It is a component of the SIB Swiss Institute of Bioinformatics' important endeavour to integrate internet resources for computer-aided drug design (Daina et al. 2016). It finds the best match for the ligands from the available FDA-approved drugs.

Repurposing FDA approved drugs as urease inhibitors

The obtained FDA-approved drugs from Swiss Similarity have docked again with the urease using the CB dock tool. The binding affinity scores were compared with the natural metabolites derived from seaweeds and the FDA-approved drugs. Those with the least binding affinities were selected as the practical and potent urease inhibitors for the respective organism. The detailed methodology of the work has been mentioned in **Figure 1.**

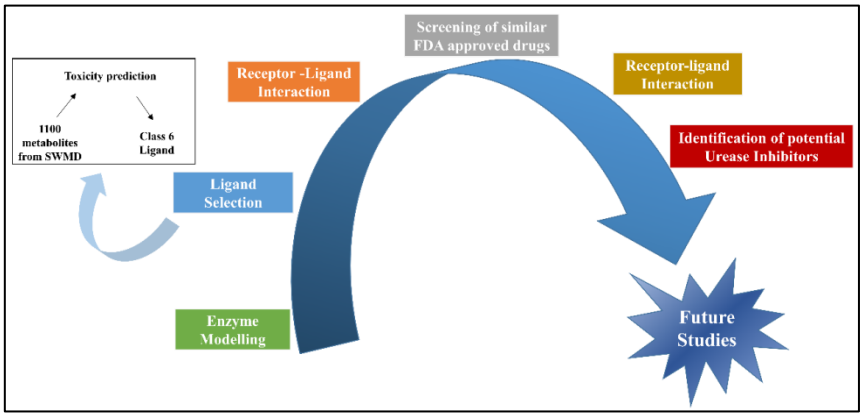


Figure 1. Flow-chart for the methodology

RESULTS

Enzyme model from SWISS-MODEL

Table 1 depicts the protein modelling using the Swiss model of *A. sydowii* and *A. astaci* ureases. Homology modelling revealed that 99% (range of 1-836 and 1-827 for *A. astaci* and *A. sydowii,* respectively) of the input sequence have been modelled, using the standard template, 4g7e.1.A (**Figure 2 (b)** and **(d)**). It is also evident from the analysis that *A. astaci* urease had the relatively highest value in sequence identity than *A. sydowii* urease, sequence similarity, and Q-mean of the protein sequence. The Phyre2 analysis also confirmed the current investigation (**Table 2**). The protein model of *A. astaci* and *A. sydowii* was obtained using Discovery Studio 2.1.0 represented in **Figure 3 (a** and **b)**.

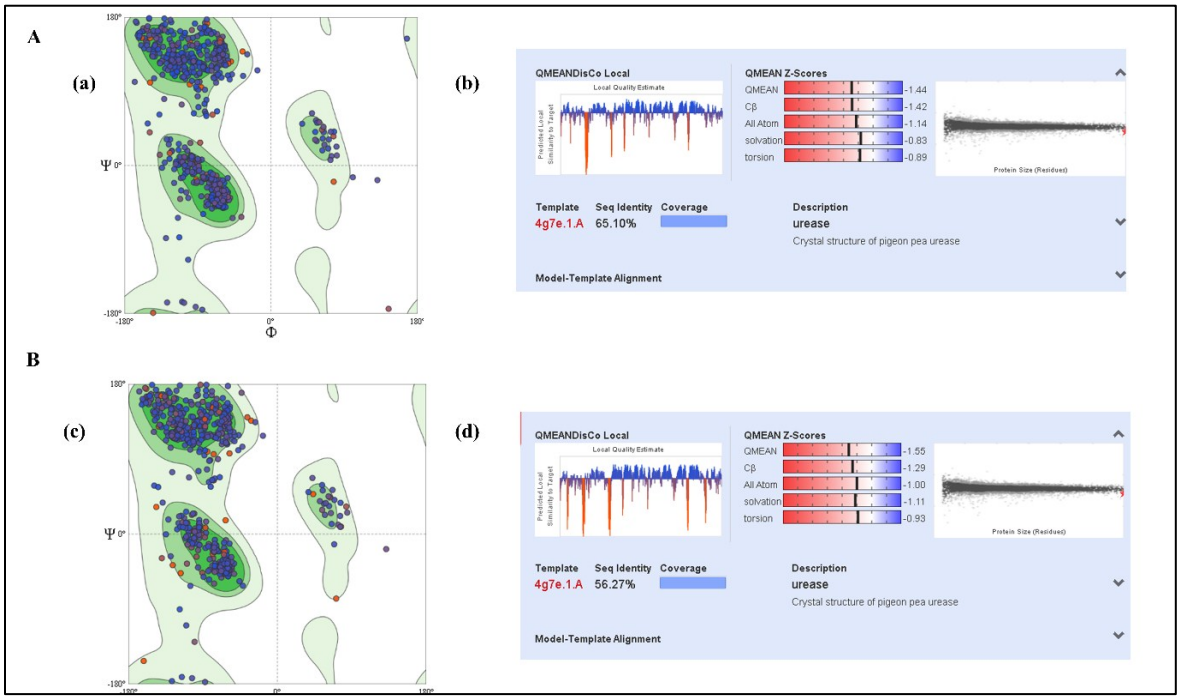


Figure 2. Swiss-model analysis of **A** (*A. astaci*) and **B** (*A. sydowii*). (a) and (c) shows the Ramachandran plots and (b) and (d) shows the template selection using Swissmodel

Table 1. Results of protein modelling using Swiss-model and Phyre2

	Template		Residue	Sequence identity	Sequence similarity	Confidence	Coverage	QMEAN
	Swiss-model	Phyre2						
Aphanomyces astaci urease	4g7e.1.A	c3la4A	836	65.10	0.49	100.0 %	0.99	0.82
Aspergillus sydowii urease	4g7e.1.A	c3la4A	827	56.27	0.46	100.0 %	0.99	0.79

Table 2. Results of protein modelling using Phyre2

	Template	% Identity	Residue	Confidence	Coverage (%)
Aphanomyces astaci urease	c3la4A	64	826	100.0%	99%
Aspergillus sydowii urease	c3la4A	56	815	100.0%	99%

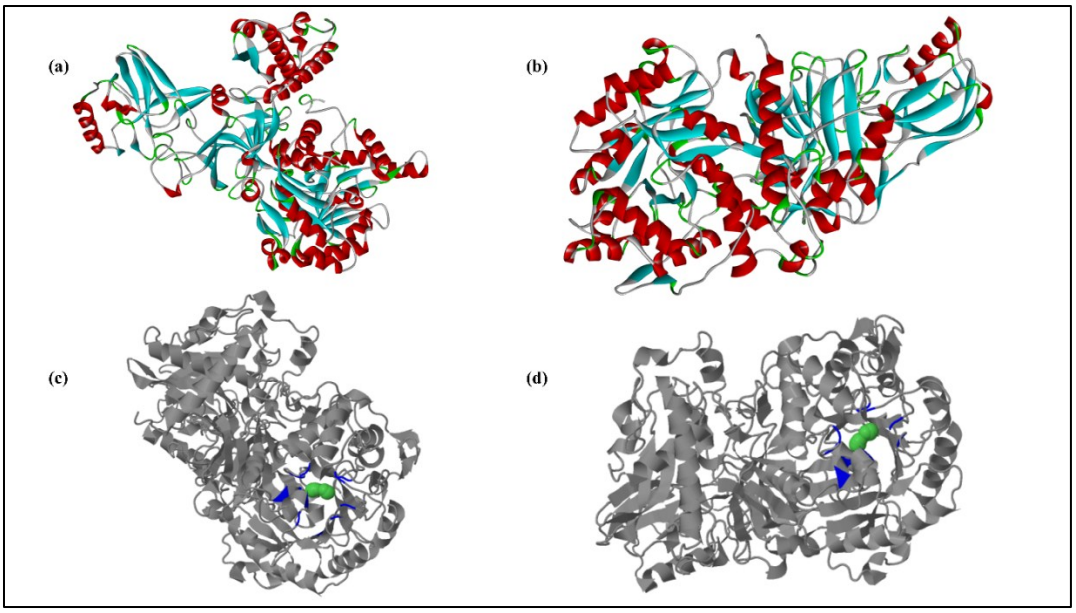


Figure 3. Protein model and active site prediction of *A. astaci A. sydowii*. (a and c represent *A. astaci* and (b and d represents *A. sydowii* respectively)

Structural analysis of urease enzymes

Ramachandran plot was obtained for both the urease structures, where the majority of the residues are present in the favoured region (**Figure 2 (a)** and **(c)**). From the VADAR 1.8, the secondary structure statistical analysis was done for both enzymes (**Table 3**). The hydrophobicity chart, and the 3-dimensional structure, represented the presence of both hydrophilic and hydrophobic amino acid residues in the enzyme models (**Figure 4**). The Protparam results generated confirmed the stability of both the enzyme models based on their instability indexes and Gravy value (**Table 4**).

Table 3. Statistical analysis of protein secondary structure rom VADAR 1.8

Protein Name	Mean H-bond distance		Mean H-bond energy		Residue with H-bonds		Helix	Beta	Coil	Turn
	observed	expected	observed	expected	observed	expected				
Aphanomyces astaci	2.2 sd=0.4	2.2 sd=0.4	-1.8 sd=1.0	-2.0 sd=0.8	625 (74%)	627 (75%)	226 (27%)	264 (31%)	346 (41%)	236 (28%)
Aspergillus sydowii	2.2 sd=0.4	2.2 sd=0.4	-1.8 sd=1.0	-2.0 sd=0.8	612 (74%)	620 (75%)	217 (26%)	273 (33%)	337 (40%)	236 (28%)

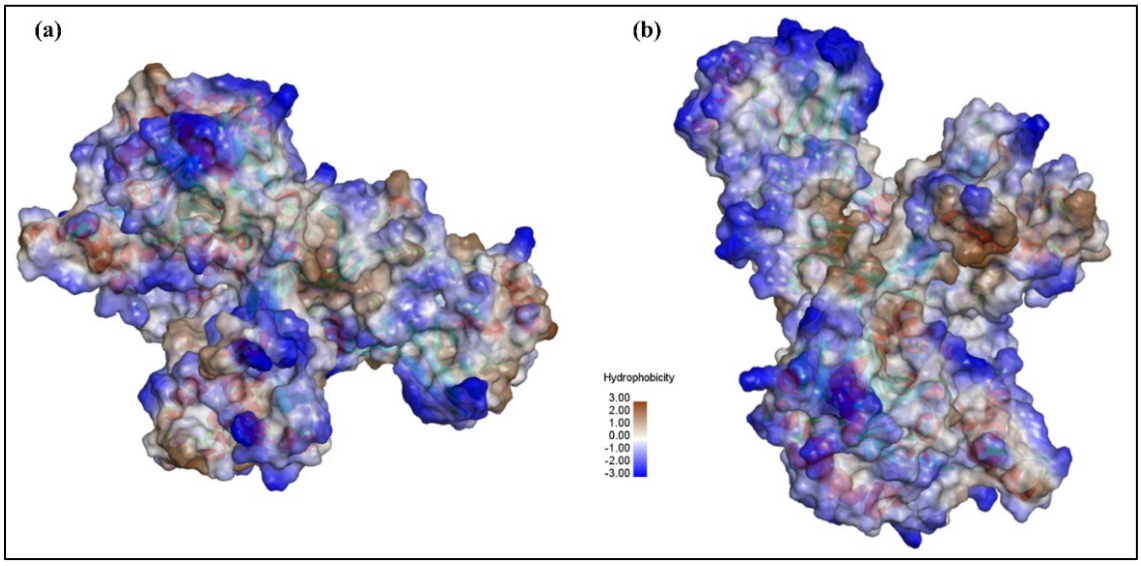


Figure 4. Hydrophobicity chart using Discovery Studio 2.1.0. (a) *A. astaci* urease; (b) *A. sydowii* urease

Table 4. ProtParam data for *A. astaci* and *A. sydowii*

	Mol. Wt	**Amino acid number**	**Theoretical pI**	**Aliphatic Index**	**Grand average of hydropathicity (GRAVY**	**Instability Index (II)**	**Stability of the protein**
Aphanomyces astaci	89892.83	836	5.94	94.22	-0.054	29.05	**Stable**
Aspergillus sydowii	88973.92	827	5.81	84.21	-0.182	35.42	**Stable**

Predicted binding site

A. astaci exhibited eleven active residues from 403, 405, 436, to 629, 632, corresponding to amino acids of His, Ala, Thr to Asp, Ala. The longest distance belongs to Ala 436. The contact was varied from 17 to 47. In the case of *A. sydowii*, ten active residues exhibited from 396, 398, 429, to 622, 625, which corresponds to amino acids of His, Ala, Asn to Asp, Ala. The longest distance belongs to Ala 429. The contact was varied from 19 to 48 (**Table 5**). The result of active site prediction using 3DLigandSite of *A. astaci* urease and *A. sydowii* urease is represented in **Figure 3 (c** and **d)**.

Table 5. Predicted binding site of *A. astaci* urease and *A. sydowii* urease

	Residue	**Amino acid**	**Contact**	**Average distance**
	403	HIS	47	0.27
	405	HIS	25	0.00
	436	ALA	19	0.70
	438	THR	17	0.60
	486	LYS	23	0.67
Aphanomyces	488	HIS	25	0.48

astaci	515	HIS	26	0.03
	541	HIS	25	0.00
	546	GLY	25	0.00
	629	ASP	28	0.06
	632	ALA	25	0.35
Aspergillus sydowii	396	HIS	48	0.27
	398	HIS	25	0.00
	429	ALA	19	0.71
	431	ASN	25	0.00
	481	HIS	25	0.48
	508	HIS	26	0.03
	534	HIS	25	0.00
	539	GLY	25	0.00
	622	ASP	28	0.05
	625	ALA	25	0.37

Ligand selection through toxicity prediction

Toxicity prediction of 1110 compounds obtained from the SeaWeed Metabolite Database using ProTox II server classified them ranging from one to six. Out of this, class 6, being the best non-toxic molecule, was chosen for the virtual screening process. Lipinski's rule of five provided better results for non-toxic metabolites. Upon comparing the metabolites with these two factors, 28 ligands were finalized for screening (**Table 6**).

Table 6. List of Class 6 ligands obtained after toxicity prediction

SWMD Id	Name of the metabolite
BD004	Lollolide
BE013	Eckstolonl
BS036	8-(acetyloxy)-5-methoxy-1,6,10,14,18-

	hexamethylpentacyclo[11.8.0.0^{2,10}.0^{4,9}.0^{14,19}]henicosa-4(9),5,7-trien-17-yl acetate
BS069	Stypodiol diacetate
BS071	4'-Chlorostypotriol triacetate
BT008	24ε-hydroperoxy-24-ethylcholesta-4,- 28(29)-dien-3-dione
BT010	24ε-hydroperoxy-24-ethylcholesta-4,28(29)-dien-3,6-dione
BT011	6β-hydroxy-24-ethylcholesta-4,24(28)-dien-3-one
BT012	24ε-hydroperoxy-6β-hydroxy-24-ethylcholesta-4,- 28(29)-dien-3-one
BU002	(3aR,6S,7aS)-3a,6-dihydroxy-4,4,7 a-trimethylhexahydro-1benzofuran-2(3H)-one
BU003	(3aS,6S,7aR)-3a,6-dihydroxy-4,4,7 a-trimethylhexahydro-1-benzofuran-2(3H)-one
RG008	24ε-hydroperoxy-6β-hydroxycholesta-4,- 25-dien-3-one
RG009	25-hydroperoxy-6β-hydroxycholesta-4,- 23(E)-dien-3-one
RG010	24ε-hydroperoxycholesta-4,- 25-diene-3,6-dione
RG011	25-hydroperoxycholesta-4,23(E)-diene-3,6-dione
RG012	6β,24ε-dihydroxycholesta-4,25-dien-3-one
RL009	(-)-α-Isobromo-cuparene
RL010	(-)-α-Isobromo-cuparene
RL018	2-tridecylheptadec-2-enal
RL053	3,4-Epoxypalisadin B
RL073	2-hydroxyluzofuranone

RL091	2-tridecylheptadec-2-enal
RL143	Laurediol diacetate
RL442	10-acetoxyangasiol
RL458	Okamurallene
RL461	Majapolone
RL465	Majapol D
RL483	Japonenyne-C

Molecular docking study

The good binding energies seen in **Figure 5** were supported by docking studies. All ligand poses were assessed. The optimal pose was chosen based on the lower and upper boundaries' minimum docking energy (kcal/mol) and zero RMSD values, respectively. The binding energy value represents the optimal structural location within a target protein's active region. Eckstololnl exhibited the maximum binding with both urease enzymes (−8.70 kcal mol^{-1} for *A. astaci* and -9.4 kcal mol^{-1} for *A. sydowii*), with the least docking energies. After eckstololnl, 8-(acetyloxy)-5-methoxy-1,6,10,14,18-hexamethylpentacyclo [11.8.0.0^{2,10}.0^{4,9}.0^{14,19}] henicosa-4(9),5,7-trien-17-yl acetate (BS036), 4'-Chlorostypotriol triacetate (BS036), Stypodiol diacetate (BS069), 24ε-hydroperoxy-24-ethylcholesta-4,- 28(29)-dien-3-dione (BT008), 6β-hydroxy-24-ethylcholesta-4,24(28)-dien-3-one (BT011), 24ε-hydroperoxy-6β-hydroxycholesta-4,- 25-dien-3-one (RG008), 25-hydroperoxy-6β-hydroxycholesta-4,- 23(E)-dien-3-one (RG009), 24ε-hydroperoxycholesta-4,- 25-diene-3,6-dione (RG010), 25-hydroperoxycholesta-4,23(E)-diene-3,6-dione (RG011), and 6β,24ε-dihydroxycholesta-4,25-dien-3-one (RG012) also exhibited higher binding affinities.

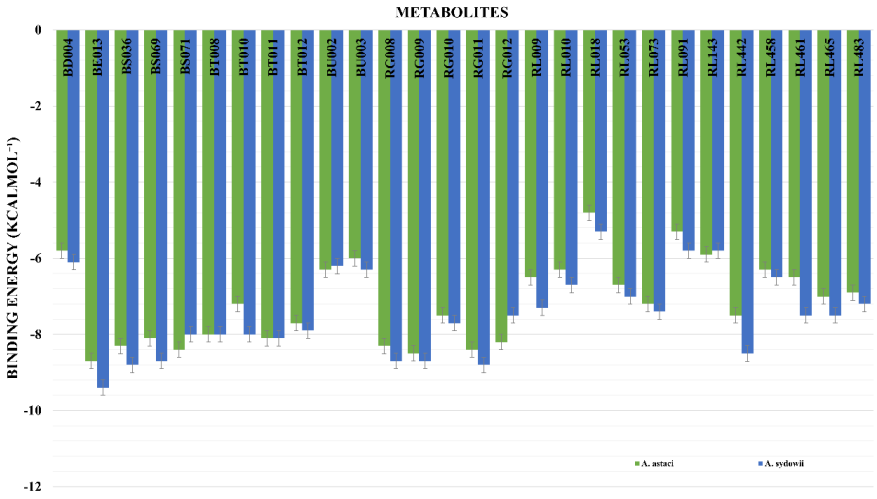


Figure 5. The docking energy values of class 6 ligands with *A. astaci* and *A. sydowii* urease

Binding Pocket Analysis of Urease-Docked Complexes

The docked complexes were subsequently investigated to understand the structure-activity link of interactions based on the *in-silico* results (SAR). The docking energy values revealed that docked molecules were bound in the enzyme's active binding region. Discovery Studio 2.1.0 was used to identify the structural analyses and residue interactions with ligands in docked complexes (**Figure 6** and **7**).

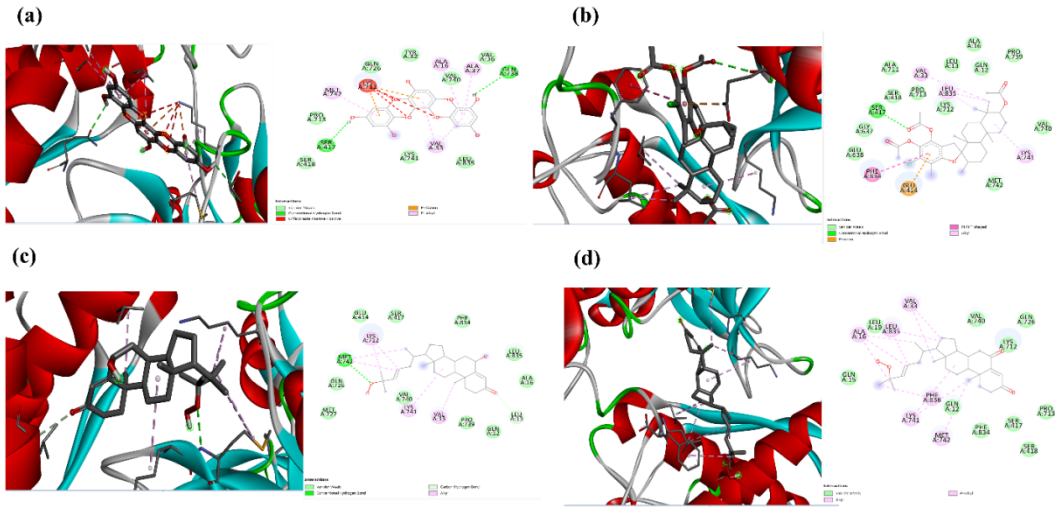


Figure 6. Binding interactions of compound ligands with the active binding site of *A. astaci* urease in 3D and 2D forms generated using Discovery Studio 2.1.0 (a)- Eckstolonl. (b)- 4'-Chlorostypotriol triacetate. (c) 25-hydroperoxy-6β-hydroxycholesta-4,- 23(E)-dien-3-one. (d)-25-hydroperoxycholesta-4,23(E)-diene-3,6-dione

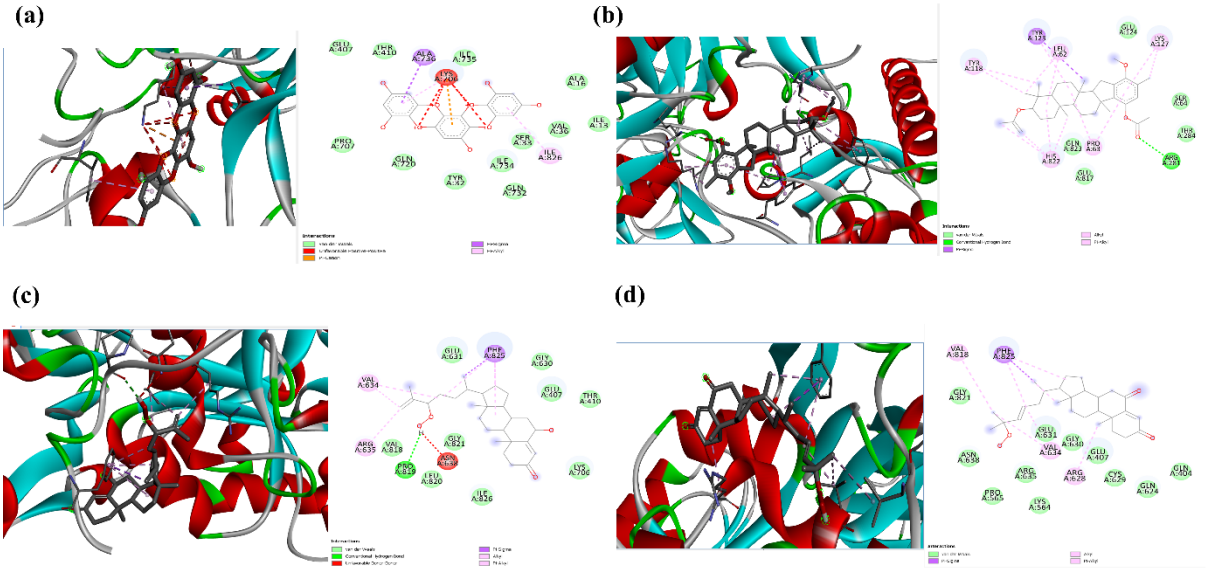


Figure 7. Binding interactions of compound ligands with the active binding site of *A. sydowii* urease generated using Discovery Studio 2.1.0 (a)- Eckstololnl. (b)- 8-(acetyloxy)-5-methoxy-1,6,10,14,18-hexamethylpentacyclo[11.8.0.0^{2,10}.0^{4,9}.0^{14,19}]henicosa-4(9),5,7-trien-17-yl acetate. (c)- 24ε-hydroperoxy-6β-hydroxycholesta-4,- 25-dien-3-one. (d)- 25-hydroperoxycholesta-4,23(E)-diene-3,6-dione

Binding affinity of similar FDA approved drug

The seaweed metabolites with the least binding energies were compared to the available FDA-approved drugs using the Swiss similarity server (http://www.swisssimilarity.ch) based on their similarity scores (**Table 7**). The binding affinity of screened FDA-approved drugs using Swiss similarity server with *A. astaci* urease and *A. sydowii* urease were analyzed using CB dock and is represented in **Table 8**. The FDA approved drugs based on similarity score and docking score for *A. astaci* are Eckstololnl, Testosterone, 25-hydroperoxy-6β-hydroxycholesta-4,- 23(E)-dien-3-one, and for *A. sydowii* the drugs could be Eckstololnl, Progesterone, Stypodiol diacetate, 8-(acetyloxy)-5-methoxy-1,6,10,14,18-hexamethylpentacyclo [11.8.0.0^{2,10}.0^{4,9}.0^{14,19}]acetate, 25-hydro peroxycholesta-4,23(E)-diene-3,6-dione.

Table 7. Similarity searching of the sea weed metabolites from FDA approved drugs

Name of the metabolite	**Similar FDA approved drug molecule with similarity score**
Eckstolonl	No similar molecule was found.
8-(acetyloxy)-5-methoxy-1,6,10,14,18-hexamethylpentacyclo[11.8.0.0^{2,10}.0^{4,9}.0^{14,19}]henicosa-4(9),5,7-trien-17-yl acetate	Vitamin E (0.504) Treprostinil (0.184)
Stypodiol diacetate	Vitamin E (0.415) Nabilone (0.175)
4'-Chlorostypotriol triacetate	No similar molecule was found.
24ε-hydroperoxy-24-ethylcholesta-4,- 28(29)-dien-3-dione	Methyltestosterone (0.652) Testosterone (0.652) Medrysone (0.509) Hydrocortisone (0.380) Norethindrone (0.342)
6β-hydroxy-24-ethylcholesta-4,24(28)-dien-3-one	Methyltestosterone (0.735) Testosterone (0.735) Levonorgestrel (0.636) Medrysone (0.592)
25-hydroperoxycholesta-4,23(E)-diene-3,6-dione	Progesterone (0.507) Methyltestosterone (0.223) Testosterone (0.223) Dydrogesterone (0.215)
6β,24ε-dihydroxycholesta-4,25-dien-3-one	Testosterone (0.900) Methyltestosterone (0.898) Medrysone (0.806) Hydrocortisone (0.752)

24ε-hydroperoxy-6β-hydroxycholesta-4,- 25-dien-3-one	Methyltestosterone (0.408) Testosterone (0.408) Medrysone (0.297) Hydrocortisone (0.214)
25-hydroperoxy-6β-hydroxycholesta-4,- 23(E)-dien-3-one	Methyltestosterone (0.451) Testosterone (0.451) Medrysone (0.331) Hydrocortisone (0.239)

Table 8. Binding energies (Kcal mol^{-1}) of *A. astaci* urease and *A. sydowii* urease with FDA approved drugs

Name of the metabolite	**Binding energy of *A. astaci* (Kcal mol^{-1})**	**Binding energy of *A. sydowii* (Kcal mol^{-1})**
Dydrogesterone	-7.7	-7.8
Vitamin E	-7.7	-7.6
Treprostinil	-7.2	-7.4
Nabilone	-8	-8.1
Methyltestosterone	-7.7	-7.6
Testosterone	-8.4	-7.7
Medrysone	-8.2	-8.4
Hydrocortisone	-7.6	-8.1
Norethindrone	-7.8	-8.1
Levonorgestrel	-7.9	-7.6
Progesterone	-7.9	-8.1

DISCUSSION

Natural products' biological qualities have long caught the attention of scientists, who have conducted extensive research by randomly testing a huge variety of natural metabolites for use in the drug discovery process. This essential and random screening approach has led to many new lead compounds. But the invention of virtual screening has made the overall process much more convenient than the rational screening method. Because an increased level of the urease enzyme has been linked to a variety of major health concerns in people, a thorough investigation of possible inhibitors is required. Besides bacterial urease, fungal ureases also hold a prominent position in this list. The current study studied the inhibitory effects of two fungal ureases (*A. astaci* and *A. sydowii*) against a macro-algal metabolite. The non-toxic metabolites (Class 6) were identified using their toxicity prediction from the several metabolites of seaweed obtained from the seaweed metabolite database. They interacted with the modelled fungal ureases. The interaction study specifically identified the potential inhibitors of both enzymes and compared them with the FDA-approved drugs.

The commonly available synthetic urease inhibitors belong to classes, like Quinolones, Flavonoids, etc. (Kafarski and Talma 2018). Urease was also inhibited naturally by herbal plant parts (Bai et al. 2017; Mahernia et al. 2015; Modolo et al. 2014) and marine organisms (Lee et al. 2012). There are literatures that portrayed the urease inhibitory activity by algae and seaweeds (Bekheet and Syrett 1977; Lee et al. 2012). Secondary metabolites with biological activity have been abundant in marine species (Heo et al. 2008). Marine algae are identified as a repository of phytochemicals that possess biological properties like anti-inflammatory, antioxidant, and anti-cancer (Lordan et al. 2011); polysaccharides, vitamins, polyphenols, minerals, and proteins (Kuda et al. 2005).

The top 5 cavities size and Vina scores of the receptor-ligand interaction are provided by CB-Dock. The group representative was chosen based on the biggest cavity size and lowest binding energy (Vina score). The Vina score indicates that the protein and the ligand have a specific binding activity (Liu et al. 2020). The Vina score, which was calculated using CB-dock from 28 ligands with Class 6 toxicity, indicates that both ligands and receptors bind well, with the Vina score indicating that the more negative the Vina score, the more stable the compounds bind to the hub target.

Even though there are no active reports that state the urease inhibitory activity of Eckstolonol, Kannan et al. (2012) mentioned the acetylcholinesterase (AChE) inhibitory activity of a similar crude extract of phlorotannins isolated from *E. maxima*, so detailed screening and research is a powerful solution to identify the potent drug-like application of Eckstolonol to tackle human infections caused by *A. sydowii* and *A. astaci*. The physiological benefits of phlorotannins are widely assumed to be their free radical scavenging and antioxidant activities (Kang et al. 2005; Kang et al. 2010). Among the screened FDA-approved drugs obtained after SwissSimilarity, the compounds from seaweeds will be safer than the suggested compounds like Progesterone, Testosterone, Vitamin E, Medrysone, and Methyltestosterone. It was also observed that the metabolites would offer a higher activity from macroalgae, for which *in-vitro* studies are recommended. Despite the fact that drug discovery from natural sources continues to be an important source of new therapeutic leads, there are significant obstacles. These tasks include obtaining these materials, as well as selecting and implementing appropriate high-throughput screening bioassays. The scale-up of active compounds production and extraction is to be carried out if the mentioned path offers a positive solution in addressing the urease inhibitory effect of *A. sydowii* and *A. astaci* urease.

CONCLUSION

The current study successfully studied the potential urease inhibitors from seaweed (macro-algae) using structure-based virtual screening (SBVS). The right urease inhibitor is chosen by comparing the binding affinity scores obtained by docking both the urease models with the seaweed metabolites. Both the fungal ureases were found to have good binding affinities with the selected 28 ligands of Class 6. Out of these, BE013 (Eckstolonl) was found to have higher binding with both the *A. astaci* and *A. sydowii* with minimum docking scores of -8.7 kcal $mol^{-1}$and -9.4 kcal mol^{-1}, respectively. Similar compounds from FDA-approved drugs were selected using a Swiss similarity server. The lowest binding affinity is taken into account and is considered as the effective urease inhibitor. There was no similar molecule obtained for Eckstolonl and 4'-Chlorostypotriol triacetate that had the highest binding metabolite for both ureases. We could conclude that the seaweed metabolites could be considered more effective urease inhibitors than the existing FDA-approved drug based on SwissSimilarity but demands high-throughput screening assays and *in vitro* studies.

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Performance tuning in classifier for underwater marine organism

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ABSTRACT

In this research, we present a comprehensive investigation into the optimization of a deep neural network (DNN) architecture for the classification of 20 distinct marine organisms in underwater environments. Our primary focus is on achieving superior performance through the careful selection and tuning of activation functions. A standard architecture was employed, incorporating seven different activation layers: Sigmoid, Relu (Rectified Linear Unit), Leaky Relu, Clipped Relu, ELU (Exponential Linear Unit), Tanh, and Soft Plus. Through rigorous experimentation, our findings indicate that the Leaky Relu activation function consistently outperformed the other activation functions in terms of classification accuracy. Leveraging the unique characteristics of Leaky Relu has demonstrated its effectiveness in enhancing the DNN's ability to discern and classify underwater marine organisms accurately. This research contributes valuable insights into the optimization of deep network architectures for underwater organism classification, shedding light on the significance of activation functions in achieving high-performance outcomes. The results underscore the importance of considering activation functions as a critical element in the design and tuning process, providing a foundation for further advancements in the field of marine organism classification using deep learning techniques.

KEYWORDS

Underwater Marine Organism, Deep Neural Networks (DNN), Classifier, Activation Functions, Classification, Deep Learning.

INTRODUCTION

The mesmerizing and intricate underwater realm has captivated human curiosity for centuries. Beneath the ocean's surface lies a vast and diverse ecosystem, teeming with life, and playing a crucial role in the balance of our planet. The classification and understanding of marine organisms in this unique environment are pivotal for ecological research, conservation efforts, and environmental monitoring. While traditional classification methods have contributed significantly to our knowledge, the challenges of the underwater world demand advanced techniques for accurate and efficient categorization. In response to these challenges, deep learning has emerged as a promising avenue, offering the potential for automated and precise classification [1].

Our research endeavours to conduct a comprehensive investigation into the optimization of Deep Convolutional neural network (CNN) architectures tailored specifically for the classification of twenty distinct marine organisms [2]. The complex and dynamic nature of the underwater environment necessitates robust and adaptive classification techniques, prompting a focused exploration into the careful selection and tuning of activation functions. Activation functions, acting as the nonlinear transformation applied to the input of a neuron, play a pivotal role in shaping the capabilities of neural networks, influencing their ability to discern and categorize marine organisms accurately [3]

To execute this investigation, we leverage the powerful capabilities of MATLAB 2020b, a versatile computing environment renowned for its extensive array of tools and functions dedicated to deep learning applications. MATLAB provides an ideal platform for implementing and experimenting with advanced techniques, enabling us to refine and test various activation functions and gain deeper insights into their impact on classification performance [4]. In our pursuit of optimization, we explore seven different activation layers, each with its unique characteristics: Sigmoid, Relu, Leaky Relu, Clipped Relu, ELU, Tanh, and Soft Plus. These activation functions serve as diverse lenses through which we scrutinize and interpret the intricate underwater world.

The need for accurate underwater marine organism classification is paramount, given the ecological and environmental significance of these organisms [5]. Monitoring and understanding the distribution and behaviour of marine life contribute to the assessment of ecosystem health, aiding in the identification of potential threats or changes. As the underwater environment poses

challenges such as low visibility, variable lighting conditions, and the diverse characteristics of marine species, the demand for optimized classification techniques becomes even more pronounced [6].

Our research addresses this demand by delving into the nuances of activation functions and their impact on deep learning-based classification. By leveraging MATLAB 2020b, we aim to provide a nuanced understanding of how these functions influence the performance of DNNs in the context of underwater marine organism classification. The study does not only focus on achieving accurate results but also emphasizes the efficiency and adaptability of the chosen activation functions in handling the challenges unique to underwater environments.

As we navigate the depths of our research, we aspire to contribute not only to the advancement of classification techniques but also to the broader field of ecological research and environmental conservation. The findings of this research are expected to shed light on the significance of activation functions as a critical element in the design and tuning process, providing a foundation for further advancements in the field of marine organism classification using deep learning techniques. Through rigorous experimentation and analysis, we seek to illuminate the path toward a more effective and refined methodology for underwater marine organism classification, fostering a deeper understanding of our oceans and their delicate ecosystems. The remaining paper is catalogued as follows: Section II. reviews the current research done in this field; Section III reviews the activation functions. Section IV. delineates the proposed algorithm; Section V. gives the experimental results; Section VI. discusses the Future Works and Conclusion and Section VII. gives the References.

II.RELATED WORKS

There are numerous approaches proposed by researchers for the classification of underwater marine organism as delineated below:

C. Spampianto et al. [7] attempt to classify fishes using texture features extracted from the Gabor filtering, gray level histogram and the histogram of Fourier descriptors of boundaries and Curvature Scale Space Transform used for shape features extracted using. The algorithm was tested on a dataset of 360 images and achieved an accuracy of 92%.

Takakazu Ishimatsu et al. [8] used two identification features: speckle patterns and scale forms of fish and used morphological algorithms and filters for discrimination. They just showed the

differentiation between three Species-Pilchard Sardine (ma-iwashi), Japanese Horse Mackerel (ma-aji), and Common Mackerel (ma-saba) with an accuracy of 90%, 88% and 90% respectively. Their method is dependent on the size and shape of the morphological filters used.

Junguk Cho et al. [9] used Haar classifiers with the Scythe Butterfly fish as their test species. Their method is heavily dependent on the background environment in the image of the fish and the angle from which the photograph is taken.

Andrew Rova et al. [10] attempt to classify fishes using the method of warping the images prior to classification using SVM on a dataset of 320 images achieving an accuracy of 90%. Chomptip Pornpanomchai et al. [11] proposed and developed a fish recognition system based on shape and texture. They compared Artificial Neural Networks and Euclidean Distance Method (EDM) working on a test set of 300 images and a training set of 600 images. They achieved an accuracy of 81.67% and 99.00% with EDM and ANN respectively.

Rodrigues et al. [13] recommended an algorithm based on SIFT feature extraction & Principal Component Analysis (PCA) but they worked on a very small dataset of 162 images encompassing 6 different species getting an accuracy of 92%.

S. Sclaroff et al. [14] performed object deformable shape detection and object detection was done through model-based region grouping. Computational complexity is the major drawback of this method.

C. Spampianto et al. [15] worked on 20 underwater videos to detect, track and count fishes with an accuracy of 85%. They performed detection using Moving Average Detection Algorithm and Adaptive Gaussian Mixture Model. Andres Hernandez-Serna et al. [16] used Artificial Neural Networks for the automatic identification of species. They worked on a dataset of 697 images achieving an accuracy of 91.65%.

Arjun Kumar Joginpelly et al. [17] propose an automatic technique using Gabor filters to extract important features from two species, Epinephelus morio and Ocyurus chrysurus. The proposed algorithm is tested on 200 frames, each containing many fish and non-fish regions. The accuracy is 70.6% for Epinephelus morio and 80.3% for Ocyurus chrysurus.

Deokjin Joo et al. [18] extracted stripe and color patterns of wild cichlids and used Random Forests and SVM for classification achieving an accuracy of 72% on a dataset of 594 wild cichlids. They have a low accuracy and they just target Cichlid fishes.

Yi-Haur Shiau et al. [19] proposed a method of sparse representation-based classification for the recognition and verification of fishes which maximizes the probability of partial rankings thus obtained. They worked on a dataset of 1000 images and achieved the highest accuracy of 81.8% for a particular feature space dimensionality. S.O.

Ogunlana et al. [20] classified using Support Vector Machine technique based on the shape features of the fish. They worked on a training data of 76 fish and testing data of 74 fish achieving an accuracy of 78.59%.

S. Cadieux et al. [21], generates the contours of fish in an unconstrained environment by deploying an infrared silhouette sensor which acquires contours of fish in a constrained flow. When the inputs are noisy, these features give a poor performance. The system has reported classification accuracy around 78%. The experimental results, which were supported by Yi Zhong and colleagues, showed that this unique strategy outperforms the well-known single modal deep learning-based SEI methods when used on a signal source dataset. The last fully connected layer of the multimodal network, which has the ability to learn more signal data for each category of signal characteristics in a range of feature spaces, combines the output of each network. Our test findings show that the multimodal deep model outperforms the single deep learn networks used by Dai Congren by a significant margin. The convolutional layer, pooling layer, and fully connected layer in a convolutional neural network are three concepts that are cited in relation to deep learning. In the discipline, these ideas are regarded as being rather important. Although it may attain a maximum of 95% on the training set, the accuracy rate on the validation set is not very high, and Dinah et al. are unable to reduce the loss of the validation. The Triple-Sigmoid activation technique was suggested. Any deep neural network model may employ the function, which is simply three Sigmoid functions concatenated, to solve the open-set problem. However, the open-set recognition problem was the only one that was studied in this paper. The suggested function may be used to solve a variety of machine learning problems, including as novelty identification, anomaly detection, out-of-distribution detection, semi-supervised learning, active learning, and incremental learning. The results also shown that for all of the stated tasks, the proposed function outperformed more sophisticated state-of-the-art open-set recognition algorithms. Recently, Hao Tang introduced a brand-new deep dictionary learning and coding network for difficult picture identification applications (DDLCN). The core convolutional layers are replaced by the suggested compound dictionary learning and coding

layers in the proposed DDLCN, however the majority of the commonly used deep learning layers, such as input/output, pooling, and fully connected, are kept in place. On five open data sets with little training data, extensive experimental results demonstrate that the DDLCN outperforms the most popular dictionary learning techniques. It performs equally well to the most complex CNN-based models.

Takuya asserts that while the accuracy during training is not significantly affected by the presence or absence of padding in the 2D convolutional layer when Deep Learning is used for goal picture identification in Can Sat with ROI segmentation, the recognition rate varies in the actual environment of our Can Sat with segmentation. the findings of a research on how the padding of the 2-D convolutional layer affects recognition rates.

Haigen and company Only a few parameters are added to the standard activation functions like the Sigmoid, Tanh, and rectified linear unit as part of an innovative technique to adaptively customize activation functions (Relu). This technique provides a small number of parameters to the traditional activation functions Tanh, Relu, and Sigmoid, and some theoretical and experimental analysis is offered to hasten convergence and improve performance. The results show that in almost all cases, the proposed approach can outperform other well-known algorithms like Relu and swish. It is quite simple to use and has notable performance in terms of convergence speed, accuracy, and generalization.

According to Bhupesh and colleagues, the key principle of the stock rate prediction technique is the idea that "current news has a big influence on stock price movements." An input consisting of a fuzzy numerical value in the ranges of 1 and -1 has been given to the suggested system. We contrast the experimental results obtained using CDL-NN with the Base model.

The study's research objectives are as follows:

1. To create a CNN model for under water marine categorization.
2. To determine the best and most suitable activation function for the hidden layer of the suggested model.
3. Utilize three distinct datasets to train the proposed model (With 200 to 400 images).
4. To assess results in light of various deep learning and transfer learning models' output.
5. To achieve these study objectives, the proposed work will examine several CNN activations functions for underwater marine species categorization in the following sections.

III.FUNCTIONS OF NON-LINEAR ACTIVATION

A critical component of a CNN is how hidden layers are activated. It aids the computer's recognition of intricate data patterns [22]. Within a network layer, this function establishes the conversion of a node's weighted sum of input into output. In other words, the operation of a neural network classifies the underwater marine organism. The output signal from the cell before it is converted into a format that can be used for feedback by the cell following it. Giving the neural network non-linear qualities is the basic objective of activation functions. Deep networks transform a node's linear input signals into nonlinear output signals to assist in learning of high-order functions [23]. Deep networks gain knowledge from high-order matrix multiplication with more than 1 degree by transforming signals of linear input into nonlinear output. Activation function variations used by different CNN layers include linear, nonlinear, and binary step functions. CNN gets to determine that the activation functions to use the hidden layer trains effectively by eliminating complicated patterns from the data using nonlinear functions based on the difficulty of the issue or the complexity of the training data patterns. On the other hand, linear functions are perfect for straightforward tasks requiring a high degree of generalization. There are generally no established guidelines for choosing the optimum activation function for a given application, even if the majority of research supports the usage of nonlinear functions in hidden layers. The method creates intricate mappings between a neural network's inputs and outputs using a nonlinear activation function. Nevertheless, there hasn't been much research on the best way to activate the hidden layers for Underwater marine species identification. By choosing the right activation mechanism from hidden layers, better model training is promised. Additionally, it raises forecast accuracy.

IV.PROPOSED EXPERIMENTAL APPROACHES

A suggested CNN model is repeatedly trained on a particular dataset using six different nonlinear activation function in order to classify underwater marine organism.

Prior to actually proceeding to the design step, the proposed CNN model must be trained on images from an adequate database. The proposed solutions contain six different activation functions, which are shown in Figure 1 given below.

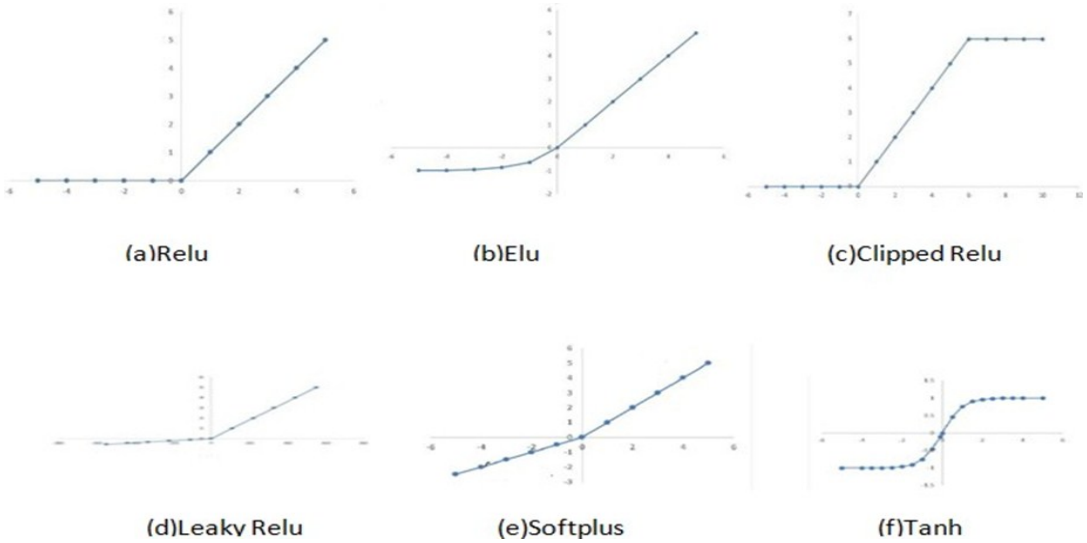


Figure 1. Several nonlinear activation functions are graphically represented as shown above

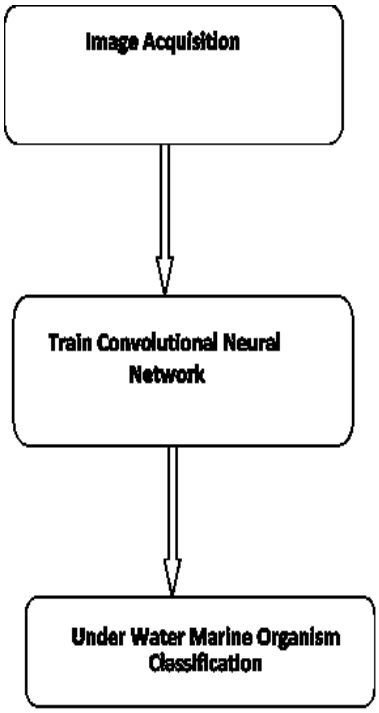


Figure.2. A number of phases in experimental techniques.

IMAGE ACQUISITION

The images have been used for this research work collected from Center for climate changes studies from Sathyabama institute of science and technology, and its nearly 189 images with 20 different categories.

The imaged are shown in Figure 3



A. PROPOSED CONVOLUTIONAL NEURAL NETWORK

Figure 6 depicts each crucial step, from picture preparation through Underwater marine classification. The deep neural network architecture, which includes layers for activation function, batch normalization, and max-pooling, serves as the foundation for the proposed CNN design. For the suggested design, which starts with three convolutional layers, two pooling layers, and three fully connected layers, the results are not as promising as expected [24]. A number of combinations of extra parameters, including maxepochs, convolutional filters, and max-pooling filters, are also used to evaluate the proposed model.

To specify the value of these hyper parameters so that they remain constant when various activation functions are attempted during the experimental period, many testing and training processes are carried out. We add more layers to our model in order to make it deeper and get a greater efficiency rate. To determine the ideal number of layers for the model, an ablation study is conducted (This includes a variety of operations, such as eliminating the last convolutional layer and retraining the network to measure performance). The final design in categorizing marine species contains a total of 7 layers which including 2 convolutional layers, 1 fully connected layer, one for image input, one sigmoid layer, one SoftMax layer, and one for class output. The experimental result analysis section contains more in- depth details regarding this CNN model.

However, throughout the design process, the following adjustments are made:

1) Adding a layer, first.

2) The worth of training choices such maxepochs, learning rate, and validation frequency is taken into account.

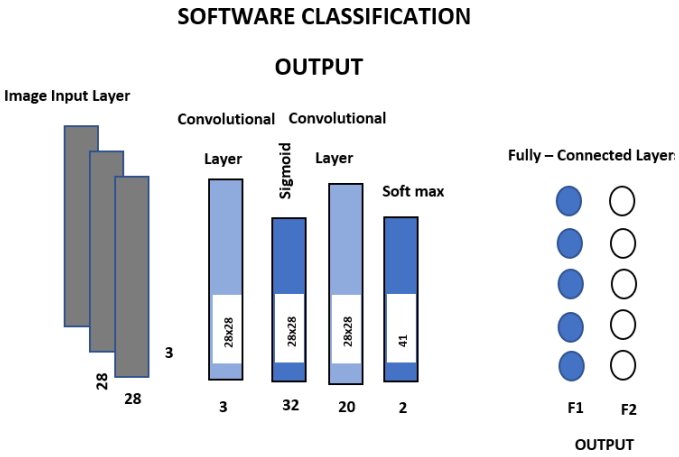


Figure 4 The proposed architecture of deep neural networks for underwater marine organism picture categorization.

B. TRAINING AND CROSS-VALIDATION

By continually doing the aforementioned technique, the activation function is utilized to convert a linear relationship into a nonlinear relationship. Deep learning networks are therefore given the power they need by the activation function to extract complex calculations and generate cutting-edge results in a range of fields. By improving convolutional neural network representational capacity by nonlinear operations with an activation function (CNNs). The beginning learning rate for the proposed model is set at 0.01, the number of epochs is fixed at 30, and the cross-validation frequency is set at 25, These remain constant for different activation functions because of lower quantity of our training datasets that consist of 547. Initially, the datasets were randomly partitioned into 75% for training and 25% for evaluation. The model is tested on datasets using two- fold cross-validation. Several times during the training sessions, this random validation procedure is carried out. Accuracy and loss have been calculated from this analysis. The accuracy graph produced by the third activation function is shown in Figure 5.

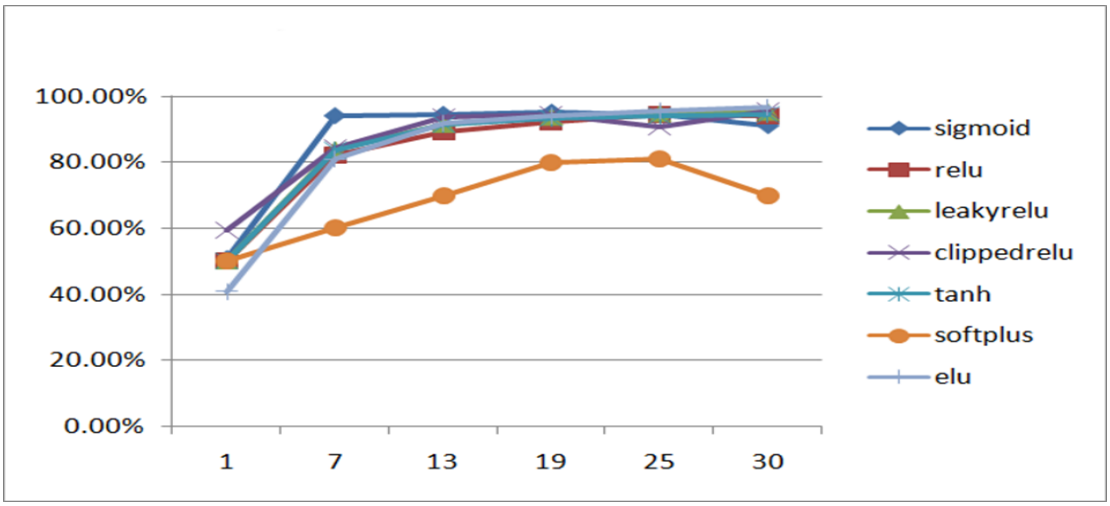


Figure.5- validation accuracy for third layer

The Figure 6 shows loss graph obtained by third activationfunction.

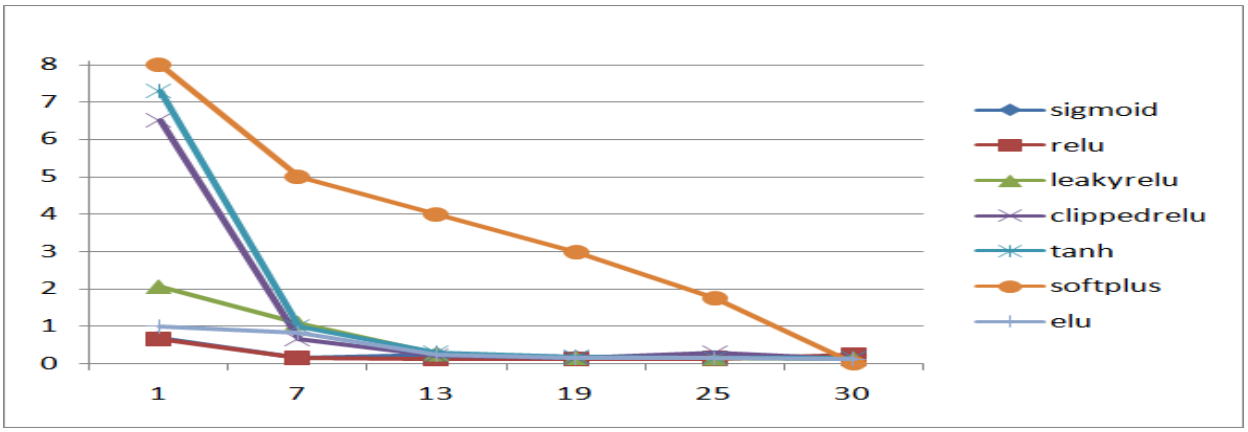


Figure.6-Validation Loss for third layer

The Figure 7 shows loss graph obtained by fourthactivation function**.**

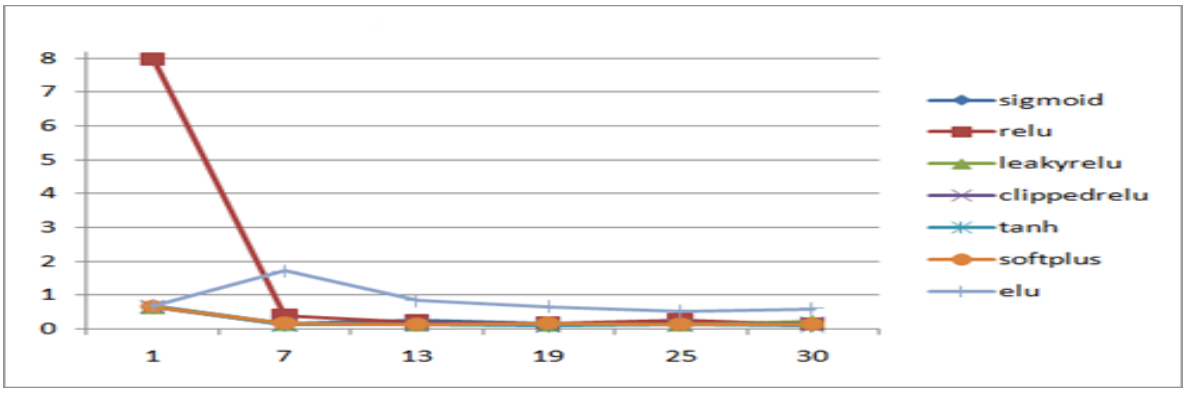


Fig.7.Validation Loss for fourth layer

The Figure 8 shows accuracy graph obtained by fourthactivation function.

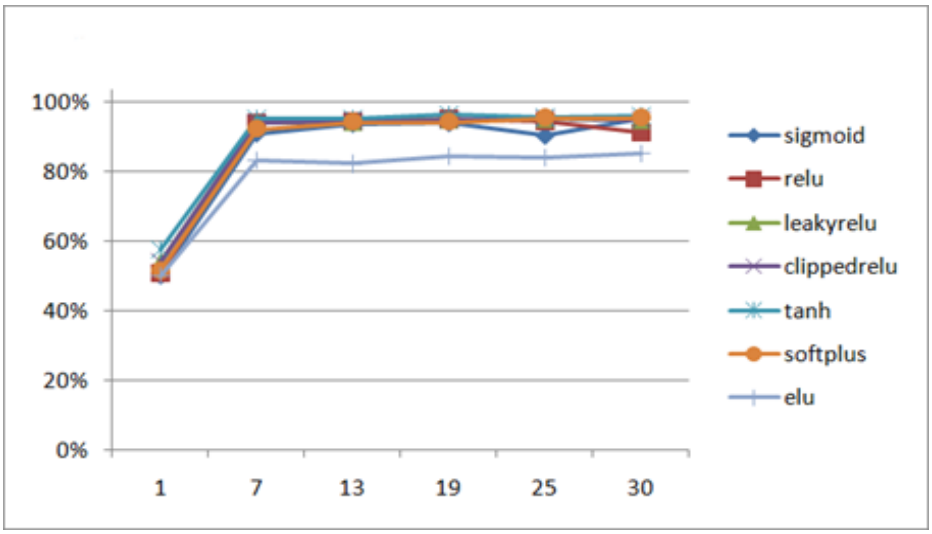


Fig.8-validation accuracy for fourth layer

V.ANALYSIS OF EXPERIMENTAL RESULTS

Each study method was carried out on a computer running Windows 10 Pro 64-bit and powered by i5 - 8th gen intel core CPU clocked at 2.3GHz and an NVIDIA GeForce GTX1050 Graphical Processing Unit.

A. EXPERIMENTAL RESULT WITH DIFFERENT ACTIVATION FUNCTIONS

To demonstrate the effectiveness of different activation functions on the suggested CNN model, the performance of the Relu, ELU, Clipped Relu, Leaky Relu, Relu, and Tanh functions are compared, and the best performer for the Marine species classification is selected using the

supplied dataset [25]. The recommended model keeps the remaining hyper-parameters constant while altering the activation function to evaluate the results. The CNN model is initially evaluated on a batch of 133 photographs after being trained on the dataset, which comprises of 189 high-resolution pros shots. To increase precision Leaky Relu works better than other activation functions that yielded the best accuracy, as shown in Tables 1 and 2, 3, and 4, which compare accuracy and losses with other activation functions in hidden layers. The confusion matrix is also discussed as a way to modify the third and fourth activation functions in Figures. 13 and 14.

Table-1. Accuracy for third layer

S. No	Activation Layers	Accuracy
1	Sigmoid	95.09%
2	Relu	91.03%
3	Leakyrelu	96.15%
4	Clipped relu	94.66%
5	Elu	95.94%
6	Tanh	95.30%
7	Soft plus	85.26%

Table-2. Accuracy for fourth layer

Sl. No	Activation Layers	Accuracy
1	Sigmoid	95.09%
2	Relu	94.44%
3	Leakyrelu	96.70%
4	Clipped relu	95.48%
5	Elu	95.09%
6	Tanh	94.44%
7	Soft plus	69.89%

Table.3.Validation Loss for third layer

Sl. No	Activation Layers	Loss
1	Sigmoid	0.1185

2	Relu	0.1391
3	Leakyrelu	0.2289
4	Clipped relu	0.1859
5	Elu	0.1112
6	Tanh	0.1385
7	Soft plus	0.6037

Table-4. Validation Loss for fourth layer

Sl. No	Activation Layers	Loss
1	Sigmoid	0.1185
2	Relu	0.1327
3	Leakyrelu	0.1137
4	Clipped relu	0.1199
5	Elu	0.1058
6	Tanh	0.1443
7	Soft plus	0.0142

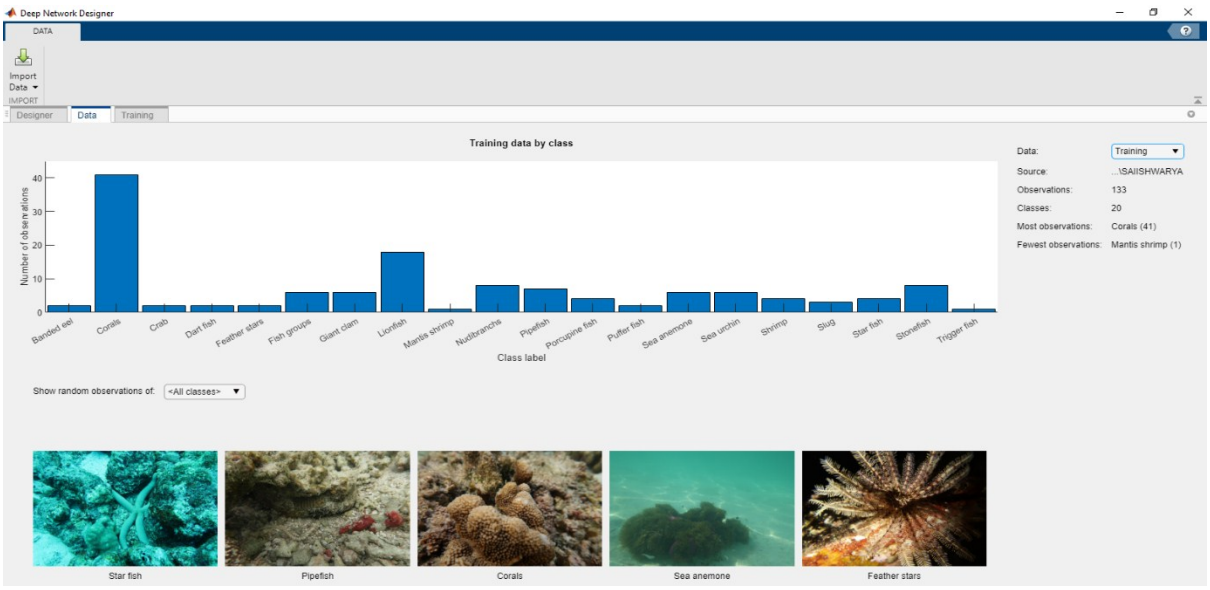


Figure.9. The Third activation function in conventional layers was modified using the classification of sample prediction are shown above,

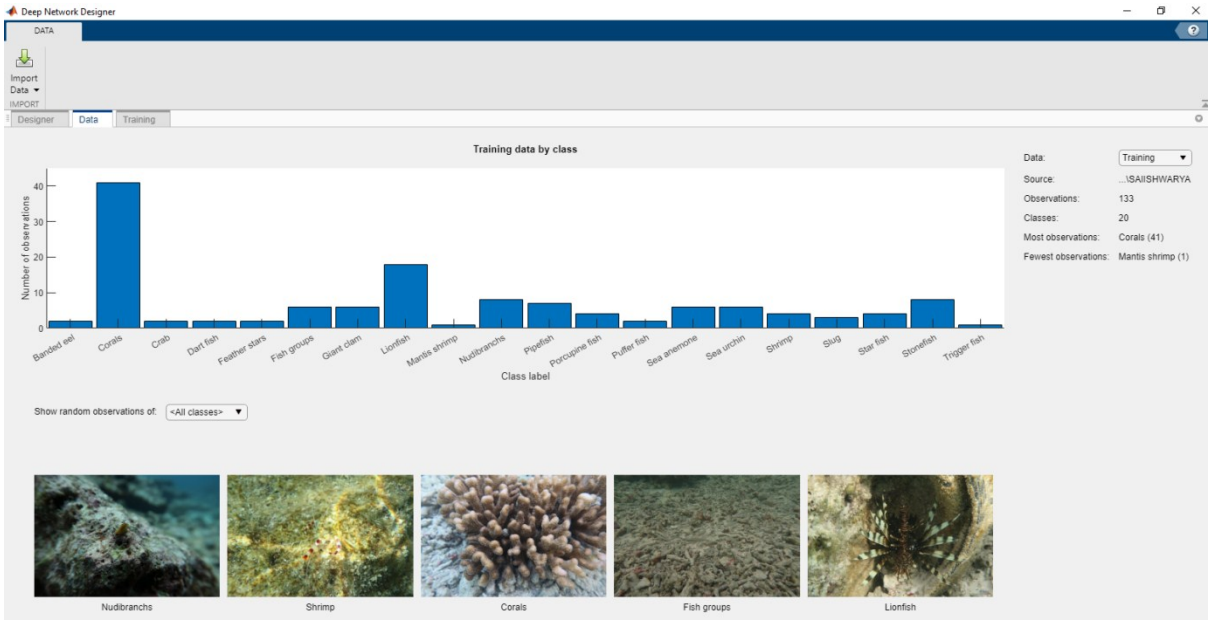


Figure. 10. The Fourth activation function in conventional layers was modified using the classification of sample prediction are shown above

VI.CONCLUSON

This analytical inquiry illustrates the potential for a high accuracy diagnosis using the suggested deep learning model to classify marine species. In this study, a single common deep learning architecture is considered and examined. The effectiveness of the architecture is assessed by changing the activation function in the third and fourth levels. The activation layers include Relu, Leakyrelu, Clipped Relu, Elu, Tanh, and soft plus. In terms of performance, this model outperforms the other Deep Learning network models accuracy-based deep learning layers raise underwater marine picture accuracy by 95.09 percent, 91.0 percent, 96.15 percent, 94.6 percent, 95.94 percent, and 85.2 percent. Relu, leaky Relu, Clipped Relu, Elu, Tanh, and Soft Plus are the six activation layers. The maximum degree of accuracy is attained by Leakyrelu layer analysis, which generates performance analysis employing a variety of activation functions in the third and fourth layers. The table above includes information on validation accuracy and validation loss.

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Candida albicans biofilm inhibition by Gold nanoparticles (Au-NPs) synthesized using *Sphaeranthus amaranthoides a medicinal herb*

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ABSTRACT

Introduction: Gold Nanoparticles are most widely used metal in green chemistry, offers a major efficacy in biomedical and therapeutic applications due to its unique surface Plasmon resonance character. In the present study gold nanoparticles (Au-NPs) was synthesized by the reduction of gold metal ions with the aqueous extract of *Sphaeranthus amaranthoides*.

Materials & methods: Gold nanoparticles of *Sphaeranthus amaranthoides* were characterized by Ultra Violet spectroscopy, Fourier Transformed Infra Red spectroscopy and Scanning Electron microscopy. Prepared nanoparticles were further analyzed for anti Candidal activity on *Candida albicans* Bio film and toxicity studies on Zebra Fish.

Results: Presence of a Surface Palsmon Resonance single peak band was observed at 540-550 nm range which was corroborated with the Scanning electron microscopy. Further analysis of IR bands from Fourier infrared spectroscopy (FTIR) revealed that the appearance of the sharp band at 1500 cm^{-1} - 1700 cm^{-}. Anti candidal investigation using Crystal violet assay revealed that Au-NPs at 1000 ng concentration have inhibited 70.6% of *C. albicans* biofilm. *In vivo* toxicity test with zebrafish embryo substantiated that Au-NPs showed >85% survival rate at 48h of exposure to Au-NPs

Discussion: Conjugation of *S. amaranthoides* with gold nanoparticle may be the responsible factor for enhancing the anticandidal activity at lower concentrations. Bioactive gold nanoparticles development leads to functional materials for biomedical and therapeutic applications

Conclusion: *S. amaranthoides* extract as capping agent as a potential agent for surface coating material for prosthetic devices to control and prevent *C. albicans* biofilm as well as biofilm mediated infection.

KEY WORDS

Candida albicans, Biofilm, *Sphaeranthus amaranthoides, Toxicity, Zebra fish*

INTRODUCTION

Candida albicans, a ubiquitous opportunistic fungal pathogen and etiological agent of candidiasis causing morbidity and mortality in immune compromised patients (Siva Reddy et al., 2019). Candida infections have become the fourth most common encountered in nosocomical pathogens in blood stream infections (Venugopal et al., 2016). Emergence of anti candidal resistance especially against the azole antifungal agents poses an important challenge to clinician and in addition these antibiotics associated with adverse effect on the host including hypersensitivity, immunocompromised and allergic reactions. (Ghazi et al., 2020).

C. albicans biofilm is a fungal community composed of proteins, lipid, polysaccharides, DNA and other chemical. These components together encompassed of exopolysaccarides (EPS). *C. albicans* enters the transition state from yeast to hyphal formation which promotes the superficial to blood stream infection. *C. albicans* infection in blood attributes to 30%-70% mortality rates (Bouza et al., 2013). Biofilm of *C. albicans* act as protective environment to achieve pathogenesis by producing hyphae which enters deeply into the cells and cause infection. Hence bio films are important adaptive mechanism for the *C. albicans* to overcome antifungal therapy. Therefore, targeting bio film of *C. albicans* is critical to overcome biofilm mediated resistance.

Green Chemistry is an emerging field where nanoparticles conjugation with natural and biological products to reduce the toxicity and adverse effects instead of using chemicals. Plant based materials nanomaterials synthesized are one of the best candidates among other methods. Gold nanoparticles have gained attention in recent years due to their stability, biocompatibility, light activating and photothermal function (Sherwani et al., 2015 and Vaid et al., 2020). An alternative strategy to treat and prevent C. albicans infection was sought and nanostructure was developed as alternative regimen. Several studies have portrayed the use of nanoparticles as a promising candidate for antifungal therapy (de Alteriis et al., 2018 and Judan et. al., 2021).

In the present study, *Sphaeranthus amaranthoides* well known for their ethanomedical properties such as antimicrobial, hepatoprotective, rejunuvation, anti-inflammatory and anticancer agent was used as the capping agent for synthesis of nanoparticles. Thus green synthesis approach using this ethanomedical plant is presumed to be with several health benefits. From the present investigation the gold nanoparticles synthesized using *S. amaranthoides have*

significant antibiofilm activity against C. albicans from in vivo investigation they are revealed to be nontoxic.

MATERIALS AND METHODS

Plant material and greener route for gold nanoparticles synthesis

The whole herb S. amaranthoides was purchased from siddha herbal market as coarse powder. The material (5g) was dissolved in 50 mL of methanol kept for overnight shaking. After 12 h the extract was filtered with whatmann's filter paper. For the synthesis of gold nanoparticles, 5mL of the extract was added to 45 ml 10^{-3} M gold chloride (Sigma Aldrich). The brown bottles were stirred consistently for 2h using magnetic stirrer under room temperature. The change in color indicated the synthesis of gold nanoparticles. The particles in the colored solution was centrifuged (4000rpm) and to remove the debris of the solvent the collected particles were rinsed with milliQ and kept under vacuum rotary evaporator (RVC 2-18 CD plus) for concentration.

Characterization of gold nanoparticles

The absorption property of Au-NPs was assayed by UV/Vis spectrometry (Enspire, Perkinelmer, USA) at regular intervals in the range of 400nm to 700nm. The bioreduction compounds that are responsible for the synthesis of Au-NPs were determined using Fourier Transform Infrared spectroscopy (FTIR). The spectrum of the surface groups was obtained by Thermo Scientific Nicolet 6700 system with 16 scans per sample at the range of 500–4500 cm^{-1}. To examine the structural morphology of Au-NPs FESEM (Supra-55, Carl Zeiss, Germany) with EDAX was used.

Preparation of fungal culture

The test pathogen *C. albicans* (ATCC 10231) which forms substantial biofilm was grown in potato dextrose agar plates. For biofilm assay *C. albicans* was grown overnight in the Potato dextrose broth (PDB) at 37°C at 7000rpm in shaker. The yeast cells were harvested by centrifugation for 15min at 2300rpm. The harvested cells were washed with 0.1M Phosphate buffer saline with pH of 7.2. Later the cells were resuspended with PBS and for every assay 100µl of suspension containing 10^7 cells/mL will be used.

Antibiofilm activity of gold nanoparticles

AuNps were used to study the biofilm inhibitory effect. For this varying concentration ranging from 250ng to 1000 ng was added to 24 well microtitre plates containing PD broth and

10^{-7} cells mL^{-1} of *C. albicans*. The microtitre plates were kept without shaking at 37 °C for 24h. Wells without nanoparticles and *C. albicans* served as blank and wells with only *C. albicans* served as control. After incubation, the unspent medium was discarded and the plates were rinsed with milliQ. The yeast biofilm was stained with 0.4% crystal violet (CV) and kept at room temperature for 5 min. The CV was discarded and plates were again rinsed with milliQ and kept for air drying. To measure the optical density (OD_{570nm}) the wells were added with 1mL of ethanol and recorded using PerkinElmer, EnSpire, USA, multiplate reader.

Biofilm inhibition by Au-Nps was examined under light microscope. The biofilm was allowed to grow on glass slide (1X1cm) kept inside the microtitre plate containing PDB. The test wells were supplemented with Biofilm inhibitory concentration (BIC) of Au-NPs. The microtitre plates were incubated for 24 h without shaking at 37 °C. To visualize the biofilm inhibition, the glass slides present inside the microtitre plates were removed and washed with milliQ. Later, the slides were stained with CV and incubated for 5min. The biofilm slide was subsequently destained. The control and treated biofilm slides were visualized under Lieca, DM2000 LED, and light microscope under 400 X magnification. The captured imaged were processed using LAS 4.9 and the significant difference was recorded.

Biofilm quantification using XTT

C. albicans biofilms grown in the presence and absence of Au-NPs for XTT assay in the microtitre plates were incubated for 12h at 37°C. After incubation, the microtitre plate was rinsed with milliQ to remove the unadhered cells (Yan et. al., 2019). The plates were added with 100 µl of XTT menadione solution and incubated in dark for 5 h at 37°C. The change in the color formation by water soluble formazan product was measured at 450 nm using microtitre plate reader (BioRad, USA).

Toxicity assay using zebrafish embryo

Healthy zebra fish embryos were collected and washed with MilliQ, subsequently added to the microtiter plate containing egg water. The embryos were separated as batches (10 embryos per well). The test well was added with Au-NPs in varying concentration. The wells containing only the egg was recorded as positive control. Immediately after the experiment, the microtitre plates transferred to 30°C for 48 h. The changes in the appearance of the embryo are recorded at 0th, 24th and 48th hour (Seema et al., 2020).

RESULTS AND DISCUSSION

Characterization of Au-NPs

The change in the colour of the solution determines the synthesis of Au-NPs. In general for Au-NPs the colour change has been recorded as either yellow to pink tones or resulting with intense purple blue colour. The difference in the colour could be the use of different plant extracts at different concentration. Here Au-NPs was recorded from yellow to intense blue colour (Fig.1a) which was monitored by analyzing the excitation due to the applied electromagnetic field of Surface Plasmon resonance (SPR). The Au-NPs synthesis was characterized with conventional UV-visible spectroscopy method. Figure 1b represents the UV-Vis scan for Au-NPs, which indicates there was major peak at 540 nm with the increase in the absorbance. The peak appearing at 540 nm -550 nm is the characteristic of Au-NPs. Similarly, Au-NPs synthesis with Aloe vera leaf extract (Sherwani et. al., 2015) and crude ethno botanical extracts (Judan et. al., 2021) have shown surface plasma resonance (SPR) at 540 nm. Further, scanning electron microscopic analysis also ascertained Au-NPs synthesis. Intriguingly, single SPR peak represent the small spherical nanoparticles of Au where anisotropic particles exhibit two or three bands in SRP. These results very well correlated with the SEM image representing small spherical morphology of Au-NPs were observed (Fig. 2).

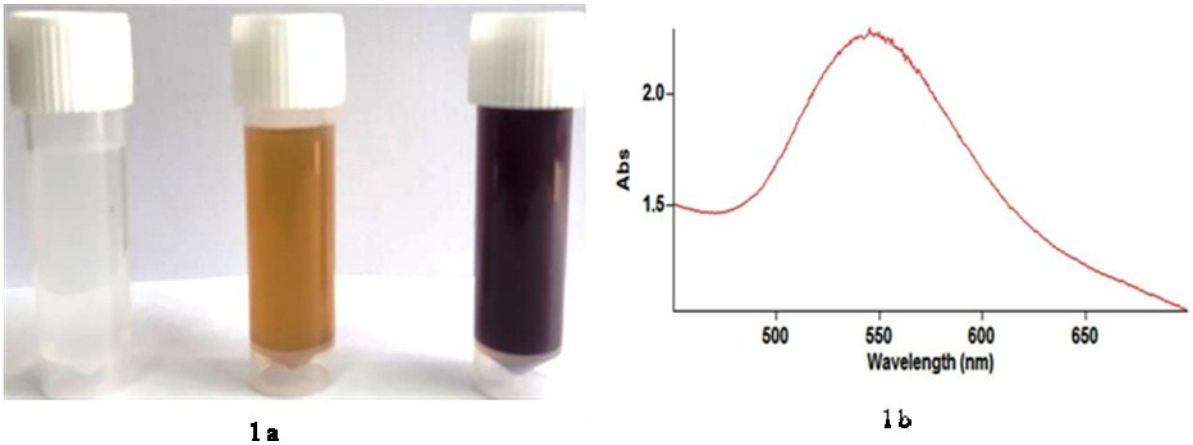


Fig 1a: Au-NPs synthesized from *S. amaranthoides* extract indicates the change in color from yellow to intense blue

1b: UV-Vis scan for Au-NPs representing single major peak between 540 nm –550 nm with the increase in the absorbance

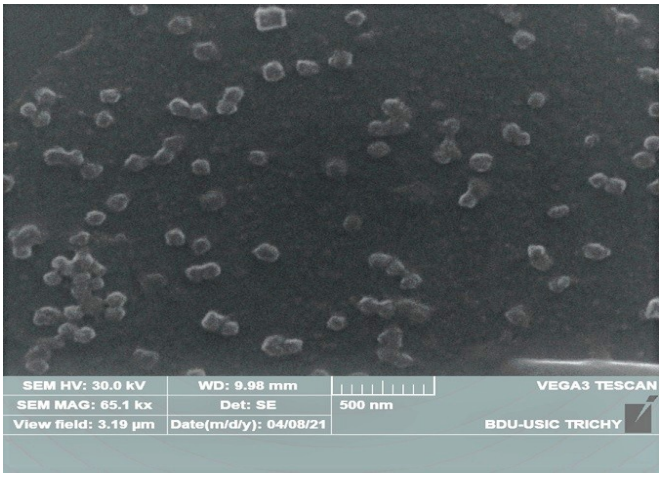


Fig 2: SEM image of Au-NPs synthesized from *S. amaranthoides aqueous* extract representing small spherical morphology

From FTIR analysis the possible functional groups of AuNPs were determined. The major stretching frequencies of Au-NPs synthesized using *S. amaranthoides* are recorded with sharp band between 1500 cm^{-1} - 1700 cm^{-1} and a major IR band between 3000- 3500cm^{-1}. The IR bands at 1500 and 1700cm represents the presence of double bond groups of C=O, C=C and C=N (Fig. 3).

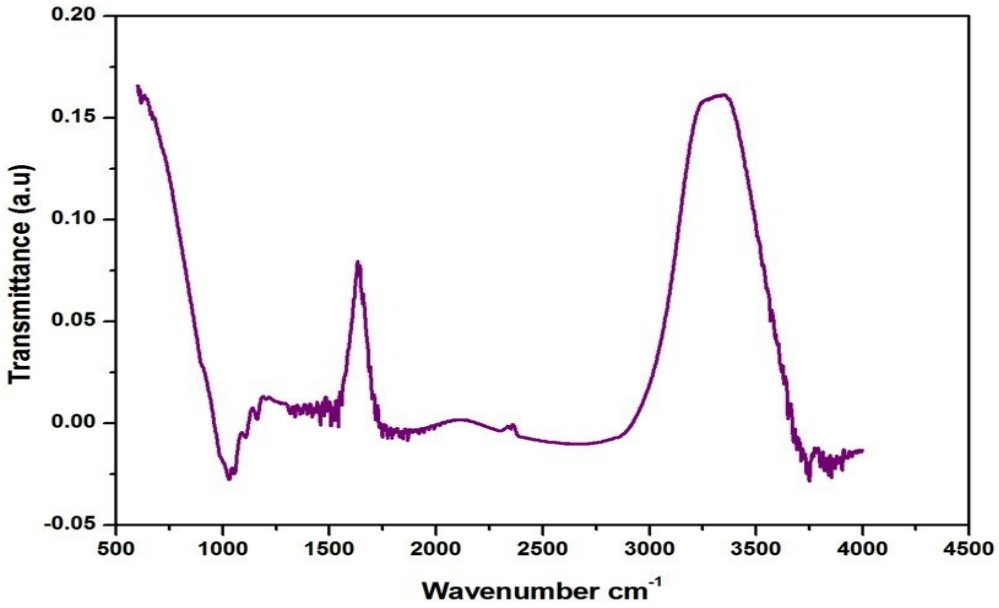


Fig 3: FT-IR spectra for Au-NPs form by using *S. amaranthoides aqueous* extract

The IR band corresponds to carbonyl, carboxyl and amide groups Thus from this study it is confirmed that Au can bind to the proteins of the plants extract through free amine groups and carboxylate groups. Also it well know that Au can bind amide group and carboxylate ions which act as the capping agent for nanoparticle synthesis (Millstone et al., 2005). *Cinnamomum zeylanicum* leaf broth during Au nanoparticle synthesis has also shown IR bands at 1743 and 1367 cm^{-1} representing the stretching of C=O and C–O stretching modes (Smitha et al., 2009) representing the possibility of Au to interact with amine and carboxyl groups of proteins. This represents the characteristic feature of Au through greener approach for synthesis while using plant based materials. The major stretching at 3000–3500 cm^{-1} indicates the presence of O-H stretch which signifies the presence of phenolic compounds, flavonoids, benzophenones and anthocyanins from the plant extract might have contributed for the synthesis of Au-NPs (Kar et al., 2017). Interestingly, aqueous peel extract of *Garcinia mangostana* Fruit Peels used for green synthesis of nanoparticles have also shown the presence of O-H stretch corresponding to the presence of phenolic and flavonoids in the extract. Therefore, the study confirms the synthesis of Au-NPs using *S. amaranthoides* extract as the reducing and capping agent.

***In vitro* biofilm inhibition assay**

Biofilm inhibition assay using CV showed Au-NPs treated wells were with sequential reduction of *C. albicans* biofilm. The OD values of treated were reduced compared to the control. At 250 ng concentration, Au-NPs have shown 22.5% inhibition of *C. albicans* biofilm. Au-NPs at 500ng and 1000ng have shown 44.6% and 70.6% inhibition respectively (Fig. 4).

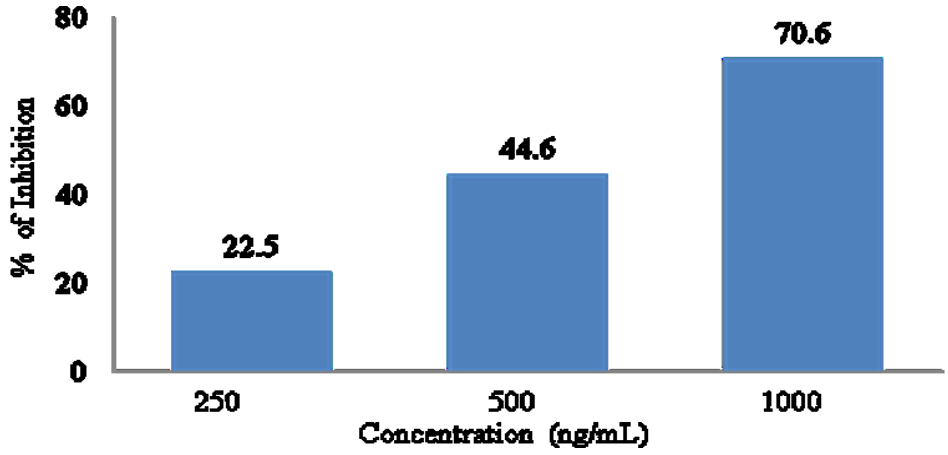


Fig 4: Biofilm inhibition assay quantified using CV A) representing dose dependent inhibition of *C. albicans* biofilm by Au-NPs.

From the CV assay it was evident that *C. albicans* biofilm was adhered to microtitre plates and in the presence of Au-NPs there was significant reduction in adherence of *C. albicans*. Also, from the microscopic observation it was determined that compared to the control there was significant reduction in biofilm of *C. albicans* (Fig. 5). From the analysis of CV slides it was observed that Au-NPs dramatically reduced the biofilm at the initial stages. Formation of biofilm by *C. albicans* involves difference stage, first stage is adherence of yeast cell, second stage is colonization and EPS production, third stage is maturation and dispersion (Nett J, Andes D 2006). Later the yeast cells get disseminated to different organs and established the infection. Furthermore in *C. albicans* the switching morphology was observed during the second stage, in this the yeast cells enter the hyphal form which is very crucial for invasive infection (Raja Mohamed et al., 2019 & 2014). In this study it is apparent that Au-NPs from *S. amaranthoides* prevent the biofilm formation at initial stages of adherence. Therefore it is substantiated that Au-NPs as the promising candidate for biofilm inhibition.

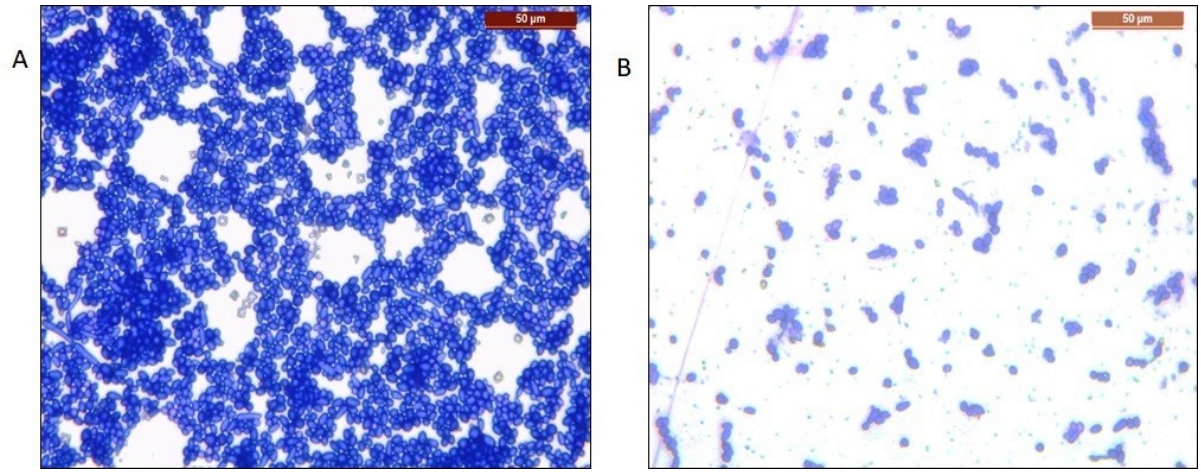


Fig 5: Light microscopic image (A) control (B) treated with S. *amaranthoides* Au-NPs.

Biofilm quantification using XTT

The XTT assay was performed to quantitatively assess the potential Au-NPs synthesized using *S. amaranthoides* extract. In the presence of Au-NPs against developing biofilms there was considerable inhibition with the growth of *C. albicans* biofilm. From the percentage biofilm calculation it was observed that at 250ng, 500ng and 1000ng there was 77.4%, 55.3% and 44.3% of metabolically viable biofilm (Fig.6)

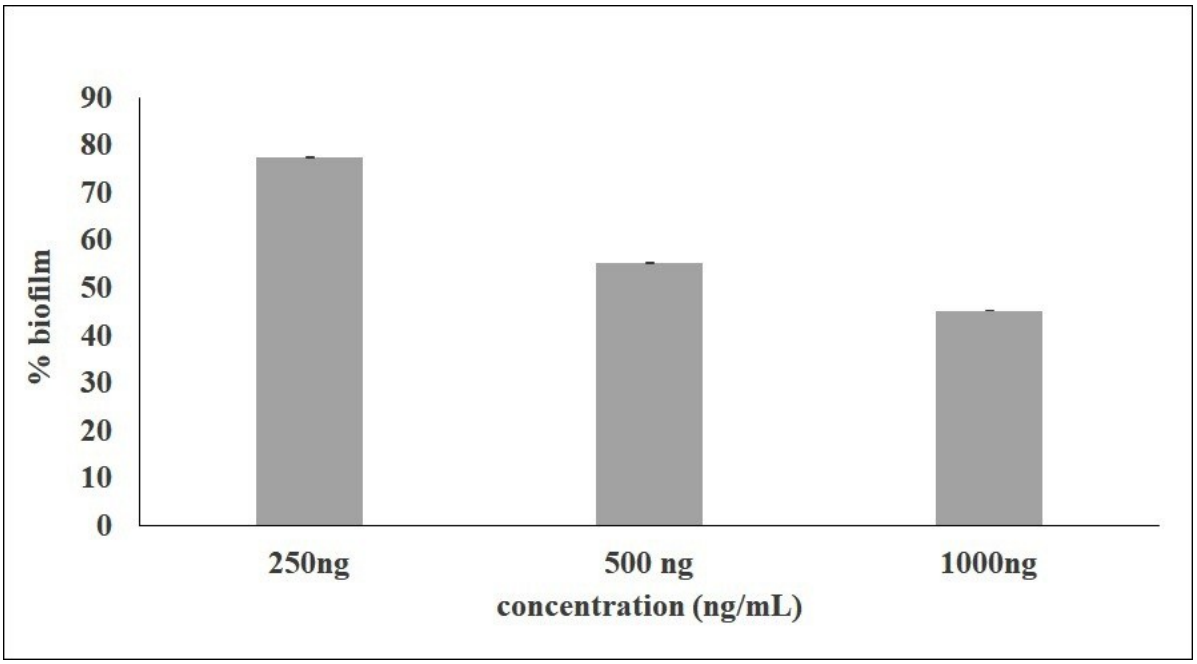


Fig 6: Quantification of Candida Biofilm using XTT assay

Toxicity assay using zebrafish embryo

To check the toxic effect of Au-NPs synthesized from *S. amaranthoides* extract, zebrafish embryos were used. The concentration ranging from 250ng to 1000ng of Au-NPs at three different time period was investigated. At 0th h there was no effect on embryos by Au-NPs. However at 24 h there was 95%, 93% and 90% survival of embryos with different concentration of Au-NPs (250ng, 500ng and 1000ng) respectively. Thus, at 48h exposure to Au-NPs (250ng, 500ng and 1000ng) there was 89%, 88% and 85% of the embryos were able to enter the larval stage without any structural anomalies respectively (Fig. 7). Investigation using higher mammals is very expensive and labour intensive. Also they have ethical concerns which thereby limit the high throughput screening methods. Thus zebra fish embryos used for toxicity test is of easy to handle due to smaller size, transparent, and cost effective. Thus zebra fish embryo used for toxicity studies are presumed as an alternative approach to reduce and refine animal use in research (Yang et al., 2009). In contrast, zebrafish embryonic development is very crucial and vulnerable to external factors. Any external toxic factor that can affect the embryo can lead to lethal organogenesis. However Au-NPs treated embryos appeared normal and entered the larval stage. Thus Au-NPs with non- toxic effect expected as valuable for further research using implant devices.

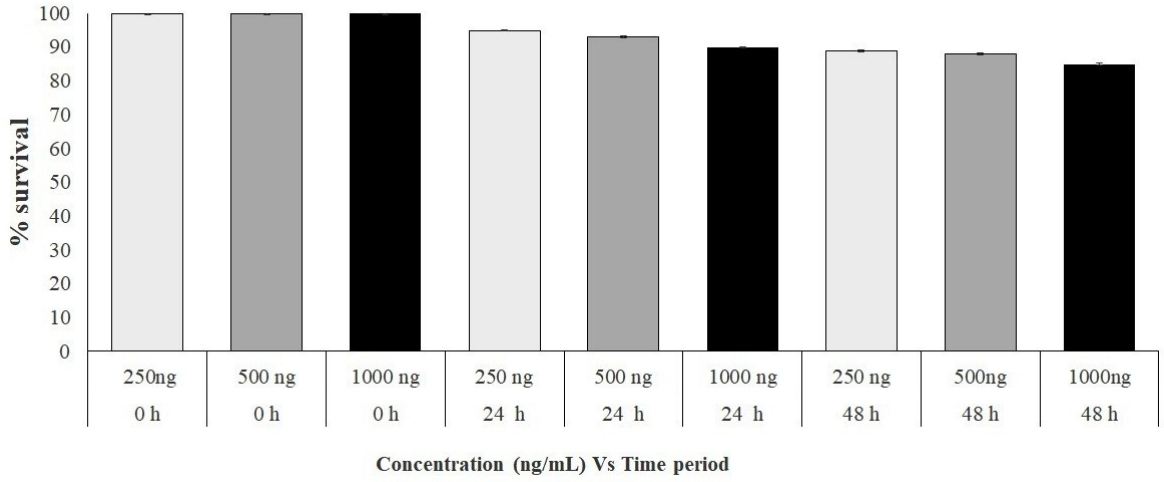


Fig 7: Toxicity assay for Au-NPs using zebrafish (Danio rerio) embryos

CONCLUSION

C. albicans biofilm is a major threat to human capable of causing infectious disease. Thus, in the present study Au-NPs from *S. amaranthoides* extract was synthesized and characterized using different spectroscopic techniques (UV-Vis, SEM and FTIR). The Au-NPs identified as small spherical was test for *in vitro* and revealed with antibiofilm activity against *C. albicans* and *in vivo* testing showed non-toxic effect. Overall, the study concludes Au-NPs synthesized using *S. amaranthoides* extract as capping agent as a potential agent for surface coating material for prosthetic devices to control and prevent *C. albicans* biofilm as well as biofilm mediated infection.

CONFLICT OF INTEREST

None

ACKNOWLDEGEMENT

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New distributional record of Red egg crab, *Atergatis laevigatus* A. Milne-Edwards, 1865 (Decapoda: Brachyura: Xanthidae) from the Gujarat coast, North-eastern Arabian Sea

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ABSTRACT

Gujarat coast is blessed with higher potential for the marine fisheries resources and reef associated crustaceans. The present study documents the first report of Red egg crab, *Atergatis laevigatus* A. Milne-Edwards, 1865 from Gujarat coast of India. The crab specimen (n=1) was collected from the Veraval fishing harbour (**20º 50' N and 70º 28' E**), Gujarat. Previously from the Indian coast *A. laevigatus* was recorded from Maharashtra, Goa, Kerala and Tamil Nadu. *A. laevigatus* can be distinguished from the other xanthid crabs based on the egg shaped carapace with uniform red colouration and slender shaped Gonopod (G1). The observed morphometric of *A. laevigatus* (male) was 76 x 41.5 mm (CW x CL). The possible occurrence of this crab may be due to the dynamic water current circulation pattern along the Arabian Sea. The paper provides detailed taxonomic characteristics of the species with photographs.

Keywords

Atergatis laevigatus, Gujarat, Range extension, Taxonomy, Xanthid crab

INTRODUCTION

The decapod crustaceans are distributed in every kind of environments, and their shape is well adapted for their survival in their ecosystem (Webber et al., 2010). Among the decapods, brachyuran crabs/true crabs are well known for their morphology as they occur in all aquatic

environment at various range of depth from the highest high tide line to the deepest trenches of 6000 meter (Onadeko *et al.,* 2015; Sureandiran et al., 2023a). A total of 62 families of brachyuran crab were reported from Indian coast among those the family Xanthidae is known to be the biggest brachyuran crab family with 47 genera and 146 species (Trivedi et al., 2018). Among the 47 recorded genera, *Atergatis* genus can be characterized through dorsal surface of the carapace do not possess any elevation, carapace region not defined and anterolateral margin of the carapace weakly emarginated (Naderloo, 2017). From the Indian coast, 8 species of genus *Atergatis* were recorded viz., *Atergatis dilatatus* De Haan, 1835, *A. integerrimus* (Lamarck, 1818), *A. laevigatus* A. Milne-Edwards, 1865, *A. latissimus* (H. Milne Edwards, 1834), *A. ocyroe* (Herbst, 1801), *A. reticulatus* (De Haan, 1835), *A. roseus* (Ruppell, 1830) and *A. subdentatus* (De Haan, 1835). The red egg crab, *A. laevigatus* was previously recorded from the various regions such as Goa (Dev Roy, 2013), Kerala (Dev Roy, 2013) and Tamil Nadu (Dev Roy, 2015) referred from the literature Trivedi et al. (2018). More recently, Khot and Jaiswar (2021) reported *A. laevigatus* from Maharashtra coast.

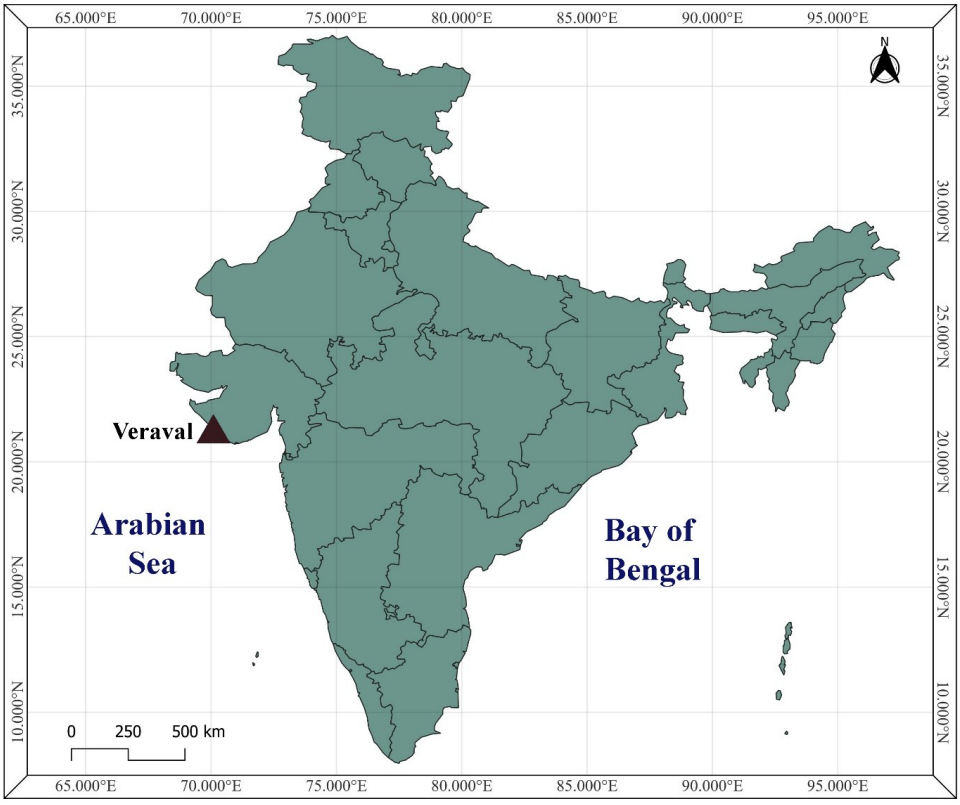


Fig. 1 Location of the study area Veraval fishing harbour (black mark), Gujarat, north-west coast of India.

MATERIAL AND METHODS

The Red egg crab, *Atergatis laevigatus* was collected from the from Veraval fishing harbour (**20º 50' N and 70º 28' E**), Gujarat, west coast of India (Fig. 1) in September 2022. The specimen was caught from the intertidal region during the low tide period at a depth < 10 m. The collected specimen was identified as *A. laevigatus* using the taxonomic literature (Khot and Jaiswar, 2021) and morphometric measurements were made using Vernier calipers (VC) with an accuracy of 0.1 mm. Photographs of the crab were captured using a Nikon D-5300 camera. The specimen was preserved using 10% formalin and deposited in the Museum of the College of Fisheries Science, Veraval, India (Museum deposit No.: KU/COF/AL.1) Standard literature and software were used for taxonomical description and illustrations (Naderloo, 2017, Sureandiran et al., 2023b). Abbreviations used in the descriptions are: CW, Carapace Width, and CL, Carapace Length.

RESULTS

Order: Decapoda Letreille, 1802

Family: Xanthidae MacLeay, 1838

Genus: *Atergatis* De Haan, 1833

Species: *Atergatis laevigatus* A. Milne-Edwards, 1865 (Fig. 2 & 3)

Material examined: One male specimen (KU/COF/AL.1); CW, 76.0 mm; CL, 41.5 mm; coll. B. Sureandiran; 15 Sep 2023 from the Veraval fishing harbour, Gujarat (**20º50'N and 70º28'E**).

Diagnosis:

Carapace sub-quadrilateral shaped, carapace length is smaller than carapace width, without dark bands or spots. Anterolateral region curved without teeth, frontal region moderately shaped and developed from interior to exterior; arm portion fat, wrist possessing 2 obtuse teeth at inner angle, followed by four to five bundles of brush like hairs. Claw tip dark followed by light colour on the remaking portion. Palm with not sharply crested upper border; fingers and thumb black with white teeth and brush of hairs. Ambulatory legs tip with tiny hairs. G1 part slender and long with tip region not sharp bearing some small tiny hairs along the tip region. G1 tip slightly curved and facing downside (Fig. 3).

Remarks

Atergatis laevigatus is confused with closely related species *A. integrimus* and *A. roseus*.

The *A. laevigatus vs. A. integrimus* they can be distinguished through absence of white spots over the carapace region in *A. laevigatus* on the other hand the carapace region fully occupied by white spots in *A. integrimus*. When comparing *A. laevigatus vs. A. roseus* they could be separated by milky white carapace in *A. roseus* and red colored carapace in *A. laevigatus*.



Fig. 2 Red egg crab, *Atergatis laevigatus* A. Milne-Edwards, 1865 from Gujarat coast of India.



Fig. 3 Red egg crab, *Atergatis laevigatus* A. Milne-Edwards, 1865: Male Gonopod (G1)

DISCUSSION

The genus *Atergatis* can be characterized though dorsal surface of carapace without any elevation, regions not defined; anterolateral margins of carapace entire, feebly lobate, weekly emarginated (Naderloo, 2017). Four species belonging to *Atergatis* genus namely *A. integerrimus*, *A. ocyroe*, *A. roseus* and *A. subdentatus* were reported earlier (Trivedi et al., 2018) and occurrence of *A. laevigatus* in Gujarat coast in the present study shows the continuous distribution of *Atergatis* genus diversity along the studied coastal region. As per IUCN (2023) *A. laevigatus* was categorized as Not Evaluated (NE). This crab species is mostly caught on the tidal areas in less numbers due to the poor appearance they are not forming commercial fishery in some areas local fisherman are consuming. Xanthid crabs are mostly available in the tidal regions similarly in present study the crab specimen was collected from the Veraval fishing harbour caught during low tide period. Khot and Jaiswar (2021) stated that the crab larvae of *A. laevigatus* is distributed along the north-eastern Arabian Sea which confirms the sudden entry of this species in the coastal waters of Gujarat. The possible occurrence of this species may be due to the physical or biological factors such as light, salinity fluctuations, wind direction, favourable feeding conditions, etc. (Sureandiran et al., 2023c).

CONCLUSION

The present study confirms the first record of *Atergatis laevigatus* A. Milne-Edwards, 1865 from the coastal waters of Gujarat, North-eastern Arabian Sea. The present study thus increases the crustacean diversity of the marine resources of the Gujarat state.

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About the organizers:

The **Centre for Climate Change Studies (CCCS)** was established in the January 2014 at International Research Centre (IRC) with the primary mandate of investigating the impact of predicted climate change on marine organisms associated to various ecosystems like coral reefs, seagrass meadows, seaweeds, intertidal zones and mangrove ecosystems etc.

At present, in the CCCS, the following research activities are going-on: (i) Implications of climate change on natural life history traits of coral reef caridean shrimps; (ii) Response of micro-planktons to elevated temperature and decreased pH using multidisciplinary approach including proteomics, biochemical and physiological assays; (iii) Contribution of seaweeds towards sustainable future by playing a role in climate change mitigation and adaptation; (iv) Diversity and status of coral reef shrimps in Gulf of Mannar Biosphere Reserve, Tamil Nadu and Lakshadweep and (iv) Plant-insect interaction under climate change scenario. Besides, the Centre is also instrumental in spreading awareness about conservation of marine ecosystem to schools and teachers through citizen science program.

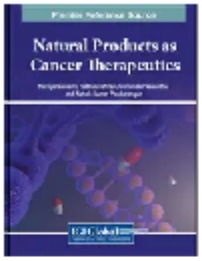
Researchers at CCCS have been actively working at Sathyabama Marine Research Station (SMRS), recently established at Rameswaram to encourage research on cutting-edge marine ecology and climate change to sustainably use, manage, and conserve natural ecosystems for the benefit of the coastal communities of Gulf of Mannar and Palk Bay regions.

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Anti-Angiogenic Activities of Natural Compounds From Plant Sources

Jackson Durairaj Selvan Christyraj, Kamarajan Rajagopalan, Pavithra Kadalpandian, Leela Bharathi Raja, Almas Vaseena M., Genga Eswari M.

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Abstract

Angiogenesis is a major common factor for regeneration and cancer biology. Many chemical compounds used for anti-angiogenesis activity are reported, but notably the active chemical compounds of plants give an equal benefit with less side effects than chemical compounds. The vascular endothelial growth factor (VEGF) and platelet-derived growth factor (PDGF) are one of the angiogenesis markers, many derivatives are reported for has VEGF and PDGF inhibitory effects. Various anti-angiogenic agents have developed by the technological advances for possible antiangiogenic therapy, example in drug industry, lichen, and their secondary metabolites such as usnic acid, barbatolic acid, vulpinic acid, olivetoric acid, emodin, secalonic acid D, and parietin. Notably, the positive effects of conventional chemotherapy can be reinforced by the metronomic model of traditional chemotherapy, because the herbal compounds effective reactivity with angiogenesis of cancer. In this chapter, the authors have covered the advancements and pharmaceutical benefits of natural products towards Anti-angiogenic activity.

Chapter Preview

Top

1. Introduction

1.1 Overview of Angiogenesis

Angiogenesis, the formation of new blood vessels from pre-existing vasculature. It occurs normally during physiologic and reparative processes. The term "Angiogensis" was first used by John Hunter, a British Surgeon in 1787. Angiogenesis may contribute to various pathologic processes, including cancer and chronic inflammatory disorders. Angiogenesis may impair processes that require vessel formation, such as healing of wounds and burns or organ repair. It occurs throughout life in both health and disease, beginning in utero and continuing on through old age. No metabolically active tissue in the body is more than a few hundred micrometers from a blood capillary, which formed by the process of Angiogenesis. Capillaries are needed in all tissues for diffusion exchange of nutrients and metabolites. Change in metabolic activity led to proportional changes in angiogenesis and, hence, proportional changes in capillarity. Oxygen plays a pivotal role in this regulation.

1.1.1 History

The Scottish Anatomist and Surgeon John Hunter provided the first recorded scientific insights into the field of Angiogenesis. His observations suggested that proportionality between vascularity and metabolic requirements occurs in health and disease. Hunter was the first to recognize that overall regulation of angiogenesis follows a basic law of nature founded by Aristotle, which in essence is form follows function. The modern history of angiogenesis began with the work of Judah Folkman, who hypothesized, (and published in 1971) that tumor growth is angiogenesis – dependent. Recognition that controls of angiogenesis could lead to cancer therapies stimulated intensive research in the field, e.g., only two manuscripts dealing with angiogenesis were published in 1970 and over 5200 articles were published in 2009.

1.1.2 Origin of Blood Vessels

The cardiovascular system is the first organ system to develop in the embryo. The luminal surface of the circulatory system in contact with blood is a single layer of endothelial cells. These are derived from mesoderm. Hemangioblasts differentiate from mesodermal stem cells and give rise to hematopoietic stem cells and angioblasts. Angioblasts are a cell type with potency to differentiate into endothelial cells but have not yet acquired all characteristic markers of endothelial cells. Vasculogenesis is the de novo formation of blood vessels from angioblasts. It occurs in the extraembryonic tissues and intraembryonic tissues of embryos, vasculogenesis is a dynamic process that involves cell-cell and cell – extracellular matrix (ECM) interactions directed spatially and temporally by growth factors and morphogens. This process includes differentiation of mesodermal stem cells into angioblasts, growth factor directed migration of angioblasts to form blood islands where angioblasts give rise to endothelial cells.

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Computational genomic sequencing and its importance for identifying the emerging variants of COVID-19

From the book Computer Intelligence Against Pandemics

Jackson Durairaj Selvan Christyraj, Johnson Retnaraj Samuel Selvan Christyraj, Kamarajan Rajagopalan, Aarya Senan Surasenan, Aparna Ramakrishnan and Harsha Haridasan

https://doi.org/10.1515/9783110767681-005

Abstract

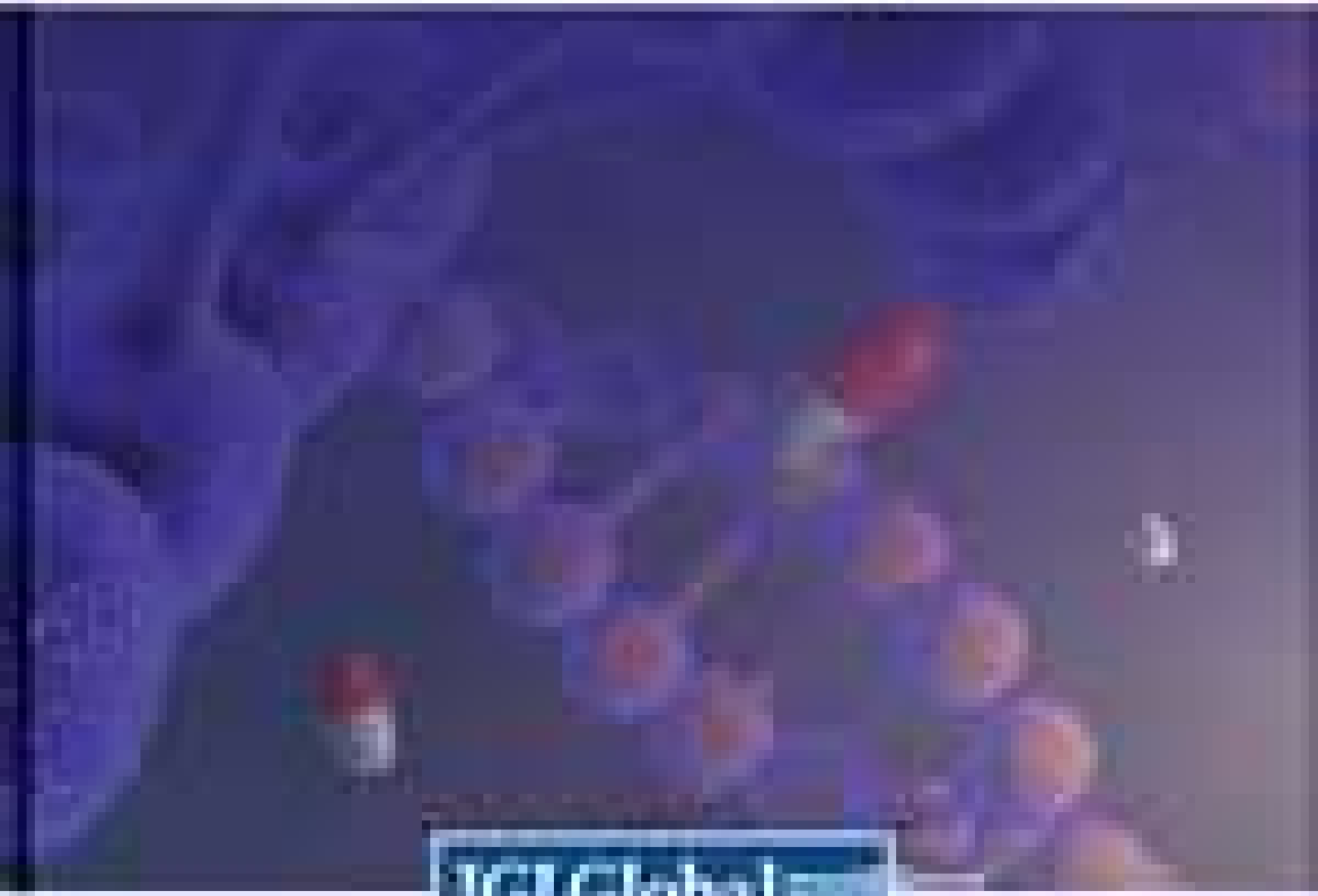
About 27 crores of people were affected worldwide by coronavirus disease, which was caused by novel severe acute respiratory syndrome coronavirus 2 (SARSCoV- 2). Understanding the evolutions and pathogenesis of virus is a key for the control of COVID-19, which can be accomplished by computational genome sequencing. The genome sequence of SARS-CoV-2 was instantly discovered and distributed on GenBank (MN908947.3). Many strains are evaluated because of the mutations in the genome of the virus. However, most of the exposed strains' (alpha, beta, gamma, delta, epsilon, zeta, eta, lambda, kappa, theta, omicron, and lota) sequences and lineages of concern resources were rapidly determined by next-generation sequencing (NGS) and shared on bioinformatics databases like BV-BRC BETA. Illumina NGS sequencing consists of four major steps such as sample preparation, cluster generation, sequencing, and data analysis. NGS presents an efficient unbiased way to classify the new strains of COVID-19 as well as provides an opportunity for the tracking of global transmission route of virus, detection of mutations to prevent the spread of new strains, reduce the use of molecular diagnostics assays, target screening for possible therapeutics, and characterization of co-infections, potent phenotype, therapeutic strategy, and genetic relatedness. In this chapter, we have covered advancements in technical aspects and the platforms for SARS-CoV-2 computational genome sequencing.

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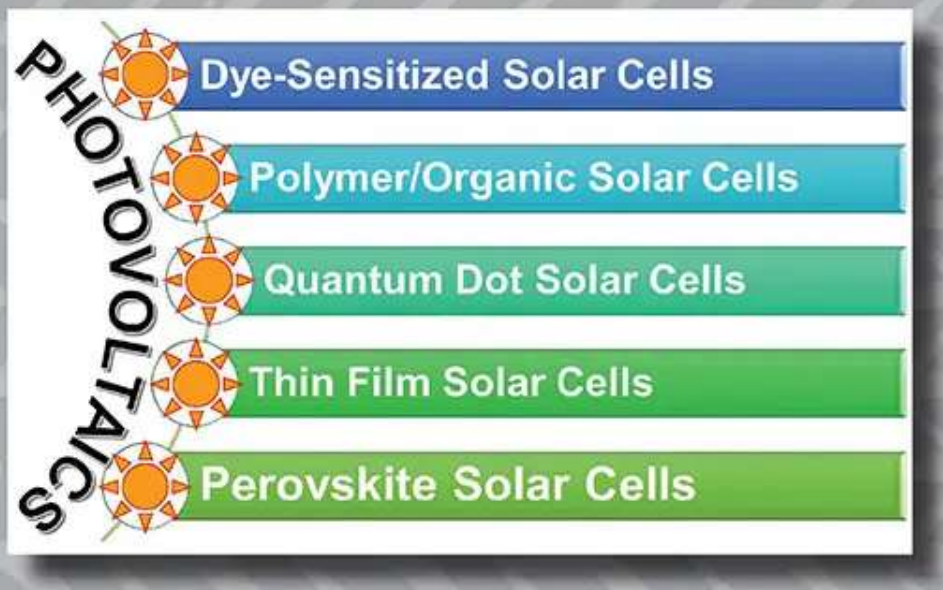


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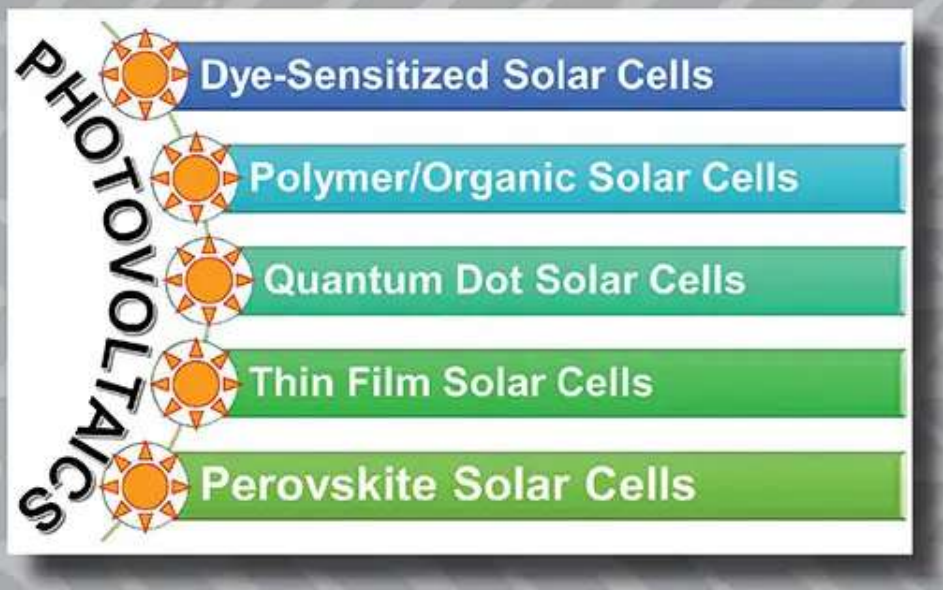


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Third Generation Photovoltaic Technology

Recent Progress and Future Perspectives



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Plasmonic Photoanodes for Dye-Sensitized Solar Cells

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Introduction 1
Plasmonic in OSCs 2
Surface Plasmon Resonance (SPR) 4
Fabrication of Plasmonic Solar-Cell Devices in Large Areas 4
Enhancement Mechanism of Plasmonic Materials 5
Localized Surface Plasmon Resonance (LSPR) 8
Propagation of Surface Plasmon Polariton (SPP) 8
Conclusion 8
References 8

Abstract

Utilizing the enormous optical cross-sections of localized nanoparticle surface plasmon resonances (LSPRs) is a promising way to increase the conversion and cost-effectiveness of photovoltaic solar cells. In this and other contexts involving energy technology, metallic nanoparticles are attractive candidates due to their localized surface plasmon resonances, which have enormous and readily regulated optical cross-sections. In this book chapter, we delved into great detail on the use of several noble metals to modify the photoanode's surface. Additionally, the Localized Surface Plasmon Resonance (LSPR)theory and mechanism were described. Also, a recent literature review for the LSPR for Ag and Au is presented to help researchers grasp the significance of noble metals on the plasmonic effect. From a business standpoint, the significance of large-area plasmonic solar-cell structure production was discussed. The final discussion covers an overview of the existing approach and potential developments for plasmonic anode materials for DSSCs.

Key Points

- Surface modification of the photoanode is discussed.
- Principle and mechanism of the Localized Surface Plasmon Resonance (LSPR).
- Role of the noble metals on the plasmonic effect provided.
- Selected and recent literature review provided for the LSPR for Ag and Au.
- From a commercial point of view, the importance of large-area fabrication of plasmonic solar-cell structures discussed.
- Finally, an overview of the current strategy and future perspectives of plasmonic anode materials for DSSCs is discussed.

Introduction

Due to the depletion of fossil fuels and increasing environmental pollution over the past few years, solar cells have attracted a wide range of research attention by utilizing natural resources in the production of electricity. DSSCs are commonly known for their spotless technology that converts sunlight into electricity. In addition, dye-sensitized solar cells (DSSCs) are highly recommended because, in comparison to other types of solar cells, they are inexpensive, flexible, simple to produce, relatively efficient at converting sunlight into energy, and environmentally friendly (O'regan and Grätzel, 1991; Thrithamarassery Gangadharan *et al.*, 2017; Lim *et al.*, 2017). On the other hand, compared to conventional crystalline silicon-based solar cells, the efficiency of a DSSC is still lower. The reduction in charge recombination at the TiO_2/dye/electrolyte interface is crucial for the proper operation of a DSSC. Therefore, creating a photoanode with an effective transport route connecting the photo-injected charge carriers to the current collector appears to be a viable solution to improve the performance of DSSCs. For more

Encyclopedia of Renewable Energy, Sustainability and the Environment

Volume 2, 2024, Pages 547-566



High Performance Quaternary Chalcogenides for Solar Energy Conversion

Devika R S, Sagaya A. Immanuel, Vengatesh Panneerselvam, Shyju Thankaraj Salammal, Shamima Hussain

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Quaternary chalcogenides have received much attention in recent years because of their unique optoelectronic properties. These materials typically consist of a transition metal, a main group element, and chalcogens. Quaternary chalcogenides exhibit a range of fascinating properties such as topological insulating behavior,

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Chapter 1 - Bioremediation, phytoremediation, and mycoremediation of wastewater

Syed Ali Abdur Rahman [1], P. Priyadharsini [2], C. Marimuthu [2], S. Sridhar [2], J. Arun [2]

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Chapter 16 - Removal of micropollutants from industrial wastewaters by conventional and advanced biological treatment processes

P. Priyadharsini [1], N. Nirmala [1], S. Sanjay Kumar [1], Kanchan Soni [2], M. Subathra [3], A. Santhosh [1], S.S. Dawn [1], J. Arun [1], Ashima Bagaria [2]

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Abstract

Industrialization modernization leads to release of anthropogenic compounds into the environment. Numerous toxic pollutants (toxic heavy metals, micropollutants, organic compounds, dyes, etc) are released into the worldwide due to the industrial activity. However, many conventional chemical (e.g., advanced oxidation processes, coagulation, and flocculation), physical (e.g., membrane filtrations and dissolved air flotation), as well as biological reactors (e.g., aerobic and anaerobic processes) could not provide environmental discharge standards for micropollutants originated from hazardous compounds. In this chapter, the advancements in all these methods and the hybrid mode of treatment are discussed in detail. Further, the future research needs and directions upon sustainable approaches on micropollutant removal and degradation need to be addressed.

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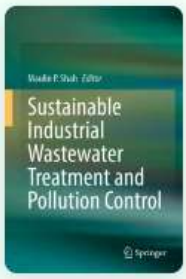
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Grafted Biopolymer Composites and Nanocomposites as Sustainable Corrosion Inhibitors

Syed Ali Abdur Rahman, P. Priyadharsini, R. V. Deeksha, J. Arun

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Phytoremediation of Metals and Radionuclides

Kanchan Soni, P. Priyadharsini, S. S. Dawn, N. Nirmala, A. Santhosh, Bagaria Ashima, and J. Arun

Abstract Heavy metals and radionuclides are the hazardous pollutants that are need to be remediated from environment for safer health and well-being. Heavy metals are leached out into the environment via numerous activities. Industrialization and modernization of radioactive applications and metal-based compounds have ended up in environment. Wetlands paves greater advantage via removal of pollutants in a natural process. This chapter highlights the phytoremediation of metals and radionuclides compounds in a sustainable and economical way. Apart from plants, microbes were also used in phytoremediation process. Metal binding particles were also employed for enhanced microbial assisted phytoremediation process. Phytoremediation is a chemical free pollutant removal process, eco-friendly and environmentally safe, etc. However further research are needed in effective processing of Phyto remediated biomass source.

Keywords Phytoremediation · Heavy metals · Radionuclides · Microbial remediation · Wetlands

1 Introduction

The increased requirement for resources from industry, military, nuclear weapon industry and agricultural site leads to huge contamination on earth environment, i.e. major cause of accumulation of the toxic pollutants including heavy metals, radionuclides, and organic contaminants in terrestrial and aquatic (surface waters, and groundwater) fauna and flora, this is due to infiltration of human activities, lack of knowledge and carelessness (Thakare et al. 2021; Singh et al. 2022b) responsible for the highest damage in the ecosystems. Most of the heavy metals i.e. Mercury (Hg),

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P. Priyadharsini - S. S. Dawn · N. Nirmala · A. Santhosh · J. Arun (✉)
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Summary

The extensive population growth, growing industrialization periodically and the emerging climate change in our day-to-day life leads to water scarcity for our daily needs itself. The absence of inefficient treatment capacity, improper management of wastewater resulting in discharge of wastewater to the freshwater bodies resulting in eutrophication. Therefore, proper treatment of

Detection of Cyanotoxins Using Bacterial Bioassays

32

Thenmozhli Geetha Saravanan, Kishore Kumar Annamalai, Abirami Baskaran, Ranjani Singaraj, Radhakrishnan Manikkam, and Manigundan Kaari

Abstract

Cyanobacteria is a group of photosynthetic prokaryotes primarily found in freshwater and marine environment. A natural phenomenon known as cyanobacterial blooms, which are characterized by a build-up of algal biomass and the potential production of cyanotoxins in aquatic environments. Cyanotoxins pose a threat to aquatic life because they can bio-accumulate on them and spread them up the food chain to humans and other animals. The oral, dermal, and inhalation routes are additional human exposure routes. Although many different analytical techniques have been used to identify and measure the presence of cyanotoxins in aquatic environments, the majority of these techniques are not readily available. Instead, agencies that monitor drinking water supplies are better served by relatively simple, low-cost techniques that can assess the potential health hazard and enable management decisions. Because cyanotoxins harm aquatic biota, it is crucial to find them in aquatic environments. Due to a number of benefits, including a shorter test period, sensitivity, cost-effectiveness, and convenience of use, the bioluminescence inhibition bioassay has been used extensively to evaluate the toxicity. Additionally, this bioassay was found to be equally applicable to all matrices like river water, sewage, sewage sludge, landfill leachate, herbicides, treated wastewater, organic and inorganic chemicals, metals, etc. for toxicity monitoring. The Microtox Acute Toxicity Test, sometimes known as Microtox, has been significant in the advancement of straightforward microscale toxicity testing. A specific clonal strain of bioluminescent bacteria is cultured in a distinctive lyophilized vial format is used in this test. This method can process a lot of samples quickly, easily, cheaply, and sensitively. Microtox is

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Extraction and Quantification of Saxitoxins from Aquatic Samples by LC-MS/MS

45

Sharon Beaula, Manigundan Kaari, Ramesh Kumar, Kishore Kumar Annamalai, Radhakrishnan Manikkam, Gopikrishnan Venugopal, and Sakthivel Krishnan

Abstract

The most well-known paralytic shellfish toxin and strong neurotoxin are called saxitoxin. Paralytic shellfish poisoning is an ailment caused by people ingesting saxitoxin, typically by consumption of shellfish tainted by toxic algal blooms. Saxitoxin has a significant negative influence on the ecology and the economy since it regularly causes the harvesting of commercial and recreational shellfish in high temperate coastal water across the world. Bivalve shellfish includes mussels, clams, oysters, scallops, etc. Liquid chromatography with tandem mass spectrometry-mass spectrometry (LC-MS/MS) is a powerful analytical technique utilized for the extraction and identification of small organic compounds. Here, this technique discussed to utilize for confirmatory identification and quantification of saxitoxin from aquatic samples with a high degree of specificity and sensitivity.

Keywords

Saxitoxin · LC-MS/MS · Paralytic shellfish poisoning

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Extraction and Quantification of Guanitoxin from Aquatic Samples by HPLC-MS

46

Angel Alisha, Manigundan Kaari, Masilamani Selvam, Kishore Kumar Annamalai, Radhakrishnan Manikkam, Gopikrishnan Venugopal, and Sakthivel Krishnan

Abstract

Guanitoxin is a neurotoxin formed by certain cyanobacterial strains such as *Dolichospermum* and *Sphaerospermopsis*. Due to its permanent suppression of acetylcholinesterase, Guanitoxin is the only naturally occurring organophosphate that may kill the animals. Even though GNT is very dangerous, it is still very hard to find it in biological samples. Guanitoxin's primary mode of action is the irreversible inhibition of acetylcholinesterase's active site, which results in an excess of acetylcholine in the parasympathetic and peripheral nervous systems and causes poisoning via activation of nicotinic and muscarinic cholinergic receptors. For the identification and confirmation of this toxin's stability, high performance liquid chromatography combined with mass spectrometry (HPLC-MS) is used. Guanitoxin may progressively degrade at ambient temperature (>23 °C) over a period of 96 h; however, it is often stable in acidic media (pH = 3.0). As a consequence, the findings presented here provide useful information for investigations intending to extract and quantify guanitoxin from aquatic materials.

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Isolation of Toxin Producing Cyanobacteria from Aquatic Samples with *Nostoc* sp.

13

Rajasekar Thirunavukkarasu, P. Gayathri, and V. Jeyanthi

Abstract

Cyanotoxins are secondary metabolites produced by cyanobacteria, a group of photosynthetic prokaryotes that are mostly found in freshwater. Cyanobacteria form the algae blooms in the aquatic ecosystems and potential release of cyanotoxins. Bioaccumulate toxins and spread them up the food chain to people and other animals, toxins pose a new threat to aquatic life. Cyanotoxin poisoning is most frequently transported on by consuming contaminated water by human. Hepatotoxins known as microcystins (MCs) are widely distributed. The most dangerous toxins are found in water supplies. Several cyanobacterial genera, including Microcystis, Anabaena, Nostoc, and Planktothrix, were found to produce MCs. In the present aim to isolation of toxin producing *Nostoc sp*. from aquatic samples with using molecular studies.

Keywords

Nostoc · Cytotoxin · Microcystins

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Detection of Cyanotoxins Using Invertebrate Bioassays in Brine Shrimp

30

V. Jeyanthi, Rajasekar Thirunavukkarasu, and Kumaran Subramanian

Abstract

Cyanobacteria are a group of Gram-negative bacteria form blooms in polluted water bodies. The presence of cyanobacterial blooms release toxins against vertebrate or invertebrate aquatic animals. It is essential to monitor microcystins (MCs) in aquatic species in order to assess the risk associated with human ingestion. The aim of this chapter is to assess the toxic effects of cyanotoxins including microcystins in brine shrimp *Artemia salina*. The brine shrimp lethality assay is performed for preliminary assessment of toxicity. Further, the sensitive and fast cyanotoxin detection methods such as enzyme-linked immunosorbent assay (ELISA) and protein phosphatase inhibition assay (PPIA) were also performed to determine the concentration of cyanotoxins.

Keywords

Cyanotoxins · Brine shrimp · Lethality · ELISA · PPIA

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Chapter 1

Isolation and Identification of Probiotics Microorganisms

Gopikrishnan Venugopal, Radhakrishnan Manikkam, Kaari Manigundan, S. Usha Nandhini, Tamil Selvam Saravanan, Bavanilatha Muthiah, and Jestin Sheeba

Abstract

Probiotics are defined as nonpathogenic live microorganisms that, when administered in adequate amounts, confer health benefits on the host. Association of probiotics with human beings has a lot of history. Well known as "health-friendly bacteria," they are widely used commercially as a functional food. The popularity of probiotics has gone exponentially high due to an increasing number of clinical trials, supporting their beneficial effects. Several in vivo and in vitro experimental evidence supports strain-specific and disease-specific probiotic efficacy to prevent and ameliorate antibiotic-associated diarrhea, traveler's diarrhea, ulcerative colitis, and many more. Besides, numerous recent studies have reported that probiotics could have a significant effect in alleviating various metabolic-, lifestyle-, and diet-related disorders like obesity, type 2 diabetes, metabolic syndrome, irritable bowel syndrome. Strains of *Bifidobacterium, Lactobacillus, and Saccharomyces boulardii* are the most commonly used as probiotics. Safety, efficacy, pathogenicity, infectivity, intrinsic property, virulence factors are to be addressed during probiotic selection. The underlying mechanisms of probiotics effects are still not fully elucidated and have been under intensive research. Numerous diverse, strain-specific probiotic mechanisms have been proposed, which include early colonization of perturbed microbes, competitive exclusion of pathogens, short-chain volatile fatty acid production, alteration of gut pH, immunomodulation, and many more. Considering the remarkable influence on human health, probiotics seem to be alluring attractive agents to promote human health conditions and to improve the quality of life against several diseases. This chapter gives a protocol to isolate, identify, and screen the probiotics microbes.

Key words Microbes, Health, *Lactobacillus*, Microorganism, Probiotics, *Saccharomyces*

1 Introduction

Probiotic microorganisms are beneficial bacteria and yeast that live in the human gut and contribute to overall health and well-being. In order to use these microorganisms as dietary supplements or in food products, it is necessary to first isolate and identify them. Isolation of probiotic microorganisms can be done using various methods, such as culture-dependent techniques or culture-

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Chapter 9

Preparation of Postbiotics from *Streptomyces* sp.

Abirami Baskaran, Kishore Kumar Annamalai, Thenmozhli Geetha Saravanan, Ranjani Singaraj, Radhakrishnan Manikkam, and Gopikrishnan Venugopal

Abstract

The discovery of new antibiotics expects the discovery of novel metabolites from diverse sources. In spite of recent advancements in identification of new natural products, the genus *Streptomyces* of Actinobacteria still remains the largest producer of unique and novel secondary metabolites, also named as postbiotics. Still, the genus is suggested to be capable of producing more than 150,000 compounds than the existing *Streptomyces* metabolites. As the search widens, apart from the usual terrestrial soils, *Streptomyces* sp. has been isolated from diverse environments in the recent years, including marine sediments, deep sea, symbionts, deserts, caves, brines, mangroves, etc. Modern bioinformatic tools such as metagenomics and transcriptomics pave way to identify novel genes and clusters in the species. Yet, isolation of postbiotics manually in the laboratory from novel *Streptomyces* sp. provides us insights into their potentiality and applicability in various fields such as medicine, industry, environment, agriculture, and biotechnology. This chapter discusses the steps to isolate postbiotics from *Streptomyces* sp.

Key words *Streptomyces*, Postbiotics, Metabolites, Antibiotics

1 Introduction

Microbial natural products and their synthetic analogues and semi-synthetic derivatives have been the primary source of antibiotics over the years. The demand for discovery of new antibiotics and drugs has increased drastically owing to the rise in antimicrobial resistance [1, 2]. Beneficial products from microorganisms containing diverse metabolites that are biologically active are termed by few scientists as "postbiotics." They include vitamins, polysaccharides, polypeptides, activators, inhibitors, and short-chain fatty acids [3].

Bioactive products possessing agricultural, industrial, and medical applications have been contributed greatly by Actinobacteria, the largest phylum in the bacterial domain. Among the 374 genera in the phylum, the genus *Streptomyces* is the largest, having

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Chapter 11

Preparation of Postbiotics from Bacillus

B. F. Paul Beulah and T. Rajasekar

Abstract

The microbiome innovation has resulted in an umbrella term, postbiotics, which refers to nonviable microbial cells, metabolic by-products, and their microbial components released after lysis. Postbiotics modulate immune response, gene expression, inhibit pathogen binding, maintain intestinal barriers, help in controlling carcinogenesis and pathogen infections. The most used approach for extracting postbiotics from microorganisms is to isolate metabolites produced by microbes using heat, enzymes, ultrasonication, ultraviolet treatment, centrifugation, and ultrafiltration procedures. This chapter will discuss the main laboratory methods in postbiotic production process of *Bacillus,* with emphasis on their quality controls.

Key words Postbiotics, Immune response, Antimicrobial, Immunomodulatory, Centrifugation, Ultrasonication, and *Bacillus*

1 Introduction

The interest in the field of beneficial microbes has emerged multifold since its inception by the Russian Nobel laureate Elie Metchnikoff. Spore-forming bacilli are being explored for the production and preservation of food for many centuries. Additionally, *Bacillus* spp. are gaining interest in human health-related functional food research coupled with their enhanced tolerance and survivability under hostile environment of gastrointestinal tract. Recently, customers have shown increased interest in considering and buying healthier foods as they have grown much more mindful of the value of nutrition and health. Therefore, there is a rise in food products with functional claims, and it is interesting to note that these functional foods have no internationally accepted definition [1]. In addition to fermented traditional foods, some of the primary categories of functional foods include nutraceuticals, probiotics, prebiotics, and synbiotics [2]. Probiotics are live microbes that provide health benefits when ingested, generally by improving or restoring the gut microflora. Prebiotics are a class of nutrients that the gut flora breaks down. Indeed, prebiotics appear to be exciting

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Chapter 19

Analysis and Identification of Short-Chain Fatty Acid Postbiotics by Gas Chromatography

Karnan Selvam, Kaari Manigundan, Velu Rajesh Kannan, Kishore Kumar Annamalai, Radhakrishnan Manikkam, Gopikrishnan Venugopal, and Sakthivel Krishnan

Abstract

Gut microbes, which are extensively distributed in the host body, create short-chain fatty acids (SCFAs). SCFAs, also known as organic fatty acids, are typically lower than six carbon atoms in length. Acetate, propionate, and butyrate are the greatest examples of significant SCFA since they are produced and absorbed in the colon before being delivered to the liver through the hepatic vein. Acetate is metabolized largely in the periphery, butyrate primarily in the intestinal epithelium, and propionate primarily in the liver. SCFAs have an impact on a range of cell types, including immune system cells and epithelial cells, via activating G-protein coupled receptors (GPCRs) and inhibiting histone deacetylase. Given the connection between changes in SCFA concentrations and the formation of diseases, techniques to quantify these acids in diverse biological samples are essential. The present procedure outlines a pretreatment approach for extracting SCFA from any biological material prior to using direct injection gas chromatography for analysis and identification. The fundamental benefit of employing this gas chromatography approach is that it provides an affordable, efficient, and repeatable method for measuring SCFAs in any biological material.

Key words Short-chain fatty acids, Gut microbiome, Gas chromatography, Biological samples

1 Introduction

Short-chain fatty acids (SCFAs), which are predominantly produced by bacteria that digest undigested carbohydrates in the gut, are influenced by the number of carbon atoms in a carbon chain [1]. Fatty acids with less than six carbon atoms are known as short-chain fatty acids. The host body contains a lot of short-chain fatty acids (SCFAs), which are recognized as crucial metabolites in disorders involving the gut microbiome. Understanding SCFA's function in maintaining host health depends on quantifying their presence in distinct biological species. For estimation and

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Chapter 19

Analysis and Identification of Short-Chain Fatty Acid Postbiotics by Gas Chromatography

Karnan Selvam, Kaari Manigundan, Velu Rajesh Kannan, Kishore Kumar Annamalai, Radhakrishnan Manikkam, Gopikrishnan Venugopal, and Sakthivel Krishnan

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Key words Short-chain fatty acids, Gut microbiome, Gas chromatography, Biological samples

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Chapter 20

Analysis and Identification of Biosurfactants Postbiotics

Kishore Kumar Annamalai, Kaari Manigundan, Abirami Baskaran, Ranjani Singaraj, Thenmozhli Geetha Saravanan, and Radhakrishnan Manikkam

Abstract

Postbiotics are soluble metabolites produced during the growth as well as fermentation of food-grade bacteria in complex microbiological cultures, food, or in the gastrointestinal tract. They are widely distributed high and low molecular weight bioactive metabolites; the most recent research on creating and using postbiotics from a variety of probiotics is very encouraging, but it is important to analyze the chemical makeup of postbiotics and run antagonistic tests in order to determine whether they are effective in affecting microorganisms that affect food and food products. As a result, foods can actually profit from a recognized postbiotic with a known effect. Cell-free supernatants known as postbiotics contain a complex mixture of metabolites secreted by probiotics, including enzymes, secreted proteins, short-chain fatty acids, vitamins, secreted biosurfactants, amino acids, peptides, and organic acids, and so on. Paraprobiotics are "inactivated microbial cells of probiotics (intact or ruptured, containing cell components also including peptidoglycans, teichoic acids, surface proteins, and many more.) or crude cell extracts (i.e., with complex chemical composition)."

Key words Postbiotics, Biosurfactants, Fermentation, Metabolites, Probiotics

1 Introduction

Postbiotics are defined as microbic metabolites produced by food-grade bacteria during fermentation that are cell-bound or discharged to the culture media, in the food or host's gut, and that have benefits for the host or food [1, 2]. Postbiotics are "nonviable bacterial products, cell constituents, or metabolic products from microorganisms that have biologic action in the host" (further known as "metabiotics," "biogenics," PCFs-probiotic cell fragments or "metabolites/CFS-cells-free supernatants") [3, 4]. Postbiotics have a number of appealing properties, such as clear chemical compositions, safe dosage levels, and a lengthy shelf life (up to 5 years) when used as an ingredient or nutritional supplement in a food or drink [5, 6]. Postbiotics have superior capacities

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Chapter 21

Analysis and Identification of Peptide Postbiotics by LC-MS, MALDI-TOF Mass Spectrometry

Archana Jeevan, Kaari Manigundan, S. Jayashree, Kishore Kumar Annamalai, Radhakrishnan Manikkam, Gopikrishnan Venugopal, and Sakthivel Krishnan

Abstract

The systematic examination of protein identity, amount, and function is known as proteomics. The proteome is a complex and dynamic structure, in contrast to the static DNA of a cell. The most popular method for performing proteome analysis is the combination of mass spectrometry and two-dimensional gel electrophoresis (2DE). This method is being questioned, nevertheless, because whole cell lysate analysis did not pick up low-abundance proteins. Other strategies utilize the incredible peptide separation and sequencing capabilities offered by MS/MS while integrating a variety of separation technologies. Several of the limitations of 2DE for proteome analysis can be overcome when liquid chromatography is paired with tandem mass spectrometry (LC/MS/MS) and used to the direct study of mixtures. This course discusses current methods for identifying and describing a lot of proteins and measuring dynamic changes in protein expression directly from complicated protein mixtures.

Key words Postbiotics, Proteomics, Metabolite profiling, Liquid chromatography is paired with tandem mass spectrometry

1 Introduction

A wide range of proteomics techniques are available to detect and examine the protein content of bacteria, including matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS), and liquid chromatography-mass spectrometry (LC-MS), which provide extensive information about the microorganisms that may be useful for identifying postbiotic peptides.

Until recently, the primary method for peptide fragmentation in a comprehensive and sensitive examination of peptides utilizing liquid chromatography (LC) coupled to tandem mass spectrometry (MS/ MS) was collision-activated dissociation (CAD). In a

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Chapter 22

Analysis and Identification of Postbiotic Enzymes

Sudhanarayani S. Rao, Vignesh Sounderrajan, T. Thangam, and Krupakar Parthasarathy

Abstract

Probiotic bacteria that have biological activity in the host produce postbiotics, which are nonviable microbial products or metabolic by-products. When organic nutrients like prebiotics are fermented anaerobically in a matrix, functional bioactive chemicals called postbiotics are produced. These compounds are used to produce adenosine triphosphate, which is an energy source. Postbiotics are low molecular weight soluble chemicals that are either secreted by living microorganisms or released after microbial cell lysis. Bacterial cellular fragments and enzymes, short-chain fatty acids, extracellular polysaccharides, cell lysates, vitamins, teichoic acid, etc. are a few examples of postbiotics. As a probiotic, lactic acid bacteria contributes significantly to a number of health advantages, such as the ability to control the immune response to different infectious diseases. Here, we describe how lactic acid bacteria produce postbiotic enzymes.

Key words Prebiotics, Postbiotics, Lactic acid bacteria, Enzymes, Extracellular polysaccharides

1 Introduction

Postbiotics are a variety of bioactive molecules, such as nonviable or inactivated microbial cells and cell compounds, as well as any soluble products or metabolic by-products arising from microorganisms (probiotics), which, when given to consumers, directly or indirectly mediate favorable biological activity [1]. As consumers have recently become considerably more aware of the importance of nutrition and health, there is a growing interest in consuming healthier meals. As a result, there is an emergence of food products featuring healthier claims [2]. Nutraceuticals, probiotics, prebiotics, and synbiotics are some of the main types of functional foods in addition to fermented traditional foods. Probiotics are living bacteria that offer health advantages when consumed. They usually do this by enhancing or reestablishing the gut flora. The gut microbiome breaks down a class of nutrients known as "prebiotics.". These have several benefits and are used as a replacement to

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Chapter 25

Immunomodulatory Activity of Postbiotics from *Lactobacillus*

K. Abirami Arasu and T. Rajasekar

Abstract

Lactobacilli-derived postbiotics contain a diverse set of molecules, including peptidoglycan, surface proteins, cell wall polysaccharides, secreted proteins, bacteriocin, and organic acids, all of which have beneficial effects on the host, such as immunomodulatory, antitumor, antimicrobial, and barrier-preservation effects. In this chapter, we comprehensively summarize the immunomodulatory methods of *Lactobacilli*-derived postbiotics. Immunomodulatory methods are measured by analyzing cytokines production with human intestinal epithelial cell (IECs) and human dendritic cells (DCs).

Key words Lactobacillus, Postbiotics, Cytokine, Metabolites and cell wall fraction

1 Introduction

Postbiotics are inanimate microbes or microbial metabolites, proteins, or peptides exhibiting health benefits. The word postbiotic is derived from the Greek words "post" meaning after and "bios" means life, implying life. Furthermore, the biotic phrase consists of probiotics, prebiotics, synbiotics, and postbiotics [1]. Several studies have found that postbiotics have immunomodulatory, antimicrobial, and anticancer properties. It reduces inflammation, blood pressure, oxidative stress, cholesterol levels, proliferative properties, and body weight. Probiotic bacteria provide numerous health benefits by modifying the intestinal flora; nevertheless, technical limitations including viability controls have prevented them from accomplishing their full potential in the pharmaceutical and food sectors [2]. As a result, the emphasis is increasingly moving away from viable probiotic bacteria and towards nonviable bacteria and its derived biomolecules, also known as postbiotics. The heterogeneous mixture of metabolic products secreted by probio-

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Chapter 26

Antibacterial Activity of Postbiotics

Thenmozhli Geetha Saravanan, Ranjani Singaraj, Kishore Kumar Annamalai, Abirami Baskaran, Radhakrishnan Manikkam, and Gopikrishnan Venugopal

Abstract

Exploring natural antimicrobials in pharmaceutical and food industries has recently become popular, due to its increased demand, safety, and efficacy. Postbiotics are soluble bioactive metabolites that are synthesized by probiotic bacteria like *Lactobacillus*, which improve the host's biological activity and specific physiological effects. Postbiotics have beneficial effects on diabetes-related retinopathy, low cholesterolemic, antimicrobial, antagonistic adiposity, contrast hypertension, anti-inflammatory, and antioxidant. Probiotic strains must primarily show antimicrobial efficacy against toxic, pathogenic, and saprophytic microbes. Since all postbiotics are strain-specific, different methods like Spot assays, Agar well diffusion, disc diffusion, and microbroth dilution (MIC and MBC) are employed to test the potential antibacterial activity of postbiotics. As a result, several techniques are being used and developed to examine the antibacterial activity of potential postbiotics. In this chapter, the methods of examination for each of the stated ways will be discussed, clarified, and the data gathered will be analyzed.

Key words MIC, MBC, Disc diffusion, Well diffusion, Spot assay

1 Introduction

Postbiotics are beneficial bioactive compounds produced in a microenvironment during the fermentation process that can be used to improve consumer health [1]. Probiotic microbe is a producer of postbiotic as a metabolic by-product that affects the host's metabolic activities [2]. According to certain research, probiotics themselves may not always be able to sustain and promote intestinal health, but the postbiotics they create can work successfully [3]. Probiotics produce a variety of postbiotics include lactospin, indole, lipopolysaccharides, exopolysaccharides, muramyl dipeptide, and teichoic acid. [4]. Research has shown the antibacterial (pathogenic and spoiler bacteria) activities of postbiotic substances, which shield against contagious diseases and food spoilage. These

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Chapter 27

Antifungal Activity of Postbiotics

Ranjani Singaraj, Thenmozhli Geetha Saravanan, Kishore Kumar Annamalai, Abirami Baskaran, Radhakrishnan Manikkam, Gopikrishnan Venugopal, and Balagurunathan Ramasamy

Abstract

Antifungal screening is primarily concerned with identifying possible cultures from a large number of samples. Filtering the samples depending on the existence of activity will help us in selecting the most effective cultures. Therefore, screening is fundamentally done to determine the effectiveness of the sample. It is not certain that samples with activity during screening will succeed in subsequent studies. The few samples that have been identified as potentially of interest can be analyzed more thorough testing to ascertain their potentiality once the screening process is complete. There is a difference between screening and evaluation that must be understood. Evaluation is the quantification and characterization of the activity, while screening is the identification of potentially intriguing activity.

Key words Antifungal, Postbiotics, Disc diffusion, Well diffusion, Microdilution

1 Introduction

In recent years, development of resistance to antibiotics among fungal pathogens is emerging as a global problem. The current antifungal compounds no longer have any effect on pathogenic fungi [1]. Fungi being eukaryotic cells and more complex than bacteria cause infections that are often difficult to diagnose and treat, and carry unacceptably high mortality rates [2]. *Candida* spp., *Aspergillus* spp. and *Cryptococcus neoformans* are among the most common etiologic agents of fungal infections which can cause vaginitis, oral candidiasis, cutaneous candidiasis, and candidemia [3]. Treatment using currently available antifungal agents possesses risk and adverse impacts due to high toxicity and side effects. Postbiotics are the soluble metabolites or by-products of probiotics cell lysis that have unique physiological roles [4]. Recent discoveries evidence that postbiotics have a wide range of positive properties,

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Chapter 28

Antiviral Activity of Postbiotics

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Abstract

Probiotics have a number of positive impacts, including regulating immunological responses, activating the immune system, and preserving homeostasis and the balance of gut microbes. Probiotics have many positive benefits for animal and human health, which has led to the development of a wide variety of probiotic agents. Probiotics have been shown to have antiviral properties, which include modulating immunological, microbial, chemical, and physical barriers through a variety of probiotics, probiotic metabolites, and host signaling pathways. This chapter details the methods that can be used to identify the antiviral activity of postbiotics against viruses. These include toxicity of the test postbiotic compounds assessed by MTT, maintenance of cell lines, determination of the infectivity of the virus, and antiviral assays. These protocols are used for the evaluation of postbiotics that can be carried out by a single individual in Category 2 + or 3 containment laboratories.

Key words Antiviral, Cytotoxicity, MTT, Probiotics, Immunogenicity

1 Introduction

Probiotics imply that bacteria must be alive and active to benefit hosts, although data reveals that microbial viability is not required to elicit such effects. According to certain theories, postbiotics, which are probiotic chemicals, can also improve host health. Probiotics have a variety of beneficial properties, including regulating immunological responses, activating the immune system, and preserving homeostasis and the balance of gut microbes [1]. As a response to the positive impact of probiotics, a broad range of postbiotics has been developed as probiotic therapeutics for human and animal health. Each year, viral infections inflict significant financial losses on cattle and continue to be a major concern for animals [2]. Additionally, a limited number of strategies for controlling and managing viral illness. Viruses infect the host through the skin and mucosal surface, where hundreds of millions of bacteria have colonized the host [3].

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Chapter 37

Bacteriocin Postbiotics for Tuberculosis Drug Development

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Abstract

Bacteriocins are ribosomally generated peptides containing antibacterial action generated by various bacteria that have the potential of regulating clinically significant susceptible and drug-resistant pathogens. Bacteriocins have been explored in order to alter and increase their physicochemical characteristics, pharmacological activities, and biosafety. Bacteriocins produced by lactic acid bacteria (LAB) are potentially effective against various bacteria and fungi. As probiotics, lactic acid bacteria play an important part in aiding several health benefits that include the capacity to modify the immune response to a range of infections. Here, we describe the production, purification, and characterization of bacteriocin postbiotics and their activity against mycobacterium using MABA and LRP assay for tuberculosis drug development.

Key words Bacteriocin, *Mycobacterium tuberculosis*, Drug, Anti-tuberculosis assay, LRP, MABA, Postbiotics, Lactic Acid Bacteria, Antimicrobial peptides, Immunomodulation

1 Introduction

Bacteriocins are naturally occurring antibacterial compounds and protein-like chemicals generated by several bacteria. They exhibit inhibitory effects on populations of unrelated or closely connected species. The precise specificity of the bacteriocin's action and its protein nature distinguishes it from other conventional antibiotics [1]. They have a narrow inhibitory spectrum of activity centered on the homologous species. While postbiotics do not contain live bacteria, they provide health benefits through comparable mechanisms as probiotics while minimizing the hazards associated with their consumption. LAB are Gram-positive cocci or rods that are aerotolerant but non-aerobic and have the capability of fermenting carbohydrates into energy and lactic acid generation. The glucose metabolic pathway can be either homofermentative or heterofermentative [2].

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Chapter 50

Biopreservation of Food Using Bacteriocin

S. Bharathi and Radhakrishnan Manikkam

Abstract

This chapter describes the process involved in (1) the preparation of coating solution containing bacteriocin (nisin), (2) the coating of nisin on plastic film, (3) the determination of the antibacterial activity of nisin-coated plastic film, and (4) the study on the effectiveness of nisin-coated plastic film for biopreservation of food (cheese) with food pathogen *Listeria monocytogenes* as test bacteria.

Key words Bacteriocin, Nisin, Plastic films, Antibacterial, Biopreservation, Food pathogen, *Listeria monocytogenes*

1 Introduction

Bacteriocins, which are ribosomally produced peptides or proteins with antibacterial action, are synthesized by bacteria [1]. By using bacteriocin in the food sector, chemical preservatives can be used less frequently [2]. Nisin is a bacteriocin used as a food additive that is produced mainly by *Lactococcus lactis* subsp. *Lactis*, which are effective against Gram-positive sporulating bacteria like *Bacillus* sp. and *Clostridium* sp. as well as *Listeria* sp. and *Micrococcus sp.* [3]. *Listeria monocytogenes* is indeed a food pathogen that food manufacturers are seriously concerned [4].

The FDA designated nisin as generally recognized as safe (GRAS) in 1988. The US FDA accepts up to 250 mg/kg, while the FAO/WHO Codex Committee on Milk and Milk Products generally allows 12.5 mg/kg of nisin as a food additive for processed cheese [5]. Many packaging films include nisin to prevent the proliferation of infectious and deteriorating microorganisms. According to early studies by Neetoo et al. [6], nisin could not be coated directly onto plastic sheets; as a result, a coating solution was required for nisin.

Dissolving nisin in a carrier solution and then coating it onto films is one way to include nisin in packaging films [4, 7]. In this, we

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Chapter 53

Postbiotic Food Packaging Using Bacteriocin

P. Sujith and T. Rajasekar

Abstract

Probiotic microorganisms that have biological activity in the host can produce postbiotics, which are non-viable bacterial products or metabolic byproducts. Bacteriocins are proteinaceous toxin produced by bacteria to inhibit the growth of closely related bacteria. There has been intense study into the incorporation of bacteriocins into packaging films to control food deterioration and pathogenic organisms for the past 10 years. Antimicrobial packaging material reduces bacteria growth on food surfaces along with bacteriocin. This protocol encompasses brief introduction, functions of bacteriocins, cultivation of lactic acid bacteria, and development of antimicrobial packaging film and evaluating its effectiveness.

Key words Bacteriocin, Postbiotics, Antimicrobial packing, Antimicrobial coating, Lactic acid bacteria

1 Introduction

By utilizing particular microorganisms (primary and secondary cultures) and their antimicrobial metabolites, biopreservation is a cutting-edge technique used to prolong the shelf life and prevent microbiological decomposition of food (i.e., organic acids, hydrogen peroxide, bacteriocins, etc.). In vitro, postbiotics have a wide range of antibacterial effects. In the food industry, postbiotics are crucial because they protect not only against pathogenic bacteria but also against decaying microorganisms. Several LAB strains synthesize bacteriocins, which are heat-stable antibacterial peptides with acceptable safety. They are well-known individual postbiotics with potential applications in the food industry [1, 2].

There are several forms of using postbiotics in food active packaging systems such as the following:

(a) A thin layer of postbiotics is coated or adsorbs onto the polymer surface.

(b) Individual postbiotics (e.g., bacteriocins and enzymes) are immobilized on polymers by ion or covalent bonds.

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Exploration of Organic Waste for its Bioactive Pigments

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ABSTRACT. Pomegranate, beetroot, and their peels were taken from kitchen waste in Kanchipuram, Tamil Nadu, India, for this study. Using ethanol and water as the solvent, the colour was recovered from residual pomegranate and beetroot products. This study included a variety of uses as well as antibacterial and synergistic effects. Against clinical infections such Staphylococcus aureus, beetroot and pomegranate peel ethanol extracts were shown to be the most effective. We've used colour to paint and then applied it on paper. The development of the plants (black gramme) was then closely watched, and the leftover pomegranate and beetroot were used as biofertilizers (after extraction). Therefore, the synthesis of pigments using renewable bioresources must be sustainable.

Keywords: Organic waste, natural pigments, Beet Root, Pomegranate and Antimicrobial activity

Introduction

Natural pigments and other bioactive substances can be found in waste or byproducts created during food preparation. While synthetic colourants have many detrimental consequences on human health, natural pigments and colourants provide a variety of health benefits. Thus, the extraction of pigments from natural sources is of great importance on a global scale. Fruit and vegetable waste is produced in large quantities by the agro-food sectors, which makes it possible to manage this waste effectively. But despite the fact that these wastes include nutrients that are good for you like dietary fibre, an antioxidant, and colour, they are still not being used. (Čanadanović-Brunet et al., 2011).

Material and Methods

Sample Collection and Extraction

In Kanchiuram, Tamil Nadu, India, *Beta vulgaris* (beetroot) and *Punica granatum* (pomegranate) were taken from kitchen waste and taken to the lab for further examination. The pomegranate and beetroot were chopped into little pieces after being peeled off. To create a pulp, the peels were then mixed in a mixer for 2 minutes (Zin, Marki, and Banvolgyi, 2020). Different peel-to-solvent ratios (0.2, 0.6, and 1.0 w/v) of aqueous and (15%) ethanol were combined with the beetroot and pomegranate pulps (50 g). Separate ethanol and aqueous extractions were carried out. The extraction procedures were carried out in a thermostated water bath with stirring at a speed of 215 rpm, maintaining temperatures of 20°C, 35°C, and 50°C for three distinct operation times (1 h, 3 h, and 5 h).

Antimicrobial and Synergistic activity of pigments using disc diffusion method.

Using a disc diffusion technique, the antimicrobial effects of beetroot root pulp and peel extracts were evaluated against *Staphylococcus aureus 29213, Staphylococcus aureus 252923, Escherichia coli 25922, Pseudomonas aeruginosa 27853* and *Klebsiella pneumoniae 13439*. The strains were purity tested after being cultivated on Mueller-Hinton agar slants at 37°C for 24 hours. The cells were removed from the agar surface after the incubation and suspended in sterile physiological solution. Using the McFarland standard, the number of cells in 1 ml of suspension was calculated. The Mueller-Hinton agar was warmed (45°C) and mixed with 1 ml of this suspension before being placed onto Petri dishes. In order to detect halo zones of inhibition around the well, 6 mm diameter paper discs were put to the surface of the agar and impregnated with 15 l of ethanol and aqueous extracts. Plates were then incubated for 18 to 24 hours at 37 °C. Triplicate analyses of each sample were performed (Anadanovi-Brunet et al., 2011). Combining two distinct chemicals has a synergistic effect, which increases the potency of antimicrobial drugs. Different combinations of substances (pomegranate aqueous + beetroot ethanol; pomegranate beetroot ethanol + citric acid + pomegranate beetroot aqueous + honey; pomegranate beetroot aqueous + pomegranate beetroot aqueous + pomegranate beetroot aqueous + pomegranate beetroot aqueous + honey) were assessed. For this test, a modified procedure was employed. Triplicates of the experiment were run (Diaz et al., 2019).

In-Vitro Antioxidant Assay

BIOPROSPECTING OF EARTHWORM CAST ASSOCIATED ACTINOBACTERIA FOR PLANT GROWTH PROMOTING PROPERTIES

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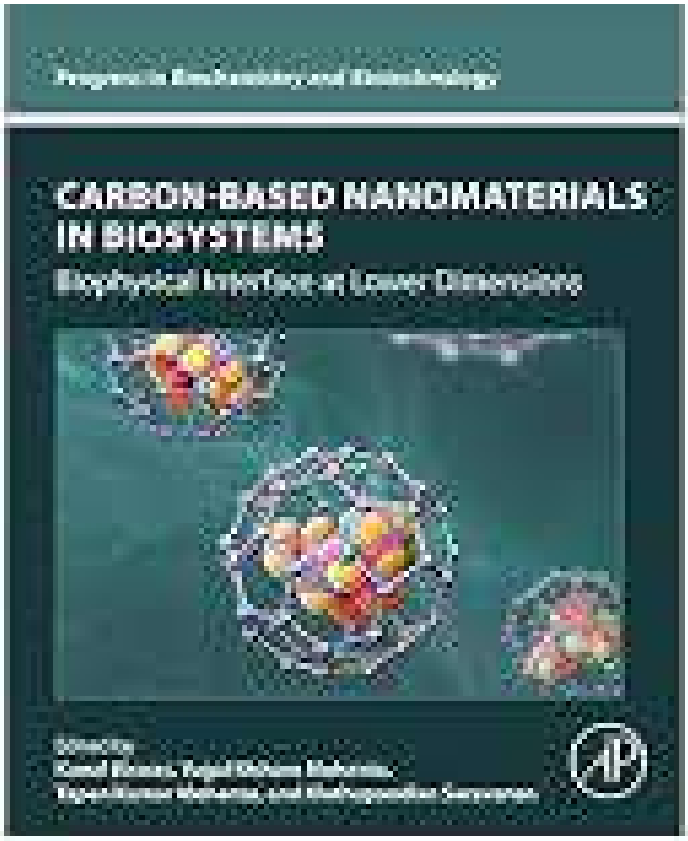
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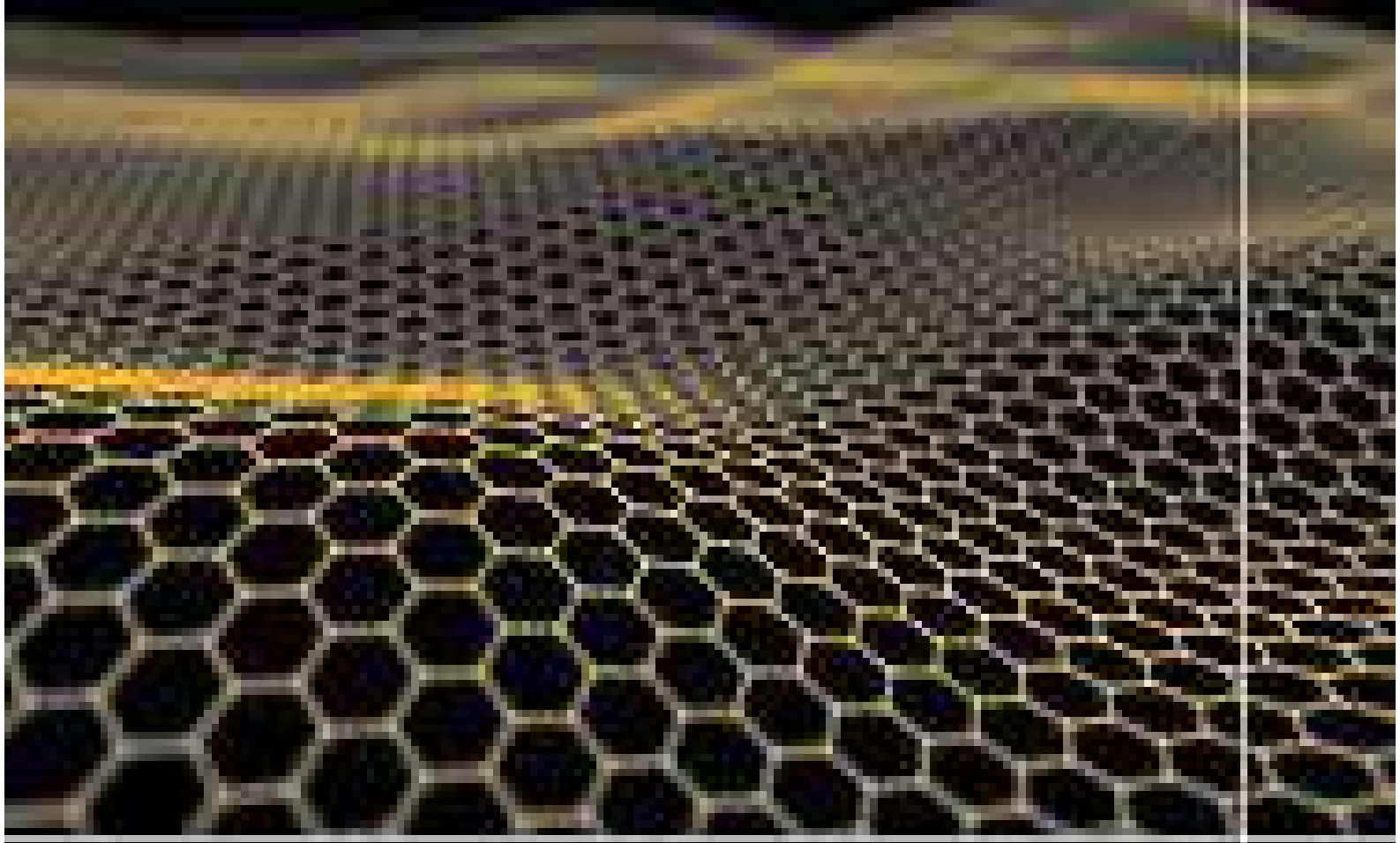
ABSTRACT

Earthworm cast and guts are potential sources of high biotechnological interest because of its great diversity of compounds exhibiting a broad spectrum of biological activities. Today, researchers are focusing on novel microbes in unusual and unexplored ecosystems. Actinobacteria are the ubiquitously distributed bacteria and the richest source for bioactive secondary metabolites including antibiotics. The present study designed to isolate the actinobacteria from earthworm cast for its antimicrobial and plant growth promoting properties.Totally 15 actinobacterial colonies were isolated from earthworm cast of Tiruvallur agricultural area, Tamil Nadu, India. All the actinobacterial cultures were screened for antimicrobial activity against one or more test pathogens eg: *Staphylococcus aureus, Escherichiacoli, Klebsiella pneumonia, Pseudomonas aeruginosa, Candida albicans* and *Ralstonia solanacearum*. All the cultures were also screened for Indole Acetic Acid (IAA), Phosphate (P) solubilisation, Extracellular enzyme activities like amylase and lipase. Optimization, characterization and taxonomy also done for the potential strain. Morphologically different colonies were isolated and sub-cultured for screening. In antimicrobial activity, among 15 isolates, EWCA5, 6 and ECA3, 16, 18 were showed antimicrobial activity against one or more tested pathogens eg: *Staphylococcus aureus, Escherichia coli, Klebsiella pneumonia, Pseudomonas aeruginosa, Candida albicans* and *Ralstonia solanacearum*. Out of 5 isolates, strain EWCA5 showed activity against maximum pathogens and was selected as a potential strain for further screening. EWCA5,9,11 and ECA9 showed Siderophore, extracellular enzyme activities like amylase and lipase. In optimization, carbon, mineral and nitrogen sources increased the activity and also bio-fertilizer production. So, the study revealed that the strain EWCA5 earthworm cast associated actinobacteria will be an imperative resource for biofertilizerapplications and also for bio-prospecting that could produce novel bioactive metabolites useful for agriculture applications.

Keywords: Earthworms, antimicrobial activity, taxonomy

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CARBON-BASED NANOMATERIALS IN BIOSYSTEMS



GRAPHENE BASED NANOMATERIALS

Application in Food, Agriculture and Healthcare

Edited by
Yugal Kishore Mohanta,
Kunal Biswas,
Saurov Mohanta and
Saravanan Muthupandian

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Chapter 8
Integration of Technology and Nanoscience in Precision Agriculture and Farming

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ABSTRACT

In addition to other cutting-edge computer technologies, the internet of things (IoT), artificial intelligence (AI), and others have been used in agriculture. However, there is currently increased focus on the use of such technologies. It is now possible to monitor the agricultural environment and ensure high-quality production through cutting-edge IoT technologies in amalgamation with nanoscience. Nanotechnology is the branch of science that deals with manipulating materials on a nanoscale. By encountering problems that cannot be solved conventionally, working with the smallest particles imaginable inspires hopes for enhancing agricultural productivity. By releasing fixed nutrients, efforts are made to restore soil fertility in the management aspects. Nano biosensors and satellite systems are used to assess the input needs for crops in controlled conditions for agriculture and precision farming, and the necessary amounts are then delivered at the correct moment. These disadvantages can be addressed by various cyber-physical systems, that is briefly explained in this chapter.

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22 Emerging Graphene-Based Nanomaterials as DNA Biosensor(s) Using Lab-On-Chip, Computational Approaches, and Robotics

Britlin Deva Jebasta N, Mithrinthaa S, Rakshi Anuja Dinesh, Sandhya S, M Bavani Latha, S Sudha, R Thyagarajan, S Jayashree, and Kunal Biswas

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22.1 INTRODUCTION

Nanomaterials improve physiochemical characteristics like strength, conductivity, and reactivity because of the high surface ratio with other electrical and physical properties. Graphene (GN) has extraordinary features in biological, physical, chemical, electronic, thermal optical, and mechanical properties [1, 2]. Graphene, a two-dimensional (2D) form of carbon with a thickness of one atom, 0.35nm that consists of Sp_2 bonded carbon atoms arranged in a honeycomb lattice. The scientists who discovered GN received the Nobel Prize in Physics in 2004 for its extraordinary material by a simple mechanical exfoliation [3].

Graphene has its derivatives in various scientific fields such as energy technology (as fuel cells, supercapacitors, and solar panels) [4, 5], nanoelectronic [6], sensors, and biotechnologies/ bioscience [7] because of their electric electronic and physiochemical properties [6]. GN has a high surface ratio (2630 m^2/g), mechanical strength (110GPA), electrical conductivity (1738 S/m), strong thermal conductivity (5000W/m/K), high charge mobility (10,000 $cm^3\ V^{-1}s^{-1}$), optical transparency (~97.7%), and there is no difficulty in biological and chemical functionalization. GN has excellent physiochemical properties that give great opportunities for biomedical/biotechnology applications [3].

The sensitivity and selectivity of the testing technique were improved by GN. For example, the thickness of the ultrathin of GN can make the sequencing of the DNA molecules. The extended surface area of GN provides enough sites for DNA anchoring and leads to efficient and rapid detection of DNA, as low charge-transfer resistance, high charge carrier and mobility, and good biocompatibility in biological and chemical functionalization. GN material is developed with accurate, sensitive, rapid, and portable DNA detection techniques [8].

DNA detection has certain drawbacks, like zero band gap, hydrophobicity, and chemical stability so graphene is processed in nanostructures like graphene nanoribbon (GNR), graphene oxide (GO), reduced graphene oxide (rGO), graphene nanopore (GNP), graphene nanoparticles (G-NP) hybrid materials. There are lots of applications in GN and GN-based nanomaterials in DNA detection. For example, GNP structure is used in the application of DNA sequencing, label-free, and

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Climate Change and Health

Prabhakar Singh, Mohammad Murtaza Mehdi, Saqib Hassan, Kunal Biswas, and V. Ramesh Kumar

Abstract The global phenomenon of climate change has emerged as one of the most critical challenges of the twenty-first century, exerting far-reaching effects on various aspects of human life. The environmental shifts and public health outcomes has garnered increasing attention from researchers, policymakers, and healthcare professionals. Over the past decade, extreme weather events have increased by 43%, leading to disruptions in healthcare infrastructure, food systems and diseases transmission. Climate change manifests through alterations in temperature, precipitation patterns, and extreme weather events amplifying various health risks. The geographical range of vector-borne diseases like malaria and dengue fever expands as warming temperatures extend the breeding seasons of disease-carrying insects. Waterborne diseases become more common as rising temperatures alter water quality and facilitate the proliferation of pathogens. Vulnerable populations and socioeconomically disadvantaged communities bears the brunt of these health impacts. Climate change and mental health has also drawn more attention. The psychological toll of witnessing and surviving climate-related disasters, contributes to elevated stress, anxiety, and depression levels. Comprehensive and multidisciplinary measures are urgently required to reduce the negative health effects of a changing environment. This book chapter explores the complex relationship between climate change and health, delving into the multifaceted ways, and highlights the comprehensive strategies to mitigate the adverse impacts of climate change and safeguard human health on a global scale.

Keywords Climate change · Diseases · Health · Pollution

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CHAPTER

5 Implications of caged molecular structure of buckminster fullerenes in food sciences and industry applications

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5.1 Introduction

Graphite and diamond are two examples of the many different forms that carbon may take in the natural world. Carbon is the most abundant element on Earth. Fullerenes are the fourth type of allotrope that carbon can take. Fullerenes are spherical molecules that are soluble in a wide variety of organic solvents. This is in contrast to the extended solid-state structures of graphite and diamond. This characteristic enables a wide variety of chemical manipulations to be carried out [1].

A fullerene is a structure made of carbon that has a fused ring system and is composed of pentagons and hexagons (see Fig. 5.1). EijiOsawa of Japan is credited with making the initial suggestion for the buckyball. He noticed that corannulene, which is a cyclopentane ring fused with five benzene rings, was a component of the football framework, and he postulated that the full structure could actually exist. At Rice University in 1985, a group of researchers led by Harold Kroto and including Richard Smalley, Robert Curl, James Heath, and Sean O'Brien [3] successfully created the first fullerene molecule by synthesizing

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Chapter 15
An Overview of Carbon-Based Nanomaterials and Their Derivatives for Different Sensing Applications



Kunal Biswas and Yugal Kishore Mohanta

Abstract Carbon based nanomaterials (CNM), henceforth mentioned as CNMs, are the classes of materials which consist of basic carbon entities as the prime architecture in the composition. Usually, CNMs comprise 2D graphene sheets, 1D carbon nanotubes, 0D carbon quantum dots, and 3D carbon nanoflowers. The alterations in the electronic configurations in the different nano-scaled systems invoke the different sensing applications and their responses, ranging from electrochemical, biosensing, amperometry, piezoelectric sensing, etc., elicited differentially from CNMs like Carbon nanotubes, Graphene sheets, Carbon dots, Carbon nanoflowers, etc., which would be highlighted with recent trend of work in this domain. Besides that, the real-life applications of CNMs in few agricultural applications would also be explained with past and recent trends with their discoveries. The underlying specific sensing properties at the atomic and electronic dimensions of different classes of CNMs would be unraveled in this chapter to showcase the significant sensing attributes existing in the inherent carbon-based nanomaterials and its modified parts for specific type of sensing applications.

Keywords CNMs · C-dot · Graphene · Electronic confinement · Physico-chemical · Sensing

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H 035

Exploring the molecular mechanism of Reactive Oxygen Species imparted by Fullerene (C_{60}) nanosystems over lung cancer cell lines: A Review

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ABSTRACT

Lung cancer remains the top cause of cancer-related death worldwide, underscoring the crucial need for novel therapeutic approaches. Fullerene (C_{60}) nanosystems have attracted interest for their achievable application in cancer therapy, owing to their unique and outstanding physicochemical features and innate capacity to either create or quench cell damaging Reactive Oxygen Species (ROS). This study elevates the molecular processes driving ROS-mediated cytotoxicity in lung cancer cell lines produced by Fullerene C_{60} [1]. Implementation of various lung cancer cell lines in in-vitro tests to determine the Fullerene C_{60}'s effect of on cell viability and ROS generation. Many other researches projected that; C_{60} Fullerene are potent to increase ROS levels when treated on a dose-dependent mode. There are more and impactful pathways that is associated with ROS-mediated cell death including oxidative stress, DNA damage, mitochondrial malfunction, and apoptosis. This contribution of signaling pathways and independent genes in ROS generation or quenching was investigated, offering adequate guidance on attainable and feasible therapeutic targets [2]. The effect of Fullerene nanosystems changes from cancer cells to normal lung cells, this paved a way considering uncomplicated access to their potential for targeted cancer therapy. Here, this study sheds light and valuable insights on the molecular pathways by which Fullerene (C_{60}) nanosystems induce ROS-mediated cytotoxicity in lung cancer cell lines [3]. Understanding these pathways is crucial for the development of robust nanoscale-based cancer therapeutics, which could pave the way for targeted and effective lung cancer treatments.

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Toxicity of fullerene and its interaction with biosystems: A review

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Abstract

Fullerene is an allotrope of carbon. It is bioresorbable and readily enters cells, making it a promising candidate in therapeutic. It also has amphiphilic and self-assembling properties, which are highly desired for effective drug delivery and tumour imaging. With such tremendous biomedical applications, toxicity is a major concern. Fullerenes can cause acute and long-term tissue damage by passing through biological barriers such as the blood-alveolus, blood-brain, and blood placenta. Fullerene has a negative impact on the liver and can alter the expression of its genes. Despite the cardiotoxic effects of some Carbon nanomaterials, fullerene has shown cardio-protective benefits against doxorubicin-induced cardiotoxicity.

In vivo analysis using freshwater fish, Anabas testudineus, fullerene C60 has shown genotoxicity even at sublethal concentrations. Even with radiation exposure, the interaction of fullerene and bacteria has shown negative genotoxicity. One of the potential risks of long-term fullerene exposure is the ability of both undoped and doped C60 fullerene to trigger inflammatory responses. The present study emphasizes the various aspects of the toxicity of fullerene.

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Effect of Multi Walled Carbon Nanotube on various bio interphase and its impact on lipid metabolism

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Abstract

Multi-walled carbon nanotubes (MWCNTs) are carbon-based nanomaterials that have gained significant appeal in nanotechnology. They are highly coveted for usage in the industrial, environmental, and medicinal fields because of their remarkable one-dimensional hollow nanostructure and distinctive physicochemical features. Despite their extensive use, limited information is known about how they affect the environment and living organisms. The first stage in determining the biosafety and biocompatibility of nanoparticles is to determine their toxic concentration in humans. Therefore, it is critical to have precise knowledge about how MWCNTs affect specific organs in order to determine their effectiveness and potential implications on health. Numerous metabolic processes can be hindered by a high nanoparticle concentration in different organs. Recent research demonstrated that exposure to MWCNT could cause lipid accumulation in different biosystems. However, the mechanisms linking MWCNT exposure and lipid accumulation remain poorly understood. This study focuses on the recent research on the toxicity of MWCNT and its potential impact on lipid metabolism in various organ systems (bio-interphase).

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Evaluation of cobalt zinc ferrite nanomaterials towards biological macromolecules on mesenchymal stem cell: A review

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Abstract

Nanomaterials are currently the topic of significant research due to their vast range of potential uses in biological, optical, and electronic sectors. In biological applications, the magnetite phase is preferred over the maghemite phase because of increased magnetization saturation and magnetic susceptibilities. Cobalt-zinc ferrite, a magnetic compound with the same crystalline structure as magnetite, is more resilient to oxidation and hence more appealing for long-term applications, such as in electronics and biological research. Due to their small size, which allows them to reach nearly every part of the body, including the circulatory system and cells, these nanoparticles are constantly being researched in the biological and medical fields. Mesenchymal stem cells, which have therapeutic potential, were used to study the biological effects of different SPIONs. The findings showed that SPIONs have a potent potential to cause oxidative damage to lipids, proteins, and DNA in tagged cells. In this, we exclusively focus on biological macromolecule damage in mesenchymal stem cells and the cytotoxicity effect of cobalt zinc ferrite.

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ORAL PRESENTATION (virtual mode)

PROSPECTS OF MULTI-WALLED CARBON NANOTUBE-BASED THERAPY TO CANCER AND THE BRAIN BEYOND THE BLOOD-BRAIN BARRIER: A REVIEW

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The most common type of central nervous system tumour that affects people of all ages is a brain tumour, which recently exceeded leukaemia as the leading cause of cancer-related mortality. There are currently few effective therapies for tumours and disorders related to the central nervous system. The lack of treatment is because of the challenges given by medication insolubility, poor distribution across cells, lack of selectivity, failure to pass cellular barriers, and blood-brain barrier (BBB). The blood-brain barrier (BBB) is a covert barrier that guards the brain, enables only a narrow range of substances to enter the brain, and contributes to the regulation of brain homeostasis. The BBB is made up of several molecular parts and transport mechanisms, which in turn provide facilities for drug efflux or blockages to drug entrance into the brain. Effective treatments for brain tumours are still difficult to find because of the BBB's low permeability and high selectivity to conventional anticancer medications.

Multi-walled carbon nanotubes (MWCNTs) have various unique properties that make them good candidates for drug delivery to the brain and cancer. Thus, to address this challenge in the treatment of brain tumours, effective drug delivery modification and unique therapeutic approaches are required in addition to the usual treatments. These characteristics include good electronic properties, a remarkable ability to penetrate the cell membrane, high drug-loading and pH-dependent therapeutic unloading capacities, thermal properties, a large surface area, and ease of molecular modification. MWCNTs might deliver drugs with great effectiveness, increased specificity, and reduced adverse effects. CNTs have mostly been used to treat cancer, although a few research have concentrated on employing MWCNTs to treat and diagnose disorders of the central nervous system.

Here, we evaluate the present status of *in vitro* and *in vivo* studies on CNT-based tumour-targeted drug delivery systems (DDS), photodynamic therapy (PDT), and photothermal therapy for the treatment of cancer (PTT). In the meanwhile, we examine the state of the art of *in vivo* and *in vitro* studies of CNT-based medication delivery to the brain.

ORAL PRESENTATION (virtual mode)

FULLERENE AS A THERAPEUTIC APPROACH IN LUNG CANCER TREATMENT: A REVIEW

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Globally, cancer is one of the major causes of mortality in recent years. Lung cancer is one of the most common types of cancer due to increased smoking and pollution. Chronic obstructive pulmonary diseases also increase the risk of lung cancer. Currently available cancer treatment options include surgical treatment, chemotherapy, radiation therapy, or an amalgamation of these methods based on the stage of cancer. The traditional cancer treatment options caused complications and the adverse effect such as chemoresistance. However, the rapid development of new technologies offers new opportunities to improve the efficiency of cancer treatments.

Nanotechnology has been increasingly studied as a potential cancer treatment in recent years. The nanocarriers are useful in targeted drug delivery for cancer treatment. Fullerenes are allotropes of carbon made up of carbon atoms arranged with 20 hexagons and 12 pentagons, with fused rings and conjugated double bonds. They are highly symmetrical and extremely stable. C_{60} fullerenes can pass through cell membranes and blood-brain barriers. They are bioresorbable and readily enter cells. Due to its cage-like structure and adaptability, it is useful as a drug delivery system. Nanoconjugates of fullerene and anticancer drugs are proven to be more effective at reducing toxicity, enhancing efficacy, and controlling drug release.

According to *in vivo* analysis, C_{60} fullerenes have significant antioxidant activity, neutralising excess ROS in cells and potentially inhibiting some cell receptors. C_{60}FAS therapy has shown a reduction in tumour volume in mice models with Lewis lung cancer. Fullerene and Doxorubicin nanoformulation has shown a considerable decrease in tumour growth and improvement in the average lifespan of the animals to a greater extent. Additionally, Fullerene-based nanocomplexes have shown a significant amount of anti-cancer potential for improving alkaloid berberine's effectiveness against lung cancer. The C_{60} fullerene being a part of the C_{60}-cis-pt nanocomplex has enhanced cis-pt entry and intracellular accumulation, boosting the cytotoxic effect of the drug on lung cancer cells. Recently, fullerene nanoformulation demonstrated the regeneration of lung epithelial cells that were treated with apoptosis-inducing molecules, implying its potential for Acute respiratory distress syndrome therapy. The present study compiles and analyses the uses of fullerene in the treatment of lung cancer.

POSTER PRESENTATION (virtual mode)

IN VITRO EVALUATION OF COBALT ZINC FERRITE CYTOTOXICITY AND CYTOCOMPATIBILITY UTILISING A HEPATOCYTE CELL LINE: A REVIEW

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Magnetic nanoparticles (NPs) show significant potential in biomedical applications such as hyperthermia, biosensors, magnetic resonance imaging (MRI), and drug delivery. Magnetite (Fe3O4) has been the most studied magnetic nanoparticle over the years. It has gotten simpler in recent years to create new, more potent varieties of magnetic NPs. Due to their intriguing magnetic and electrical characteristics with outstanding chemical and thermal stability, spinel ferrite nanoparticles (NPs) are significant. We have explored the crystal structure, dielectric, transport, and magnetic characteristics of cobalt zinc ferrite as a follow-up to our searches for suitable magnetic candidates for multiferroic composite structures. However, the inadequate understanding of these NPs' biological responses may ultimately limit their potential for use in biomedicine. To ensure that magnetic NPs have positive effects in the field of biomedicine, it is therefore vital to investigate their biological fate and potential harmful response. Toxicological studies with a hepatocyte cell line. Finding a viable alternative *in vitro* model to accurately predict the *in vivo* toxicity is therefore essential. Human cell lines are good *in vitro* models and sensitive tools for high-throughput toxicity screening, with the potential to reduce animal use in toxicity studies. The creation of mechanistic data that may be used for toxicity evaluations using cell lines is a possibility. To investigate the cytotoxicity and cytocompatibility of NPs, we have used extensively utilized *in vitro* cell culture models, liver (HepG2) cells. As a result, this review was carried out to assess the toxicity of the complex of Cobalt Zinc Ferrite nanoparticles on liver cells.

Carbon and boron based 2D nanomaterials: efficient lubricant additives

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Researchers are mainly concerned with minimizing friction and preventing the wear of moving mechanical components, since these problems create significant energy and economic constraints for many small-scale and large-scale mechanical industries. Nanomaterials, especially 2D nanostructures such as graphene and its derivatives graphene oxide or reduced graphene oxide (GO/rGO), and hexagonal boron nitride (h-BN), as additives in conventional lubricants attract significant attention because of the remarkable enhancement of anti-friction and anti-wear characteristics. This chapter aims to provide a detailed overview of recent developments in 2D nanomaterials dispersed in nanolubricants. The preparation of 2D nanomaterials, surface functionalization of graphene and h-BN using various chemicals/methods (oxidation, amine functionalization, alkylation, ionic liquids, and surface modifiers) and other nanoparticles, and their influences on the friction and wear behavior in nanolubricants are discussed in this chapter. Additive concentrations and their dispersion stability in lubricants, functional groups, and sliding conditions are the key determinants of the tribological properties of nanolubricants. The tribofilm formation mechanism and the impact of tribofilms on the anti-friction and anti-wear behavior of nanolubricants are also discussed in this chapter.

1 Introduction

1.1 Significance of lubricants in the current scenario

Longer life of moving mechanical assemblies and reduced fuel consumption are the two major concerns of the transportation industry. In addition to efficient vehicle operation resulting in enormous global cost savings, substantial reductions in greenhouse gases emissions are also much more important to reduce global warming. According to a recent survey, about 33% of fuel energy is lost as friction-related losses in a passenger car alone. It is estimated that 26% of transportation fuel energy is lost to friction loss, excluding braking friction.[1–3] Lubricants, both liquid and solid, have been the standard method of lowering friction and wear for the past few decades. Layered materials such as graphite and molybdenum disulfide (MoS_2) are traditional solid lubricant materials and oil-based liquid lubricants widely used for many industrial applications.[4–6] Oil lubricants are most commonly used for moving mechanical assemblies owing to the limitations of graphite and MoS_2 as they require specific conditions to provide lubricity and wear resistance. During operation, lubricants reduce friction and wear by effectively separating the contact interfaces by means of forming a boundary film with low shear and high durability. Furthermore, several active studies aim

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16 - Nanocomposite ceramic diffusion barrier coatings for nuclear vitrification furnace

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Abstract

This chapter describes the use of nickel-yttria stabilized zirconia (Ni-YSZ) nanocomposite coatings as a ceramic diffusion barrier material in the nuclear vitrification furnace, which operates at high temperatures, high pressure, and corrosive environments. These coatings were developed utilizing the electron beam physical vapor deposition technique on metallographically prepared nickel (Ni) base superalloys, especially Inconel 690. The structural, morphological, nanomechanical, adhesion strength, and tribological characteristics of YSZ and Ni-YSZ nanocomposite coatings with various concentrations were investigated. The nanomechanical characteristics of YSZ coating deposited at various substrate temperatures and Ni–YSZ nanocomposite coating with variable weight percentage of Ni and YSZ are discussed in this chapter. It also looks into the interdiffusion effects and physicochemical factors that happen at the interface of coated and uncoated Ni-base superalloy/borosilicate glass. Compositionally graded coating of Ni–YSZ that was exposed to borosilicate melt for 10 h at 1373 K is also reviewed. The novel approaches and concepts for improving mechanical and tribological properties are explored. The use of these coatings for future nuclear vitrification furnace components, which can withstand harsh corrosive environments, is also discussed.

Silicone-Based Coatings for High-Temperature Applications

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Coatings for High-Temperature Environments: Anti-Corrosion and Anti-Wear ..., 2023 · Springer

Abstract

This chapter explores the use of silicone-based coatings for high-temperature applications. These coatings have unique properties that make them ideal for use in environments that experience extreme temperatures, such as aerospace, automotive, and industrial applications. This chapter also discusses the benefits of using these coatings, including their excellent thermal stability, resistance to oxidation and corrosion, and ability to maintain their properties over a wide temperature range. This chapter also looks at some of the key factors that influence the performance of silicone coatings, including temperature, stress, exposure, and curing time. In addition to the benefits mentioned above, silicone-based coatings offer other advantages such as flexibility, adhesion to various substrates, and chemical resistance. These properties make them suitable for use in harsh environments when exposed to chemicals, abrasion, and weathering. Finally, the chapter highlights the importance of curing conditions on the coating performance. In conclusion, silicone coatings play a vital role in many industries, and understanding their properties is essential for achieving optimal performance and durability.

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