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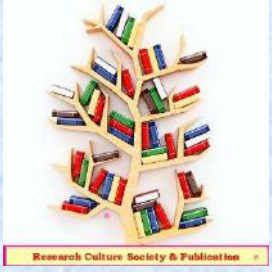
Conference Special Issue - 44 September, 2023

Organized by :

Chreso University (CU), Zambia
International Scientific Research Association
Research Culture Society
&
Eurasian Institute of Science and Technology (EU)



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International Scientific Research Conference

Date: 23 – 24 September, 2023

Conference Special Issue - 44

Managing Editor
Dr. C. M. Patel
(Research Culture Society and Publication)

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Dr. Jessica C.
Prof. Dr. M. Narayani

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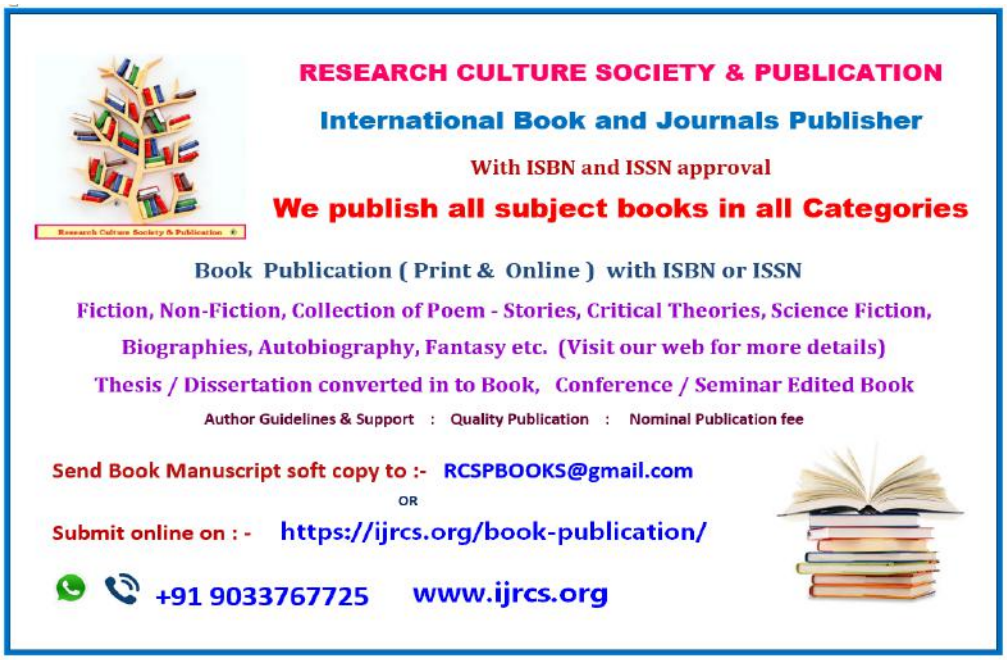

About the organizing Institutions:

Chreso University (CU), a faith based University founded by Dr. Helmut Reutter and Mrs. Esther Reutter, under the umbrella vision for Chreso Ministries, was officially established in the year 2010 under the Universities Act No. 26 of 1992. And in 2016, the University was duly registered with the Zambia Higher Education Authority under the Higher Education Act No. 4 of 2013. Chreso University operates three (03) University campuses namely: City campus (RC No. HEA 022); Makeni campus (RC No. HEA 084) and Ndola campus (RC No. 077) at Zambia, Southern Africa.

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Eurasian Institute of Science and Technology (EU) : Institute of Science & Technology is a self financed college, sponsored has been started in the year 2013 with a noble aim of imparting technical education. The institution enables them to be placed as the best professionals in industries and make them enter into high level programs with competence and confidence. Institute trains specialists in Physical Science, Life Science and Computer Science, Eurasian University is one of the best education institutions of the central region of EU, for qualified personnel training in science, management and technological specializations. Scientific subjects performed by the university aimed to increasing the efficiency of production and control processes, power saving and environmental protection.

International Scientific Research Association is a registered and an esteemed research association working on to provide scientific research services, educational studies and activities at international level, also coordinate with other research organizations for the educational research events. Scientific Research Association as honorary partner of the 'Research Culture Society' with MoU – collaboration.

Objective of the International Conference:

- Our main objective is to promote scientific and educational activities towards the advancement of common citizens' life by improving the theory and practice of various disciplines of science and engineering.
- To meet and discuss the practical solutions, scientific results and methods in solving various problems with people who are actively involved in emerging research fields.
- To organize lectures by scientists and experts and to disseminate their ideas and concepts among the science and technology community.
- Provide the delegates to share their new ideas and the application experiences face to face.
- The aim of the conference is to provide platform to students, scholars, academicians and industry persons to converse and share the ideas.

About the Conference :

"International Scientific Research Conference" Date: 23 – 24 September, 2023 aims to bring together students, scholars, researchers, academicians and industry persons to deliberate on contemporary issues concerning Science, Agriculture, Engineering and Technology research and applications.

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The framework includes engineering and technology as they relate to applications of science. Engineering is used to mean engagement in a systematic design practice to achieve solutions to particular human problems. Technology is used to include all types of human-made systems and processes.

The edited issue book is a collection of peer-reviewed scientific papers submitted by active researchers in the International Conference on Science, Engineering & Technological Innovation. This edited issue book can be helpful to understand the various concepts of Science and Technological Innovation to the researchers and academia.

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Message

Dear Ladies and Gentlemen!

It gives me much pleasure to be part of this Organization Committee of two days Conference entitled, "International Scientific Research Conference" jointly organized by 'International Scientific Research Association', 'Research Culture Society', 'Eurasian Institute of Science and Technology' and 'Chreso University' dated on 23-24 September, 2023.

This international Conference forum will encourage participants and academicians to reveal their endeavors, extend professional networks and jointly ascertain the existing and upcoming research instructions/guidelines and innovations at international level. I highly commend that all the presentations in this research conference will being interesting topics with fruitful discussions. It is really helpful to Chreso University to show case our students/scholars research outputs and grow in research and innovation through this platform.

This conference will consider and discuss all the facts, issues, challenges, advanced development and updation in the specified field including Science, Computer Science, Engineering & Technology and Agriculture globally and come up with solutions and recommendations that will contribute significantly to a healthier world.

Thank You!!!

Prof. Dr. M. Narayani

Vice Chancellor, Chreso University, Zambia

Dr.C. M. Patel

Director, RESEARCH CULTURE SOCIETY

Web: www.researchculturesociety.org

Email : director@researchculturesociety.org

Message

Dear Professional Colleagues,

It is gratifying to note that Chreso University, Zambia; 'International Scientific Research Association'; & Eurasian Institute of Science and Technology, Eurasian University (EU) in collaboration with 'Research Culture Society' (Government Registered Scientific Research organization) are organizing - 'International Scientific Research Conference' during 23 – 24 September, 2023.

The aim of the conference is to provide an interaction stage to researchers, practitioners from academia and industries. The main objective is to promote scientific and educational activities towards the advancement of common citizen's life by improving the theory and practice of various disciplines of science and engineering. Provide the delegates to share their new research ideas and the application experiences face to face.

I believe, this International Conference will help in redefining the strong connection between students and academicians from different institutions. An additional goal of this international conference is to combine interests and scientific research related to General Science, Physical Science, Applied Sciences, Agriculture, Engineering and Technology Development to interact with members within and outside their own disciplines and to bring people closer for the benefit of the scientific community worldwide.

My best wishes to the committee members, speakers and participants of this scientific conference ISRC-2023.

Dr.C. M. Patel

Director, Research Culture Society.

Dr.Jessica C.

Founder President, International Scientific Research Association.

Email : scientificresearchassociation@gmail.com

Message

Dear Colleagues !

I am grateful to co-organizing institutions, all the speakers, committee members and presenters of 'International Scientific Research Conference' (ISRC-2023). The overwhelming response to the contributors was acknowledged in a very positive manner and it shows that the new age is very much eager to work with technical literature. The rising researcher and scholar from various institutions and in-house participants motivate us to improve ourselves.

We are currently in the era of science and engineering revolution, spearheaded by recent developments in engineering, technology and sciences, providing sustainable solutions to various issues.

Here I am delighted that the series of conferences has successfully completed its first fold, it's all due to the valuable efforts of faculty members of the computer science and engineering department.

I extend my best wishes to the editorial team of the special issue, at last I hope this technological literature interaction will be a source of inspiration to upcoming educationists, technocrats and stakeholders.

Jessica

ISRC - 2023 Conference Chair

Founder, International Scientific Research Association

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Prof. Natalia., Head of the Eurasian Institute of Science and Technology, EU.
Dr.Jessica C., Head – International Scientific Research Association.
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TABLE OF CONTENTS

INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD
ISSN: 2455-0620 [Impact Factor: 7.581]
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S- State Mass Splitting of D and D_s Mesons in a Dirac Formalism

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Abstract: In this study, we consider the hypothesis that a meson consists of a quark and an antiquark, which are confined by an effective linear potential $V_q(r) = \frac{1}{2}(1+\gamma^0)(a^2 r + V_0)$. This potential is believed to represent the non-perturbative interactions of gluons. We calculate the S-state hyperfine splitting of charmed $c\bar{q}(q = u, d)$ and charmed - strange $c\bar{q}(q = s)$ meson systems. Our calculations take into account the perturbative contributions of the quark-gluon coupling, specifically the effects of one-gluon exchange, in addition to the necessary center-of-mass correction. The observed mass splitting obtained in our study exhibits a reasonable level of agreement with the corresponding experimental values. The computed states $1\,3_{S_1}(2011.38\ \text{MeV})$ and $2\,3_{S_1}(2609.25\ \text{MeV})$ for the D meson exhibit a satisfactory level of concordance with the values provided by the Particle Data Group (2010.28±0.13 MeV) and BABAR Collaboration (2608.7± 2.4± 2.5 MeV) respectively. The computed ground state $1\,1_{S_0}(1967.91\text{MeV})$ for the D_s meson is found to be in good accordance with the Particle Data Group (1968.49 MeV). The remaining radial excited states exhibit a satisfactory level of agreement with alternative theoretical models.

Key Words: Mass Spectra, Potential Model, Charmed Mesons, One Gluon Exchange.

1. INTRODUCTION :

Heavy hadron spectroscopy, which performed a key role in the development of QCD, has seen renewed interest in recent years due to the discovery of numerous new states. The significant advancements in experimental [1] research conducted by various collaborations such as "BABAR, BELLE, BES-III, B-factories, Tevatron, ARGUS, CLEO, CDF, SELEX, and DØ", focusing on the investigation of hadrons, have presented novel complexities in the theoretical comprehension of hadrons that consist of one or more heavy flavor quarks. Recent discoveries in the heavy flavor sector have revealed a number of states that don't fit our present picture of normal mesons. Thus, studying the structure of such exotic states, especially the newly discovered states such as D(2550) [2], D(2610) [2], D(2640) [3], D(2760) [2], $Y(4260)$ [4], $Z_c(3900)$ [4], etc. has sparked tremendous interest in the spectroscopy of these open-charm mesons. The D and D_s mesons are of particular importance since these are the hadrons with two open flavours ($c, \bar{u}\ or\ \bar{d}\ or\ \bar{s}$) that limit their decay via strong interactions. Furthermore, apart from the challenges posed by exotic particles, there are several states that may be categorized as radial and orbital excited states of ordinary hadrons, or combinations thereof. In particular, the discovery of newly observed resonances of D_s states especially $D_s(2638)$ [5], $D_s(2710)$ [6], D_s (2860) [7], D_s (3040) [7], etc., has increased interest in the spectrum of these double-open flavor mesons. Therefore, it is of great significance to make efforts to comprehend these recently found states in order to enhance our understanding of the dynamics between quarks and antiquarks within the $Q\bar{q}$ bound state. As a result, a successful framework can reveal crucial information regarding quark-antiquark interactions and QCD

behavior in the doubly open flavor hadronic system. Despite the presence of numerous theoretical models [8–11] that aim to investigate the quark structure of hadrons and their properties, these models consistently fail to accurately predict the energy levels of low-lying states. The deviations between the theoretical predictions and the corresponding actual values range from 60 to 90 MeV. Also, there are still questions about how the hyperfine and fine structure splitting of meson states depend on the masses of the quarks that make them up and the running strong coupling constant. Although nonrelativistic models have been extensively validated and proven highly effective in explaining the behavior of heavy quarkonia, discrepancies arise when attempting to describe mesons that consist of light- flavor quarks or antiquarks. Even though the phenomenological depiction has validity in the non-relativistic context, it becomes imperative to adopt a relativistic approach due to the comparable magnitude of the meson mass splitting and the constituent quark masses. Furthermore, apart to the spectroscopic significance of the mesonic sector, several electromagnetic characteristics of baryons exhibit a strong correlation with the relativistic motion of the quarks that confined within the hadrons. Despite relativistic quark models [12] have been inspired by the dynamical concept of quarks and gluons (QCD), there has not yet been a comprehensive quark model that encompasses all ranges, either derived from first principles or supported by fundamental experimental observations. In this regard, potentials of a distinct kind of Lorentz structure with evenly mixed scalar-vector portions in linear [13], harmonic [14], logarithmic [15], and non-coulombic power-law [16] form have also been studied. These potential models employed inside a confined hadronic sector exhibit a level of success that is about equivalent to that of the bag model [17]. Nevertheless, the non-uniqueness of bag-like models cannot be conclusively shown unless a comprehensive exploration of viable models including a broader spectrum of mesonic and baryonic events is undertaken. The current study is just an initial endeavor in that direction, since it presents a basic phenomenological framework of independent quarks confined by an equal admixture of scalar-vector potential to analyze the S-wave mass spectra of D and D_s -mesons. Our analysis will consider the effects of spurious centre-of-mass motion and the residual one-gluon exchange interactions, including these corrections in a perturbative approach.

In this article Section-2 is dedicated to a concise examination of basic framework. The results and discussions for current study are presented in Section-3. Finally, Section- 4 contains a summary and conclusion.

2. Basic Framework :

In the present investigation, it is assumed that the constituent quarks inside a meson are subject to independent confinement, as described by a potential of the form [13].

$$V_q(r) = \frac{1}{2}(1+\gamma^0)(a^2 r + V_0) \tag{1}$$

To a first approximation, the confining component of the interaction is thought to supply the zeroth-order quark dynamics inside the meson through the quark Lagrangian density as

$$\mathcal{L}_q^0(x) = \bar{\psi}_q(x)\left[\frac{i}{2}\gamma^\mu \overleftrightarrow{\partial}_\mu - m_q - V_q(r)\right]\psi_q(x) \tag{2}$$

In the context of a stationary system, the spatial component of the quark wave functions, denoted as $\psi(\vec{r})$, obeys the Dirac equation

$$\left[\gamma^0 E_q - \vec{\gamma}.\vec{P} - m_q - V_q(r)\right]\psi_q(\vec{r}) = 0 \tag{3}$$

The Dirac equation's solution can be mathematically represented in a two-component form, including both positive and negative levels of energy at the zeroth order.

$$\Psi_{\xi}^{(+)}(\vec{r}) = \mathcal{N}_{\chi}\begin{pmatrix} \frac{ig_{\xi}(r)}{r} \\ \frac{\vec{\sigma}.\hat{r}f_{\xi}(r)}{r} \end{pmatrix} U_{\xi}(\hat{r})$$

(4)

$$\Psi_{\xi}^{(-)}(\vec{r}) = \mathcal{N}_{\chi}\begin{pmatrix} \frac{i(\vec{\sigma}.\hat{r})f_{\xi}(r)}{r} \\ \frac{g_{\xi}(r)}{r} \end{pmatrix}(-1)^{j+m-l}\, U_{\xi}(\hat{r})$$

(5)

$$U_{\xi}(\hat{r}) = \sum_{m_l,m_s}\left\langle lm_l\tfrac{1}{2}m_s\middle|jm\right\rangle \mathcal{Y}_l^{m_l}(\hat{r})\,\chi_{\frac{1}{2}}^{m_s}$$

(6)

The spinor $\chi_{\frac{1}{2}}^{m_s}$ represents as spin operator as $\chi_{\uparrow\uparrow} = \binom{1}{0}$, $\chi_{\uparrow\downarrow} = \binom{0}{1}$

The radial equation comes from the Dirac equation as follows

$$g_{\xi}''(r) + \lambda_q\left(E_{\chi} - m_q - 2a^2r - 2V_0 - \frac{k(k+1)}{r^2}\right)g_{\xi}(r) = 0$$

(7)

$$f_{\xi}''(r) + \lambda_q\left(E_{\chi} - m_q - 2a^2r - 2V_0 - \frac{k(k+1)}{r^2}\right)f_{\xi}(r) = 0$$

(8)

Where $\lambda_q = E_q + m_q$

and,

$$E_{\chi}' = E_{\chi} - \frac{V_0}{2}$$
$$m_q' = m_q + \frac{V_0}{2}$$

The symbol $\xi = (nlj)$ and $\chi = (nl)$ are used to denote the Dirac quantum numbers, and the normalized spin angular part is provided as follows

It is possible to transform Eqs. (7) and (8) in to a comfortable dimensionless form

$$g_{\xi}''(\rho) + \left[\epsilon_{\chi} - \rho - \frac{k(k+1)}{r^2}\right]g_{\xi}(\rho) = 0$$

(9)

$$f_{\xi}''(\rho) + \left[\epsilon_{\chi} - \rho - \frac{k(k+1)}{r^2}\right]f_{\xi}(\rho) = 0$$

(10)

The quantum number k take the values as

$$k = \begin{cases} -(l+1) = -\left(j+\frac{1}{2}\right), & \text{for } j = l+\frac{1}{2} \\ l = +\left(j+\frac{1}{2}\right), & \text{for } j = l-\frac{1}{2} \end{cases} \quad (11)$$

here, we choose a dimensionless factor $\rho = {}^{r}/_{r_0}$ with a scale factor $r_0 = \left(a^2\lambda_q\right)^{-1/3}$ and

$$\epsilon_\chi = \left(\frac{4\lambda_q}{a^4}\right)^{1/3}\left(E_\chi - m_q - V_0\right) \quad (12)$$

The overall normalization constant $\mathcal{N}_\chi$ is

$$\mathcal{N}_\chi^2 = \frac{3\Gamma(n)\left({}^{\lambda_q}/_{r_0}\right)}{\Gamma\left(n+l+\frac{1}{2}\right)\left[2E_\chi + m_q - \frac{V_0}{2}\right]} \quad (13)$$

The fundamental eigenvalue Eq. (9) can be numerically solved by using an approximation [18], which would provide the eigenvalue ϵ_χ as well as the normalized wave functions $\psi_\xi(\vec{r})$. This will ultimately result in a comprehensive depiction of the individual quark dynamics within the S-state meson core, expressed by means of the quark orbitals as described in Eqs. (4) and (5), accompanied by the matching binding energy E_χ as determined by Eq. (12). To achieve precision, the eigenvalues ϵ_χ [19] can be computed using a conventional numerical solution approach applied to Eq. (9). To obtain the individual quark binding energy E_χ the Eq. (12) can be transformed using an appropriate substitution.

$$ax_\chi = E'_\chi - m'_q \quad (14)$$

Eq. (12) can be converted to a form

$$a^2 x_\chi^3\left(x_\chi + b\right) - \epsilon_\chi^3 = 0 \quad (15)$$

Where

$$b = \frac{2m'_q}{a}$$

The summation of the binding energies of the individual quarks contributes to the overall mass of the meson core. The resulting solutions of Eq. (15) yield the quark binding energy, which subsequently determines the zeroth order mass of the mesons

$$M_\chi^0(c\bar{q}) = E_M^0 = \sum_q E_q \quad (16)$$

This contribution requires adjustment owing to center-of-mass motion, quark-gluon interaction, and quark-pion interaction, all of which must be evaluated independently in order to determine the actual mass of the meson.

In the present theoretical framework, it is observed that the energy E_χ of the quark-antiquark system is subject to a significant contribution arising from the motion of its center of mass. If this feature is not properly considered, the theory of the independent motion of quarks within the

meson core will not result in a meson state with a well-defined momentum. Despite ongoing debate around this topic, we adhere to the methodology employed by the authors [20, 21], which represents a singular approach to addressing the center-of-mass motion. In accordance with their prescribed methodology, one can derive an approximate calculation for the momentum of the center of mass, denoted as $\vec{P}_M$,

$$\langle \vec{P}_M^2 \rangle_\chi = \sum_q \langle \vec{P}_q^2 \rangle_\chi \tag{17}$$

where $\langle \vec{P}_q^2 \rangle_\chi$ stands the mean value of the squared momentum of the individual quarks over the $1S_{1/2}$ single quark states and the current approach gives it as

$$\langle \vec{P}_q^2 \rangle_\chi = \frac{(E_\chi'^2 - m_q'^2)(4E_\chi' + m_q')}{5(2E_\chi' + m_q')} \tag{18}$$

The energy correction to the meson mass in Eq. (16) as

$$(\delta E_M)_{C.M} = \left[\left({E_M^0}^2 - \langle \vec{P}_q^2 \rangle \right)^{1/2} - E_M^0 \right] \tag{19}$$

The quarks within the core of a meson are currently believed to only be subject to the force originating from the mean effective potential $V_q(r)$ as described in Eq. (1). The only interaction present within the meson is the potentially weak one-gluon exchange interaction, as described by the interaction Lagrangian density as

$$\mathcal{L}_I^g = \sum_{a=1}^{8} J_i^{\mu_a}(x) A_\mu^a(x) \tag{20}$$

The vector gluon fields $A_\mu^a(x)$ consist of eight components, while $J_i^{\mu_a}(x)$ represents the color current of the i^{th} quark. Utilizing first order perturbation theory, it is justifiable to compute the energy shift in the mass spectrum resulting from the interaction energy of quarks, which arises from their coupling to the colored gluons. This technique results in energy shifts related to color-electric and color-magnetic interactions [22]

$$(\delta E_M)_g = (\delta E_M)_g^e + (\delta E_M)_g^m \tag{21}$$

Where

$$(\delta E_M)_g^e = \alpha_c \sum_{i,j} a_{ij} T_{ij}^e \tag{22}$$

And,

$$(\delta E_M)_g^m = \alpha_c \sum_{i,j} b_{ij} T_{ij}^m \tag{23}$$

The expressions for $T_{ij}^{e,m}$ are given by

$$T_{ij}^{e} = \frac{12(E_i+m_i)(E_j+m_j)}{\pi(2E_i+m_i-V_0)(2E_j-m_j-V_0)} I_{ij}^{e} \quad (24)$$

$$T_{ij}^{m} = \frac{8}{\pi(2E_i+m_i-V_0)(2E_j-m_j-V_0)} I_{ij}^{m} \quad (25)$$

Where,

$$I_{ij}^{e} = \int_0^\infty dk\, F_i^e(k)\, F_j^e(k) \quad (26)$$

$$I_{ij}^{m} = \int_0^\infty dk\, k^2 \langle\langle j_0(|\vec{k}|r_i)\rangle\rangle \langle\langle j_0(|\vec{k}|r_j)\rangle\rangle \quad (27)$$

With,

$$F_i^e(k) = \frac{1}{2\lambda_i^2}\left[(4(E_i - V_0)\lambda_i - k^2)\langle\langle j_0(|\vec{k}|r_i)\rangle\rangle - 4\lambda_i a^2 \langle\langle r_i j_0(|\vec{k}|r_i)\rangle\rangle\right] \quad (28)$$

In this case, the symbol $j_0(|\vec{k}|r_i)$ represents the zeroth-order spherical Bessel function, while the double angular brackets signify the expectation values with respect to the radial angular component of the quark wavefunction, the variables a_{ij} and b_{ij} represent the numerical coefficients associated with each meson, whereas α_c denotes the quark-gluon coupling constant.

The coefficients a_{ij} and b_{ij} for nonself-conjugate mesons consisting of a heavy quark Q and a light antiquark $\bar{q}$ systems are calculated as

$$b_{Qq} = \begin{cases} 2 \text{ for triplet states} \\ -6 \text{ for singlet states} \end{cases} \quad (29)$$

and

$$a_{Qq} = -2 \quad (30)$$

It has been shown that the binding energies of the component quarks have an effect on the mass of an S-state meson at zeroth order. These energies are constrained in a manner that is independent of the phenomenological mean potential. This potential is believed to account for the primary non-perturbative multigluon interactions. However, corrections need to be applied to account for the effects of spurious center-of-mass motion and residual quark-gluon interactions. By considering such corrections as though they are of equal size, one can get the mass of an S-wave meson as

$$m_M = E_M^0 + (\delta E_M)_{C.M} + (\delta E_M)_g^e + (\delta E_M)_g^m \quad (31)$$

The hyperfine splitting of the ground-state meson primarily arises from the strong spin-spin interaction energy in the color magnetic component $(\delta E_M)_g^m$. The summation of the first three components on the right-hand side of Eq. (31) results in the determination of the spin-average mass, denoted as $\bar{E}_M$, for the meson. Hence, Eq. (31) may be formulated as the measurable mass of an S-state meson.

$$m_M = \bar{E}_M + (\delta E_M)_g^m \quad (32)$$

3. Results and Discussions :

In the current framework, the calculation of energy correction terms and determination of the physical mass of the D and D_s mesons are contingent upon the potential parameters (a, V_0) and the quark masses m_q.

The present methodology involves the utilization of potential parameters (a, V_0) and quark masses m_q to calculate energy correction terms and ascertain the physical mass of D and D_s s mesons.

Here we choose the potential parameters as

$$(a, V_0) = (1.401, -1.510)\ \text{GeV} \quad (33)$$

The appropriate selection of quark masses may be reported as.

$$(m_u = m_d, m_s) = (0.01, 0.221)\ \text{GeV} \quad (34)$$

and

$$(m_c, m_b) = (1.25, 4.12)\ \text{GeV} \quad (35)$$

The value of the quark-gluon coupling constant is taken as $\alpha_c = 0.18$ [23]

The mass spectra of measurements of D and $D_s -$ mesons have been analyzed in detail and provided in Tables 1 and 2 respectively. The mass spectra obtained by our calculations exhibit a strong correlation with the established states reported in the Particle Data Group (PDG) database [1]. Despite the existence of several meson states, a substantial number of states beyond the $1S$ level remain mostly unexplored and unknown today. The mass of $1S$ and $2S$ states of D-meson, as determined by calculations, exhibit a strong agreement with the experimental values reported in the PDG [1, 24], with an uncertainty of 0.05% and 0.02% respectively. The additional excited states of D-meson, specifically the $3S$ and $4S$ states, exhibit a rather close proximity as indicated by the reference [25]. The determined mass of the $1S$ and $2S$ states of the D_s meson exhibits good agreement with the Particle Data Group (PDG) reference [1, 5, 26, 27], with a variation of around 0.1% and 0.3% respectively. The other radial excited states of D_s meson agrees well with [28].

Table-1: S-wave spectrum of D meson in MeV

n L	J^P	State	Our m_M	Expt. [1, 24]	[29]	[30]	[25]	[31]	[32]
1 S	1^- 0^-	$1\,3_{S_1}$ $1\,1_{S_0}$	2011.38	2010.28 ± 0.13	2010	2010.53	2018 1865	2013 1890	2038 1874

			1866.56	1864.86±0.13	1871	1867.00			
2S	1^- 0^-	$2\,3_{S_1}$ $2\,1_{S_0}$	2609.25 2548.10	2608.7±2.4 2839.4±4.5	2632 2581	2605.86 2521.72	2639 2598	2708 2642	2645 2583
3S	1^- 0^-	$3\,3_{S_1}$ $3\,1_{S_0}$	3112.96 3067.32		3096 3062	3747.89 3086.31	3110 3087	3103 3064	3111 3068
4S	1^- 0^-	$4\,3_{S_1}$ $4\,1_{S_0}$	3508.41 3477.21		3482 3452	3663.28 363.56	3514 3498	3395 3299	- -
5S	1^- 0^-	$5\,3_{S_1}$ $5\,1_{S_0}$	3811.23 3795.64		3822 3793	- -	- -	- -	- -

Table-2: S-wave spectrum of D_s meson in MeV

nL	J^P	State	Our m_M	Expt. [1, 5, 26, 27]	[29]	[28]	[33]	[34]
1S	1^- 0^-	$1\,3_{S_1}$ $1\,1_{S_0}$	2114.23 1967.91	2112.3±0.5 1968.49±0.32	2111 1969	2113.9 1968.3	2117 1970	2107 1969
2S	1^- 0^-	$2\,3_{S_1}$ $2\,1_{S_0}$	2719.32 2641.18	2710^{+12}_{-7} 2632.5±1.7	2731 2688	2717.8 2635.5	2723 2684	2714 2640
3S	1^- 0^-	$3\,3_{S_1}$ $3\,1_{S_0}$	3255.88 3205.94		3242 3219	3263.8 3202.4	3180 3158	- -
4S	1^- 0^-	$4\,3_{S_1}$ $4\,1_{S_0}$	3696.42 3677.58		3669 3652	3781.6 3732.1	3571 3556	- -
5S	1^- 0^-	$5\,3_{S_1}$ $5\,1_{S_0}$	4039.95 40.16.32		4048 4033	- -	- -	- -

4. Summary and Conclusions :

In this article, we analyzed S-states mass spectra of D and D_s mesons in a Dirac formalism. Though, there are several experimentally observed states of these mesons, the majority of them beyond $1S$ states remain completely unknown for the present time. At last, we concluded that the other radial excited states which we have reported in this article are anticipated as recommendations to interpret future experimental investigation.

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Unveiling the Spectrum of Charles Bonnet Syndrome in South Gujarat: A Comprehensive Investigation into its Prevalence

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Abstract: *Charles Bonnet Syndrome (CBS) is a rare condition characterized by complex visual hallucinations in individuals with diminished vision, often due to conditions like macular degeneration (MD), cataracts, or glaucoma. This study sought to address the prevalence of CBS in South Gujarat through a systematic investigation.*

During the research period, we enrolled 250 individuals from various age groups and genders with varying underlying causes of visual impairment at Eye Hospitals in South Gujarat. Rigorous ophthalmological assessments confirmed visual impairment, and those meeting the inclusion criteria were further evaluated for CBS using a structured questionnaire. Comprehensive assessments of CBS symptoms were conducted through structured interviews and standardized questionnaires.

Our primary findings revealed that CBS affected approximately 5% of the target population of 250 individuals with visual impairments, emphasizing its significant prevalence among this group. Statistical analyses, employing established epidemiological methods, considered the complex nature of CBS and potential demographic and clinical factors.

Additionally, we explored the impact of CBS on the mental health and overall well-being of affected individuals, highlighting the importance of early detection and appropriate management.

This study underscores the need for increased awareness among healthcare providers and the general public about CBS. It also emphasizes the necessity for tailored interventions and support mechanisms to enhance the quality of life for individuals living with CBS. Further research is warranted to deepen our understanding of CBS's underlying mechanisms and to develop effective prevention and management strategies.

Key Words: *UN, Society, Heath, Nations, Economy,*

1. INTRODUCTION:

Visual hallucinations are described as visual perception that occurs in the absence of an external stimuli. [1] Enucleation of the eye, optic neuritis, retinitis pigmentosa, and diabetes mellitus, macular photocoagulation, optic neuritis and Leber's hereditary optic neuropathy, and macular translocation have all been linked to hallucinations in recent years. [2-6] Patients who have lost their vision may experience both simple and complex visual hallucinations. Charles Bonnet syndrome (CBS) occurs when individuals have intact intellect and no other plausible explanations for hallucinations. [7]

Charles Bonnet Syndrome (CBS) is a psychologically normal disorder distinguished by elaborate visual hallucinations in persons with low vision (LV). Its prevalence ranges from 0.5% to 19.5% in this group. [8] There are two types of hallucination (VH): basic and complicated. Simple hallucinations (SH) consist of pictures such as spots, flashes, floaters, and forms (e.g., circles, squares), whereas complex hallucinations (CH) consist of persons, faces, animals, plants, or entire sceneries. Lesions at any level of the visual system might cause these hallucinations. [9] It has been linked to a variety of pathologic diseases affecting the eyes, central visual pathways, and occipital brain. [10] An occipitotemporal and occipitoparietal visual association neocortex lesion is a common source of visual field deficiency associated with simple hallucinations, whereas complex hallucinations are linked with occipitotemporal and occipitoparietal visual association neocortex damage. [10]

Though there are many variations, CBS is best defined as visual hallucinations in patients with acquired vision loss who do not have cognitive impairment. CBS patients often have bilateral vision loss. Patients with CBS retain awareness of the hallucinations' unreal character and do not hallucinate in any other sensory modalities. [7] Some patients may be initially tricked by their visions, but they eventually recognise it is a hallucination. For many patients, these visions are simple to recognise since they frequently have unusual and humorous qualities and are perceived in finer detail than real objects due to the patients' visual impairment. The episodes can range from seconds to hours, and the condition can endure from days to years. [11] These episodes might recur in clusters or on a regular basis, with asymptomatic intervals in between, and are often self-limiting. In general, the frequency of events decreases over time. [3]

2. Literature Review:

Charles Bonnet Syndrome (CBS) is a condition that may develop secondary to visual impairment. This condition is marked by intense, visual hallucinatory experiences with a variety of unique manifestations. These hallucinations can range from simple colours and patterns to complex images similar to those described above (Skorin, 2005). Those experiencing these types of visual hallucinations tend to have preserved cognitive function and awareness, such that this condition occurs without delusions (Jurišic et al., 2018). This feature contrasts with other diagnoses associated with hallucinations such as paranoid schizophrenia and other psychoses.

Charles Bonnet was a Swiss philosopher who first recounted this condition when observing his grandfather, Charles Lullin, who was visually impaired due to cataracts (Damas-Mora et al., 1982). Bonnet detailed Lullin's vibrant accounts of his visual hallucinations, which Lullin maintained were purely fictitious and often amusing (Sacks, 2013). This early collection of research was amassed in 1760, a mere two centuries before the eponym "Charles Bonnet Syndrome" would even be considered (Damas-Mora et al., 1982). Charles Bonnet was a pioneering scientist of his time and dabbled in a multitude of disciplines (Sacks, 2013). Like many philosophes of the 17th century, the conception of the "tabula rasa" (the philosophy that

knowledge comes from experience) influenced his 2 hypotheses on the brain and this condition (Sacks, 2013). Bonnet theorized about a modular conformation of the brain, with diverse segments each with separate functionalities (Sacks, 2013). Moreover, Bonnet believed that although Lullin was without visual stimulus, his visual brain was pulling from memory rather than sensation to create his pseudo-hallucinations (Sacks, 2013). This notion is not too far from what is commonly accepted today. Despite this early conception of CBS research, most of the current literature on CBS has been conducted in recent decades. This fairly recent focus means there remain critical gaps in the knowledge of this syndrome. This point is worthy of being echoed to stress the importance of continuing research on this incredible condition.

3. Research Objectives / Aims:

- To determine the prevalence of hallucinations in patients with Charles Bonnet Syndrome.
- To describe the characteristics of hallucinations experienced by patients with Charles Bonnet Syndrome, such as frequency, duration, modality, and content.
- To assess the impact of hallucinations on patients' quality of life, including emotional well-being, social functioning, and daily activities.

4. Research Method:

- 250 individuals who attended ophthalmology clinics and psychiatric clinics who were above 18 years of age with best corrected visual acuity of 6/12 or below were tested for CBS.
- Participants were disqualified if any of the following conditions were met:

visual acuity greater than 6/12;
diagnosis of schizophrenia or another mental illness in which hallucinations are a recognised symptom;
use of medications known to cause visual hallucinations;
hallucinations in any sensory modalities other than vision;
alcohol consumption.

- The screening question was based upon that used by Holroyd [13] with some slight adjustments to the wording: ‘We had a patient here the other day that had a similar problem with their eyes to yourself. The condition made it difficult to see things and they also noticed that they could see things that were not there or there or that other people don’t see. Has this ever happened to you?’ If the patient answered ‘yes’, then he/she was interviewed with special attention to the characteristics of visual hallucinations such as the recent frequency, the time of the day of occurrence, the duration, the laterality of the affected eye, the influence of eyelids, the emotional impact of the hallucinations on the patient, the content of visual hallucinations and insight into the unreal nature of the hallucinations. Most of these questions were derived from Teunisse et al.

5. Discussion and Analysis:

Parameters		N=250 n (%)
Age (years)	30 - 40	16 (6.4%)
	41 - 50	54 (21.6%)
	50 - 60	65 (26%)

	60 - 70	57 (22.8%)
	70 - 80	58 (23.2%)
Gender	Male	119 (47.6%)
	Female	131 (52.4%)

None of the participants had a history of psychiatric illness, indicating that they did not have a pre-existing psychiatric condition.
Eye Affected:

The majority of participants had left eye involvement:
Left Eye: 136 participants (54.4%) , Right Eye: 110 participants (44%), Both Eyes: 4 participants (1.6%), Underlying Eye Conditions and their distributions were Glaucoma: 25 participants (10%), Diabetic Retinopathy: 84 participants (33.6%) , Cataract: 63 participants (25.2%) , Age-related Macular Degeneration: 78 participants (31.2%) after careful evaluation it was found that a small portion of the participants were diagnosed with Charles Bonnet Syndrome (CBS) 5 participants (2.5%) in total 250 individuals were suffering from CBS.
These parameters provide a comprehensive overview of the demographics and characteristics of the study population, including age, gender, medical history, and eye conditions. This information is crucial for understanding the prevalence and potential risk factors associated with Charles Bonnet Syndrome in the South Gujarat region.

6. Results / Findings:

All 5 participants (100%) in this subgroup experienced hallucinations. Among the 5 participants with hallucinations: 1 participant (20%) was male, 4 participants (80%) were female. Presence of Full Insight was found in Among the 5 participants with hallucinations, 4 participants (80%) had full insight into their hallucinations. This means that they were aware that their hallucinations were not real.

Presence of Partial Insight was seen in 1 participant (20%) of those with hallucinations had only partial insight. This suggests that this participant had some awareness that their hallucinations were not real, but not a complete understanding. Among the 5 participants with hallucinations, 3 participants (60%) reported that their hallucinations were repetitive, meaning they experienced them on multiple occasions. All 5 participants (100%) who experienced repetitive hallucinations reported that these hallucinations occurred on a monthly basis.
These parameters provide insights into the characteristics of individuals who experienced hallucinations, including their gender distribution, level of insight into the hallucinations, whether the hallucinations were repetitive, and the frequency of repetition. This information helps in understanding the nature of hallucinations in the context of Charles Bonnet Syndrome in your study population.

7. CONCLUSION:

The findings regarding hallucinations within the context of Charles Bonnet Syndrome (CBS) in our study population offer intriguing insights into the manifestation of this phenomenon. Firstly, it's notable that all five participants within this subgroup experienced hallucinations. This highlights the prevalence of hallucinations as a defining feature of CBS in our sample, consistent with the established diagnostic criteria for the syndrome. However, the gender distribution among participants with hallucinations, with a predominance of females (80%), raises interesting questions about potential gender-related patterns in CBS. While the

small sample size necessitates caution in interpreting this gender disparity, it suggests the need for further investigation to explore whether there are significant gender differences in CBS prevalence or presentation.

Moreover, the distinction between full insight (80%) and partial insight (20%) into hallucinations provides valuable insight into the cognitive experiences of individuals with CBS. Those with full insight were fully aware that their hallucinations were not real, aligning with the typical features of CBS. In contrast, the participant with partial insight had some level of awareness but not a complete understanding. This finding underscores the heterogeneity in how individuals with CBS perceive and interpret their hallucinations, suggesting that some may experience a more nuanced relationship with their visual phenomena.

Additionally, the revelation that 60% of participants with hallucinations reported repetitive experiences, occurring on a monthly basis, highlights the chronic and recurring nature of CBS-related hallucinations. This observation emphasizes the persistence of these visual phenomena and underscores the importance of longitudinal assessment and support for individuals with CBS. Taken together, these parameters contribute to a more comprehensive understanding of CBS and its diverse manifestations in our study population. Nonetheless, it is essential to acknowledge the limitations of our study, particularly the small sample size, which calls for future research with larger and more diverse cohorts to confirm and expand upon these intriguing findings.

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An Outlier Detection of Air Quality India Using Classical Statistics and Isolation Forest

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Abstract: *Air, which is necessary for human life, has been harmed by continual advancements in nearly every facet of contemporary civilization. Dangerous substances are produced in our environment by routine transit, industrial, and domestic processes. With accelerating industrial expansion and rising population density in Kolkata City, air pollution is continuously rising. India's third-most populous city, Kolkata, is one of the 25 most polluted in the world, along with 10 other Indian cities that are even more polluted. The goal of the current study is to comprehend how outliers of NO2 and PM2.5 are detected, as well as to examine a year's worth of air pollution data from Kolkata (India), in order to analyse it and anticipate outliers. In order to expose the data and identify impurities that have an immediate impact on NO2 and PM2.5, an exploratory data analysis and the Isolation Forest (iforest) technique for outlier detection are used. Several outliers have revealed in the data by the provided methodology. The result demonstrates the development of the outlier detection technique and gives further insight into the various outlier approaches.*

Key Words: *Outlier Detection, Exploratory Data Analysis, Machine Learning, Isolation Forest, Indian Air Quality.*

1. INTRODUCTION:

The modern human is affected by anthropogenic sources of air pollution such as the burning of straw, coal, kerosene, and emissions from factories, cars, aeroplanes, and aerosol cans. Our environment is surrounded by a variety of dangerous contaminants every day, including CO, CO2, PM, NO2, SO2, O3, NH3, and Pb. The chemicals and particles that constitute make up air pollution have an impact on plant, animal, and even human health. Numerous dangerous illnesses in people, including heart disease, pneumonia, bronchitis and lung cancer, can be brought on by air pollution. Total outliers vary from the manual's points, which supports the idea that they can be a substantial source of pollutants for the study of air pollution in urban areas. Additionally, data on irregular processes like emissions may be found in data that are not too high but differ from neighbouring observations. Bhunia G.S. et al. [1] carried out a spatial-temporal study on the air quality in Kolkata using data from 2017 to 2020. For each of the sample locations, the spatial distribution was calculated using the radial basis function (RBF) approach. The model fit that estimates the spatial distribution of air pollutants was chosen using mean standardised error (MSE) and a root mean square standardise error

(RMSSE). In order to uncover obscure trends in the dataset and identify pollutants. that have an immediate effect on the air quality index, an exploratory data analysis is conducted. Nearly all contaminants are seen to have greatly lowered in 2020. In order to analyse and predict air quality, the research endeavour takes at a six-year period of pollutants data from 23 Indian cities. Resampling technique is used to study the data, and several machine learning techniques are used in forecasting the air quality. The results are compared with the available metrics [2]. According to the current study, lockdown measures during the COVID-19 pandemic have substantially reduced environmental pollution levels in Kolkata, along with other major cities around the world. The key objectives of this research are to forecast PM2.5 concentrations using MLR (multiple linear regression) and ANN (artificial neural network) models, as well as to evaluate how precise both approaches are [3]. M. Ahmad et.al. used the two methodologies to detect the Yamuna River outlier with different locations [4]. Majumdar et al. [5] projected emissions for the year 2030 in the Business-as-usual (BAU) case, thus taking into account the impacts of existing and proposed policies. The findings show that existing measures/policies are inadequate to significantly reduce the emissions of Kolkata Metropolitan City (KMC) PM2.5 by 2030. The author addressed of three alternative configurations that take into account various non-technical city-specific pollution management methods as well as financial implications. The results show that significant emission reductions have been made, with 35% for PM2.5 and 45% for NOx, by spending EUR 1.15 billion on innovative mitigation efforts across various industries, in comparison to the “business as usual” scenario, which is projected to cost EUR 0.78 billion by 2030. By 2030, the main air pollutants would have significantly decreased (51% for PM2.5 and 54% for NOx) at a cost impact of EUR 1.18 billion thanks to advanced mitigation techniques along with the control of general bases of pollution. With the additional advantages of a decline in emissions of greenhouse gases, CO2 by 24% in 2030, at successive costs of 0.70 billion euros, carbon-free policies can substantially reduce major air pollutants. In Kolkata, Haque and Singh [6] examined the relationship between air pollution and human health. According to the respondents, 85.1% of respondents had respiratory diseases, which included 60% of acute respiratory infections (ARI), 7.8% of chronic obstructive pulmonary diseases (COPD), 1.2% of upper respiratory tract infections (URTI), and 12.7% of influenza. Despite the fact that the pollution level was deemed critical, only 39.3% of respondents said that outdoor (air) pollution has adversely destroyed their health. Outliers could just be noisy data, or they might indicate unusual activity in the entire system. These values are extremely vital and can lead to informed or significant outcomes, as well as the selection of the most efficient mitigation procedures [7]. Horn et al. [8] provide the enhancement of reference interval estimation using a new detection of outlier technique that has been studied using a physician-determined robust sample. The effect of including non-healthy people in the sample, as assessed by a physician, is evaluated. Singh et al. [9] aimed to compile a systematic and general overview of various outlier recognition techniques. Sim et al. [10] spotted potential outliers using the box plot technique. Grubbs' [11] essay is a pioneer the dealing with difficulty in finding outlier observations in an experimental effort. Di Blasi [12] examined the Mino River basin (NW Spain) water outlier from different automated monitoring stations. Outlier detection is a crucial task in data mining and is employed frequently in sectors such as industrial systems, flood prediction, and intelligent transportation systems [13]. There is a lot of research on outliers already, including methods based on distribution, distance, density, and grouping. Specifically, [14] the distribution-based model of the data to be tested must be obtained in advance; it depends on the dataset's overall distribution and is not suitable for datasets with uneven distribution. The distance-based [15] technique is less effective in the case of high-dimensional data and needs users to choose suitable distance and scale settings.

The anomalous point cannot be correctly studied since the outlier in the clustering method [16] is not the intended location of the cluster. The aforementioned approaches for outlier detection all use global abnormal standards to analyse data objects, which makes them ineffective for collections with uneven distributions. There aren't many indications that can categorise data in practical uses, and the distribution of data is often skewed. Yuanyuan W. et. al. [17] LSTM autoencoder-based anomaly detection has been proposed for time series data on indoor air quality. Cheng Z. et al. [18] The nearby outlier component model and the isolation forest model have been established. A suggested two-layer progressive ensemble approach for recognising outliers addresses the shortcomings of iForest and LOF. The dataset is quickly scanned using iForest in this method, the seemingly normal data is pruned, and an outlier possibility set is produced. The introduction of the outlier coefficient is used to build a pruning approach that is dependent on the number of outliers in the data in order to further increase pruned precision. The exception to the option set is then subsequently distinguished using LOF to generate more precise outliers. G Arun and S Rathi [20] provide a system for evaluating air quality in the future. Three parts make up the present experiment: collecting information, predicting AQI, and assessing air quality. Obtaining current information and structuring it for use as input in the following module is known as preparation of data. In this study, forecasting is done using sparse spectrum GPR (SSGPR), while assessing the quality of the air is done using cloud models. The current work aims to close this gap by analysing an entire year of daily significant air quality data from Kolkata, India. The present study is a sincere effort to add new concepts for data visualisation and finding outliers based on Classical Statistics and iForest of NO2 and PM2.5 to the literature.

2. MATERIAL AND METHODS:

Today, poor air quality in India is seen as both a serious health issue and a major problem to the prosperity of the nation. Air pollution in cities has a significant impact on the ecosystem, particularly in developing nations. Kolkata City is one of the Indian cities that needs measures to intervene to guarantee healthy air quality in the future. More areas are affected by air pollution by smog, industrial activity etc. The primary sources of pollution in India are the electricity manufacturing sector, the transportation sector, soil and road dust, waste combustion etc. Throughout the current study, data collected on air pollution were taken from the Central Pollution Control Board (CPCB) in India [21].

Classical Analysis:

The traditional statistical analysis is to track air quality, and determine the significance of any of them that exceeds the limit using descriptive statistics like mean, quartiles (Q1, Q2, Q3), time series, box plots, etc. Generally speaking, the conventional statistical approach aims to explain the descriptive statistics, and distributions, and to find the validity of the sample data gathered by the original population. Consequently, classical statistics, which is based on the characteristics of the object of repeated measurements, tries to forecast the pace with which the process of measuring is repeated unpredictably with a particular outcome. It is feasible to assess properties multiple times for a single item or just once. The objective of conventional statistical evaluation is to evaluate the empirical frequency distribution which produces the absolute frequency of occurrence of each of the various possible outcomes. [7]. If there exists only a limited number of distinct outcomes (discrete example), if the statistic is used in the case of an infinitely frequent and arbitrarily reliable calculation, and if each result is distinct, the result of the relative frequency approach will not be very useful.

Isolation Forest:

To begin processing the information, the iForest is used with the goal of finding outlier possibilities. Having linear time complexity and good precision, it is an unsupervised outlier detection method. The forest is made up of a collection of binary trees that were created using the datasets randomness. Next, make your way through the forest's trees, calculating the anomaly score for every point of information in each one. The isolation tree's construction algorithm is given as iTree (X, e, h) function. Where X is input dataset, e indicates height of current tree and h is height limit. The pruning strategy's goal is to keep the outlier choice set for additional analysis while removing the data point that appears to be typical. Due to the unknown percentage of outliers, the existing method is unable to reliably calculate an edge for deciding whether a certain point is included in the proposed set. Experiences has shown that outliers tend to make datasets more dispersed. As a result, the outlier coefficient defined in this study is used to assess the dataset's extent of variation and to calculate the snipping cut-off. Specify a dataset: $D = \{d_1, d_2, \ldots, d_n\}$. Here, n is the sample size of dataset D. d_i is an attribute in D, and $d_1 = \{x_1, x_2, \ldots, x_n\}$. x_j is a specific fixed data value of the attribute d_i . The coefficient of outlier is written as:

$$fd_i = \frac{\sqrt{\frac{x_j - \bar{x}^2}{n}}}{\bar{x}} = \sqrt{\frac{x_j - \bar{x}^2}{n\bar{x}^2}} \quad (1)$$

Here, $\bar{x}$ is showing the mean of the d_i and fd_i is measure of dispersion of the attribute d_i. Now, calculate the outlier coefficient vector Df of the dataset, which is recorded as:

$$Df = fd_1, fd_2, \ldots, fd_n \quad (2)$$

The pollution level of the dataset, or the trim threshold θD, can be computed through the outlier coefficient vector. The percentage of outliers in the dataset is shown by the next θD. Top_m in this context refers to m values with a high dispersion coefficient following sorting, and α stands for an adjustment factor. Where α and m depend on chosen size and distribution of the data.

$$\theta_D = \frac{\alpha Top\_mDf}{m} \quad (3)$$

So, for each dataset's unique properties, we select a separate threshold.

iForest calculates an "anomaly score" for each point. The first $1 - \theta_D$ points of the dataset are removed based on these scores, and the additional points make up the "outlier candidate set."

3. Results and discussion:

Findings have been collected in two stages of analysis. The air quality variable in the dataset was statistically examined in the first phase using time series and box plots, and the subsequent step used the iforest approach to identify outliers.

TABLE 1. Descriptive statistics of No2 and PM2.5 Kolkata India.

Descriptive Statistics	***NO2***	***PM2.5***
N	365	365
Mean	43.38	68.32
SE Mean	1.70	3.04
Std Dev	32.54	58.17

Variance	1059.01	3384.15
Minimum	8.92	7.86
Maximum	150.01	304.74
Q1	18.68	27.54
Q2	28.64	49.40
Q3	56.66	90.97
Inter Quartile Range	37.99	63.43

Table 1 indicates the parameter limits and does not go over the set limit. The following data analysis approach depicts a time series of yearly air quality data of Kolkata from 01-01-2019 to 31-12-2019 (Figure 1 and Figure 2) ranging of No2 (8.92, 150.01) and PM2.5 (7.86, 304.74) and the cyclic behaviour of NO2 and PM2.5 are shown that the highest concentration in between January to March and the lowest concentration recorded between April to December.

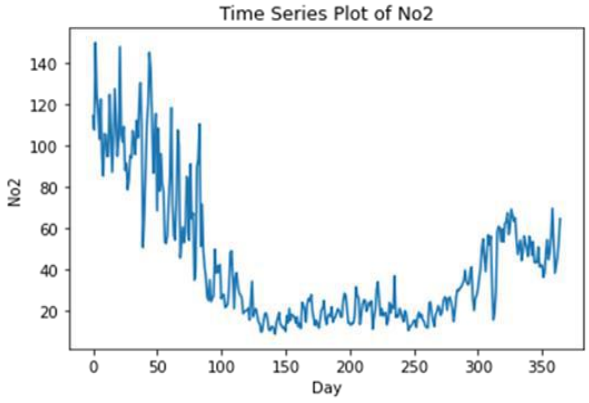

Figure 1: Time Series plot of No2

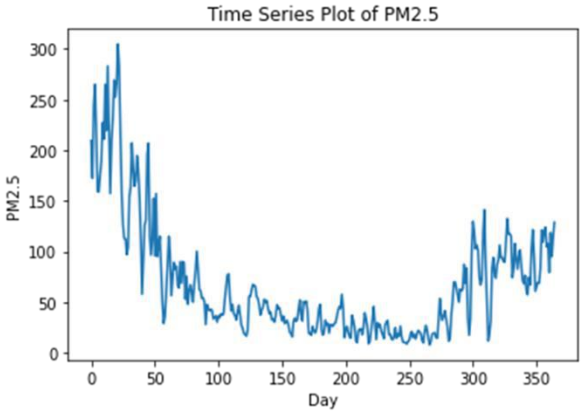

Figure 2: Time Series plot of PM2.5

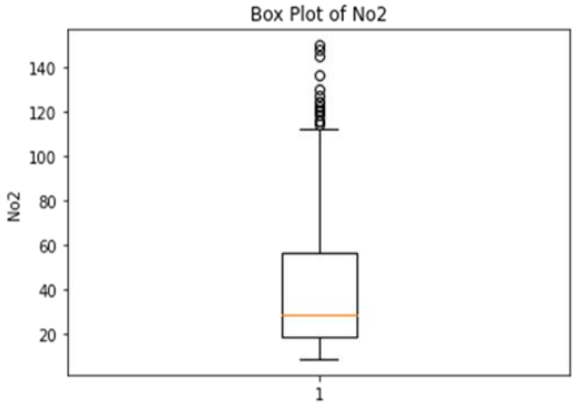

Figure 3: Box plot of No2

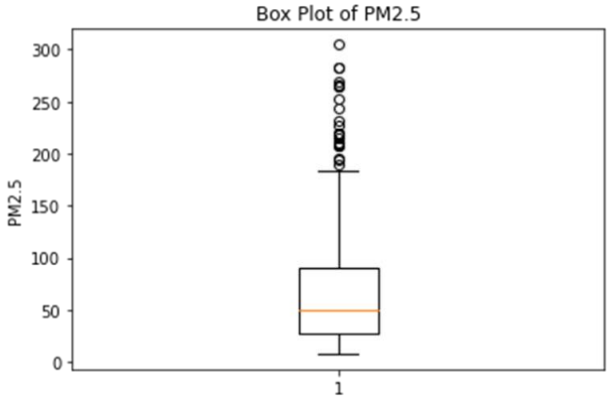

Figure 4: Box plot PM2.5

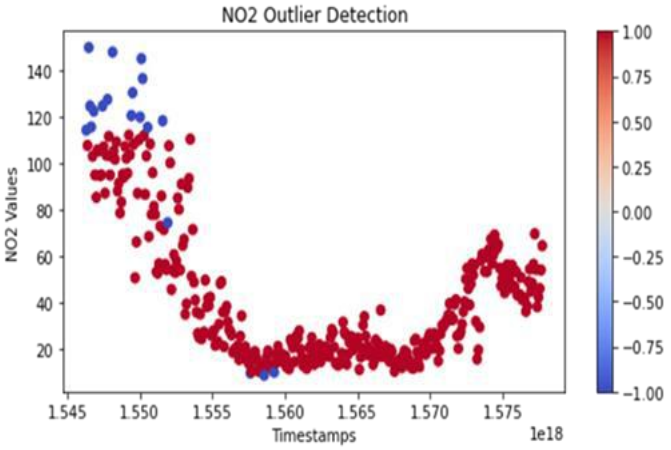

Figure 5: Outlier representation of No2

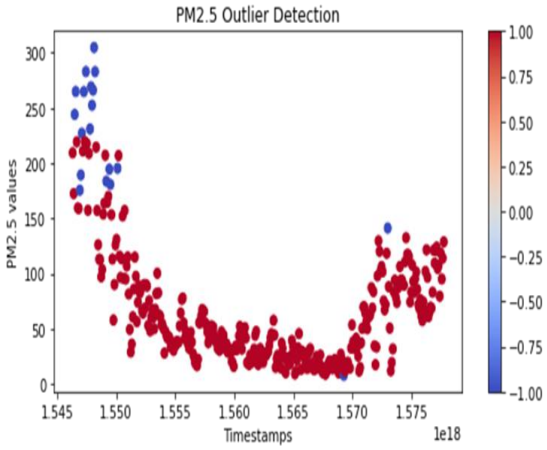

Figure 6: Outlier representation of PM2.5

The graphical representation of Box plot of No2 and PM2.5 are shown in figure 3 and figure 4. The middle line (orange colour) of the box represents the mean, the upper line is for the third quartile, and the lower one is showing the first quartile. The dots seen on the chart represent the outliers. The graphical representation of No2 and PM2.5 data displays the mean (43.38, 68.32) ($\mu g/m^3$), maximum of (150.01, 304.74) ($\mu g/m^3$) and the minimum of (8.92, 7.86) ($\mu g/m^3$). The value of first quartile of No2 and PM2.5 stands at (18.68, 27.54) ($\mu g/m^3$), and the third quartile is (56.66, 90.97) ($\mu g/m^3$).

There are 32 outliers for NO2 and 29 outliers for PM2.5 obtained using the classical statistics and obtained 25 outliers for NO2 and 27 outliers using iforest. Figure 5-6 shows the outlier of No2 and PM2.5. The dataset we prepared for outlier detection of No2 and PM2.5, the analysis is done by using Jupyter notebook and the blue dot are shown the outlier in both figures 5 and 6. When we apply this method then we can verify the outlier and behaviour of the data sets.

Boxplots and iForest are two effective methods for detecting outliers. While boxplots offer a simple and visual way to identify outliers, iForest's advanced machine learning algorithm can detect more complex anomalies. Understanding the advantages and disadvantages of each method will enable data analysts to make sound decisions when identifying and removing outliers from the data.

4. CONCLUSION:

The study of the air air quality evaluation demonstrates that Kolkata turns into a polluted metropolis. The amount of air dust has increased via springs and spikes both inside and outside of Kolkata recently due to population growth, carload as well as construction explosions. Kolkata is currently dealing with a multi-pollutant crisis and an upsurge in air pollution. The current paper examined air quality data for Kolkata, India, over the span of a year. The dataset is cleansed before being subjected to exploratory analysis and data visualisation to find the outlier. The traditional vectorial approach used in box plots with this extent in mind is still too simplistic. Although it offers intriguing statistical data, the discrete basis of the data set causes a number of flaws in the time association arrangement of the data set. Additionally, it misses all of the trends or outliers that exhibit behaviour that deviates from the norm by having high or low values that are just below the bounds. iForest is a different method we employed in the

current investigation. Anomaly score of each data point in the forest has calculated after using the iForest tool to build binary trees. The outlier is detected by using both of the techniques. The current study intends to make a greater contribution to the analysis and forecasting of air quality for a city in India that may not have been sufficiently investigated. Future work might be extended by applying functional data analysis techniques for AQI prediction.

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DOIs:10.2015/IJIRMF/ISRC-2023/004 --:-- Research Paper / Article / Review

Understanding the Value of Re Attach Therapy for Helping Students with Intellectual Disability Manage Behavioural Challenges in Modern Inclusive Classroom Settings

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Abstract: The current paper explains the value of Reattach therapy for helping students with intellectual disabilities (SwID) manage behavioural challenges in modern, inclusive classroom settings. In today's culture, news about current events tends to dominate conversation. Significant challenges arise while trying to control the behaviours of children with ID in economically disadvantaged regions of India. Children with ID are no exception to the rule regarding the need for unconditional affection, support, and assistance from adults who care for them. A positive adult role model can be a tremendous asset to a young person growing up in poverty. Regarding their children's challenges, parents of ID children should not feel any pressure to improve them. A child with an ID has a much higher chance of succeeding academically and socially when they receive help as soon as possible. Your child can learn from observing how you react to adversity. Your positive outlook could inspire your child to stop stress ng and independently seek solutions to academic issues. They wanted to see how well behavioural therapy performed in contexts with limited funds. We rarely consider our motivations and vulnerabilities while judging and reacting to such situations. When our typical means of processing information fail, the extent to which the past shapes the present will become more obvious. Our mental capacity would be overwhelmed when we become full of unprocessed facts. Students who struggle academically must be coaxed into discussing their issues in ReAttach. This method can aid those with ID who need help with both oral and written communication. ReAttach can assist children with ID by rapidly collecting and understanding information that is important to them. In ReAttach, the therapist's attention is directed not so much toward the topic at hand as the act of talking itself. Students with ID often benefit from cognitive training through practiced mental activities. Using their keen powers of observation and deduction, children with ID came to the next facts to manage behavioural challenges in modern, inclusive classroom settings. Several of my long-held convictions were promptly and quietly evaluated due to using ReAttach. After being heartened by the early outcomes, we set out to put ReAttach through its paces as a bottom-up approach for children and adults in the real world. During this time, therapists also emphasized transdiagnostic study and therapy. Since my team has created ReAttach to assist children with ID in better-integrating knowledge, feelings, and experiences, I am enthusiastic about transdiagnostic treatment. Students with ID

were immediately categorized as having never learned or forgotten these skills. The only goal was to aid in the total recovery from their managed behavioural challenges in modern inclusive classroom settings.

Keywords: Understanding, Value, ReAttach, Therapy. Helping, Students with Intellectual Disabilities, Managing, Behavioural Challenges, Modern, and Inclusive Classroom Settings.

1. INTRODUCTION:

In ReAttach, students with ID can freely explore multiple avenues of associative thought without worrying about falling behind on work. Students with ID can use ReAttach to practice making sense of novel information or being motivated to see patterns where there were none before. During sessions with ID pupils, the therapist's job is to keep calm and not draw attention to themselves. Because the therapist in ReAttach does not focus on the details of the trauma the patient has experienced, the treatment is seen as objective. ReAttach sessions do not necessitate rewriting or exposing mental pictures. Compared to the photo description, ReAttach makes ID children happier by teaching them how to cultivate positive emotions. By providing a secure environment, ReAttach helps patients develop their capacity for empathy and reconnect with reality. These goals can be met in a single session of multisensory ReAttach (Bartholomeus et al., 2021). ReAttach therapy can help people, say Ehrenreich-May and Chu (2013), since it targets multiple potential causes of psychological distress.

He provides an evidence-based alternative to standard care through transdiagnostic therapy. This study aims to learn how families struggling with ID students take advantage of ReAttach, a transdiagnostic intervention that comes at no extra cost. The foundations of the narrative psychological intervention known as ReAttach include the management of effect and arousal in the context of the external environment, the stimulation of various sensory processing, the production and mentalization of ideas and emotions, and the processing of associative memories. Many people with intellectual impairments have found relief using ReAttach, based on its supporters. By comparing and contrasting two common approaches to regulating emotions, this study hopes to fill a knowledge gap (Weerkamp-Bartholomeus et al., 2020). These days, many speeches discuss recent events. Our reactions to these events rarely lead us to dive deeply into our inner resources and drive. When our regular information processing abilities are impaired, we become aware of the lasting effects of the past on our behaviour. One additional instance is forgetting one's past. Perhaps you feel overwhelmed by everything going on around you. Those who join ReAttach under the guise of being students with ID do not have to discuss any issues they may have in secret. Those with autism who have difficulty communicating verbally have been demonstrated to benefit greatly from this approach. ReAttach facilitates the rapid assimilation and processing of information, which lessens the possibility of information overload for ID students manage behavioural challenges in modern, inclusive classroom settings.

In ReAttach, the therapist focuses on the process rather than the content of the conversation. Pay close attention to the read-out instructions if you want to get the most out of your cognitive training. ReAttach's goal is to promote optimal growth in children with ID through an approachable, tailored, and systemic intervention. The procedures that were carried out to assess ReAttach's effectiveness in this scenario are described in detail. Since extended stress or traumatic experiences, patients may develop maladaptive patterns, which is the idea behind ReAttach. A therapist who is familiar with ReAttach Theory can help a patient make sense of

the world by creating a secure attachment and teaching them how to manage their emotions. A number of these, including those by Young (1994), Young et al. (2003), Farrell et al. (2014), and Haeyen (2019), have demonstrated the efficacy of schema-focused therapy for helping students with ID manage behavioural challenges in modern, inclusive classroom settings.

2. The Concept of ReAttach Therapy

ReAttach, as described by Weerkamp-Bartholomeus (2018), is a psychological intervention that combines social cognition training with various sensory stimulations. Children who utilize ReAttach report reduced emotional discomfort and a more positive school experience, according to a study cited by Weerkamp-Bartholomeus (2015). Therapists can use ReAttach to tap their patients on the hands, providing a form of tactile stimulation. Multiple studies have found that modest, non-noxious stimulation of skin sensory nerves causes the release of oxytocin (Uvnäs-Moberg et al., 2015; Walker et al., 2017). These outcomes suggest that even during ReAttach, the regular body release of oxytocin can be induced by low-intensity, non-noxious tactile engagement of the hands, which has a calming and relaxing effect. Words are widely acknowledged to be among the most potent tools for conveying ideas and information; however, when combined with ReAttach therapy, visual imagination, and Multisensory Integration Processing by Cognitive Bias Modification, the scope of what can be captured in terms of the interconnections among various pieces of information is greatly expanded.

Given that without it, you will be unable to identify and modify the biased mental models you have built. This method considers the patient as a whole instead of only their symptoms. In order to use ReAttach, users are not required to open up about their struggles. In order to cope with information overload, ReAttach allows users to collect and process data, thoughts, and experiences swiftly. The therapist in ReAttach pays less attention to the client's worries and more to the therapy itself. Students with ID are expected to pay close attention when one of their assigned thoughts is read aloud in cognitive training. The ability to handle more data leads to the development of novel concepts. This is according to new research (Weerkamp-Bartholomeus, 2015). With the proper support in place, an individual identified with an intellectual impairment can achieve academic success. Fortunately, most contemporary policies, regulations, and ordinances in various school districts do their best to meet the varying requirements of students with various disabilities. Through cognitive bias reduction and ReAttach therapy, he could identify how his unpleasant emotions, thoughts, and memories were connected to his erroneous beliefs and assumptions. The most up-to-date research (Bartholomeus, 2018) found and reorganized the incorrect mental models maintained by his family utilizing the vocabulary and sensory inputs integrated into Cognitive Bias Modification, which aided in his successful treatment. ReAttach employs powerful feelings to sift through flawed ideas and plans. More and more research suggest that attending to these concepts can help reduce psychopathology. Several studies (Bartholomeus, 2015) provide evidence for this theory. The most beneficial treatment was ReAttach Therapy. The adolescent's stubbornness, destructiveness, belligerence, desire to lie, and predisposition to make up bogus stories suggest that linear analytic verbal approaches and traditional therapy may not have been effective with him. ReAttach's introspection tools allowed him to reflect on how his prior traumas affected his present outlook in modern, inclusive classroom settings.

3. Features of the ReAttach Strategy

ReAttach had been examined extensively, and we kept tabs on our development before making it available to students with ID. We were also curious about the effectiveness and durability of

the cognitive training. We worked with parents and other stakeholders to hone the intervention and conducted a field study. The true meaning of the word inclusion is often lost in translation. Most empirical studies on inclusive education have relied on normative concepts like fairness and democracy as their foundation. Therapists use the ReAttach technique to increase arousal and oxytocin release by gently and continuously caressing the back of a person's hand (Bartholomeus, 2015). This hormone is essential in forming bonds and is a direct payoff for interacting with others. Since judgments depend heavily on context, putting such principles into practice may be difficult. We gave students with ID complete directions to adhere to before each ReAttach therapy session. The first step in treating a patient is reducing their arousal. This is why the study of and implementation of inclusive education face many challenges. It uses Niklas Luhmann's social system theory and the resulting ReAttach therapy to analyse the benefits and challenges of inclusive education. We can learn more about what drives students to come to class by looking at various opportunities. Conditions for entering and leaving the system are also displayed, and the functions of the various parts are clarified. Taking on the work of Niklas Luhmann and the ReAttach therapy of the social construction of reality, this study examines how all forms of communication within the educational context can lead to institutionalized systems with mechanisms that form ongoing exclusion for some students. ReAttach can control both types of arousal at once since it makes use of several sensory modalities. Learning, group attention, sensory stimulation, and language use are only a few of the social cognitive skills that benefit from heightened arousal. When learning material that must be reprocessed multiple times before it can be absorbed, children with ID often need to achieve a condition of near sleep. When you tap your hands together slowly, you might get a weak and strong response. The unconscious is the repository of our most private mental and emotional data. When information stored in long-term memory is reassembled, it may not make sense.

Facts are reprocessed in ReAttach to reflect the person, significant others, and the group more accurately. The reprocessing information requires maintaining an alertness level above the Alpha-Theta transition. Recovering memories from long-term storage requires meditation (Kirov et al., 2009; Molle, 2010). ReAttach therapy strategy implementation with ID students was outlined in great depth. Anxiety reduction will be a primary goal of the first counselling session for children with ID. This can be done in various ways, such as by touching the hands of ID students, changing one's tone of voice, altering one's mood, paying closer attention, and being physically present. The ability to synthesize data from many sensory inputs ultimately becomes useful for these people. The Features of the ReAttach strategy entails several steps:

- It allows for the integration of visual and auditory cues at the same time while also appealing to the tactile sense.
- The key to capturing and retaining the attention of individuals is to maintain an appropriate level of excitement.
- Tapping is useful for teaching multitasking since it stimulates several sensory integration processes.
- Information processing proficiency improves learning and personal and social development.
- Positive conduct is reinforced by the hormone oxytocin, released in response to social touch. Weerkamp-Bartholomeus (2015) suggests that teachers should connect gently with ID students not to overstimulate oxytocin production.

4. Multisensory Integration into ReAttach Approach

The ReAttach approach centres on tailored, modular, and progressively difficult mental exercises. In order to clarify the therapeutic potential of the system, we have provided a brief description of the therapy features. Tapping is also included for the reasons that will become clear hereafter. The main objective of ReAttach is to teach students with ID to multitask by engaging their senses. The tactile way, activated when you tap someone on the back of the hand, works in tandem with the auditory and visual streams. Students with ID need help with word recognition, as seen by their poor ability to make proper pronunciation and spelling comparisons. Since of this, teachers must take corrective measures, picking and choosing from a variety of possibilities.

Many methods, such as a multisensory approach, have been developed to aid these students. Students with ID who have trouble reading may benefit from activities that use the reader's other senses (sight, sound, movement, and touch). ReAttach therapy effectively treats the conditions mentioned above by handling maladaptive emotions and improving relationship efficiency, emotion regulation skills, behaviour control, and distress situation management positions. The ID students were scheduled to take part in ReAttach therapy sessions. The ID students, who were first timid, have since calmed down and cooperated effectively throughout each session. Family members and friends also benefit from children's ID, those receiving psychological counselling on adjusting to life with the condition. The multisensory approach and his staff's mental readiness for his rigorous management style required extensive training. It was suggested to devote more time to the studies. Reattach therapy with other children his age was then used to aid in his recovery. The caregiver had imparted psycho-education, enlightening the teacher on the best ways to support adolescents with ID who, in the setting of modern, inclusive classrooms, might display challenging behaviours. Lack of control over one's emotions is a hallmark of many mental illnesses. Students with ID are especially at risk of the damaging outcomes of extreme emotions, challenging interpretations of emotions, and bad reactions to emotions. These can range from brief outbursts of anger to more significant acts of vandalism, hatred, and even attempted suicide. These students with ID still have a way to go before they can make a meaningful contribution to a group effort. Multisensory integration processing with bias correction is used in ReAttach Therapy to help students with social and emotional control, behaviour management, and stress resilience in the context of modern, inclusive classroom settings.

5. Challenging Behavioural Issues among Students with Intellectual Disability

Intellectual disability can be defined by challenging behaviour frequently difficult to identify and treat. There is a risk that the person's quality of life will decline if taken from their communal home. This paper examines the complex relationships between mental illness and the emergence of maladaptive patterns of behaviour, the efficacy of current psychosocial and pharmaceutical treatments and the accessibility of care. Identifying and treating disruptive behaviour in ID students may be challenging for healthcare providers. Therapies for children with ID should focus on resolving their specific behavioural challenges. Whether a child with ID is in mainstream or special education, they can benefit from learning skills for managing their behaviour. Due to a lack of funding, special education services for children with ID in rural India are severely underutilized (Grey et al., R. P., 2005). All behaviour can be traced back to the interaction between an individual and their environment, as all behaviour is intentional, has a reason, and conveys meaning. According to the Royal College of Psychiatrists (2007), challenging behaviour encompasses a wide range of acts that might be

harmful, frightening, disturbing, or unpleasant to others. It might be challenging for students with ID to keep up with their usually developing peers in regular classes. Since this, it is important to tailor lessons to the requirements of individual students. Students' intrinsic motivation increases when they have social support from their peers. This research synthesis looks at how youth with moderate to severe ID can benefit from peer-supported strategies to increase their school attendance. A total of investigations matched the inclusion criteria, focusing on student involvement in modern classroom settings.

Despite widespread attempts, only some groups have successfully persuaded rural populations of the merits of restoration. The proper care that rural children with ID need to address their behavioural anomalies is hindered by a lack of trained experts, erroneous information, malpractice, and social concerns. Some parents turn to harsher techniques for addressing their children's conduct because they cannot afford professional aid. In rural areas, three perspectives predominate: Many parents, to begin with, do nothing at all. Limited and disagreeable responses designed to safeguard the well-being and safety of others may lead to a person's exclusion from services and community activities because of their negative impact on social and ethical norms. Therefore, it is essential to identify the root causes of disruptive behaviour and implement solutions. Professionals and carers encourage responding to challenging behaviours using socially supportive rather than restrictive measures (Royal College of Psychiatrists, 2007). Taking a proactive and flexible approach when dealing with challenging behaviour is essential because it is typically an attempt to convey unmet needs. The child could also be rewarded with something tangible, such as a gift or candy. Negative language or actions are never acceptable. Behaviour modification principles (Lakhan, R., 2013) suggest that congratulating children when they succeed at something difficult can have the opposite effect desired. This means that people from various walks of life could have distinct takes on the same challenge.

When people frequently pose risks to their health or the health of others, they may face mental health issues. Acts of violence, self-injury, sexually inappropriate behaviour, illicit behaviours, and ritual activity are a variety of self-injurious behaviours (Royal College of Psychiatrists, 2007). Those with mild to severe mental health issues, including students with ID and personality disorders, have benefited from using ReAttach. It is an easy-going, friendly, and immediate intervention. When you are struggling to keep your emotions in check, using ReAttach can assist. Those struggling with fears and past traumas will find our approach extremely useful. We think it is helpful for students with ID to keep their issues to themselves. A key benefit of cognitive bias management is the ability to swiftly and efficiently change harmful impacts into more adaptive and positive ones. The method's flexibility makes it useful for students with ID to deal with behavioural issues in modern, inclusive classroom settings.

6. Maladaptive Behaviour and ReAttach Therapy Interventions

The principles of attachment theory, arousal regulation, and cognitive retraining are all incorporated into the ReAttach therapy framework. The solution sought to make learning more engaging by creating a setting similar to the child's everyday life during play (Bartholomeus, 2013). The unexpectedly positive outcomes for people with psychological problems that sparked the ReAttach concept necessitated training more experts and conducting a field study to investigate the method's adaptability using Young's (Young, 2003). A new study linking information-processing bias to emotional challenges suggests that treatments like ReAttach may be useful for reducing maladaptive behaviours in a wide range of people with mental health issues. It will use data collected from trained experts to demonstrate how the ReAttach

multi-modal method might be useful in therapy. The primary goal of therapy for students with ID is to lessen the impact of their emotional disorder. The therapist accomplishes this by reorienting the group's attention and altering the volume and tone of interactions with the ID-hand students through physical activity. The therapist uses both verbal and visual stimuli to stimulate the client's many senses at once. The method rests on the assumption that people's responses to unexpected stimuli are heavily influenced by their current perspectives. Based on the literature (Artnz & Bögels, 2000; Arntz, 2011, 2012; Arntz & Jacob, 2012; Farrell et al., 2014), the main goal of schema-focused treatment is to help patients swap out their fixed teenage models for more flexible, adult-like ones. According to the outcomes of this case study, it would be beneficial to implement this strategy. Traditional therapeutic counselling methods, such as linear analytic verbal techniques and conventional behavioural interventions, may not have generated the desired holistic and complete effectiveness given the adolescent's personality traits, which include being defiant, destructive, aggressive, lying, and fond of making up bogus stories. *ReAttach Therapy* is an effective and tailored technique that utilizes tapping to decrease physiological arousal of mental images in the form of Cognitive Bias Modification through mentalization and Cognitive Bias Modification to rearrange maladaptive behaviour (Bartholomeus, 2018). The first step in using ReAttach is to think deeply about distressing material.

The fundamental goal of treatment is mental health improvement. The sweet spot for taking in a wide range of sensory information is between total relaxation and full alertness. The therapist needs the patient to be relaxed and attentive throughout the session. The therapist guides a student with ID through introspection by asking them questions about their feelings, connections, and worldview. Taking the long view and applying Reattach therapy universally may help ID students for the rest of their lives. It is essential to train adults to provide children with the tools they need to flourish socially, grow physically and mentally, and become productive adults. This method has a direct impact on young people, inspiring them to become leaders in the communities where they live. Based on the results of this study, therapists with only ReAttach training may be able to help a wide range of people with mental health problems. ReAttach is a low-cost substitute for lengthy psychotherapy that can be utilized for tackling behavioural problems in modern, inclusive classroom settings.

7. Conclusion :

It may take some time, but discovering and perfecting a novel intervention is exciting. When cognitive training for this young adult with ID was discontinued, no regress in features was seen. Instead, he boasts about how much he has grown up and become self-sufficient due to his enhanced abilities. We found that children and adults with ID made major advancements in day-to-day functioning due to our applied education. However, more study is needed and encouraged to understand the mechanisms underlying these benefits. It might be assumed that the bulk of ID students could benefit from the various components of the ReAttach approach. The ReAttach strategy performed admirably in this particular instance. The more tolerant attitude of his classmates has greatly facilitated Students with ID's adaptation to his new school. Now that he believes in his capabilities, he can move forward with his life with greater purpose and enjoyment. Everyone learned to keep their cool and weigh their options before reacting. These outcomes could be explained by the increased capability of modern humans to integrate information from several sensory channels, resulting in a more stable and trustworthy sense of self and surroundings. ReAttach therapy is useful in treating emotional dysregulation because it employs Multisensory integration processing and cognitive bias correction. The negative

effects of stress, anxiety, and a lack of emotional control can be mitigated by investing more time and energy into meaningful connections. However, therapy may be required for extreme cases of anxiety and violence. Positive behavioural support is on the rise as it addresses an individual's values and needs to reduce troublesome behaviour. As an outcome of the continual improvement and expansion of treatment options, the ReAttach approach to treating children with ID and problematic behaviours has a promising future inclusive classroom setting.

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SCREENING OF SEAWEEDS IN DIFFERENT SOLVENTS & GC-MS Analysis

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Abstract: Phytochemical is naturally present in the seaweeds which biologically play a significant role. The intention of this study was designed to screen the constituents selected from seaweed collected from Rameswaram and Tuticorin Southern coast of India. The present study investigated the presence of phytochemical constituents of the brown seaweed. ***Halimeda tuna, Sargassum wightii***, and ***Amphiroa fragilissima*** were extracted with solvents having different polarities like acetone, ethanol, Diethyl ester, Benzene and Distilled water and screened for the phytochemical constituents, with standard procedure. Among the five seaweeds showed the maximum number of active constituents in the Acetone and Ethanol extract likewise to have a number of diligent compounds in extract. A. specific seaweeds showed minimum compounds in Diethyl ether well as Benzene extract. Moreover, specific seaweed ***Halimeda tuna*** have shown the superior quantity when compared to other species. The maximum lipid content was recorded in green *seaweed* ***Halimeda tuna*** *and the red seaweed* ***Amphiroa fragilissima*** recorded *the minimum content.* GC-MS analysis revealed the presence of phytochemicals including biochemical composition of selected seaweeds and potential sources for the extraction of further immunological processes. One of the most accurate analysis available for the best seaweeds select and it occupied GC/MS Analysis which is used to detect volatile and non-volatile components. The extraction of ***Halimeda tuna*** considered the best result except other seaweeds comparatively all other seaweeds. ***Amphiroa fragilissima*** extracts less activity in phytochemical reaction. The extraction for phytochemical analysis of these seaweed has sufficient action of whole works. From this work, we have concluded the best solvent as such as Acetone and Ethanol suitable for extract preparation of selected seaweeds

Keywords: ***Halimeda tuna, Sargassum wightii*** and ***Amphiroa fragilissima*** .

1. INTRODUCTION:

Seaweeds have significant nutritional value and may be a source of proteins, carbohydrates, fibre, minerals, and vitamins. They may also have a low liquid content. The pharmaceutical industry may be interested in potential bioactive chemicals produced by marine species since they are a rich supply of both structural and biologically active metabolite.The presence of substances including alkaloids, flavonoids, glycosides, phenols, s aponin, steroids, etc. in seaweeds may be the cause of their therapeutic effects (Britto and Seb astian2011).Therefore, the initial screening test may be helpful in identifying the bioactive pri nciples, which may then result in the development of new drugs (Doss, 2009).According to Etherton et al.(2004) these bioactive chemicals have been shown to be effective in reducing chronic diseases like cancer and cardiovascular disease. An evaluation of the phytochemical components found in natural extracts is called phytochemical screening. According to Kuda et al. (2002), green, brown, and red algae contain a variety of organic and inorganic compounds that are good for human health. source of the high nutritional value and their therapeutic benefits for a variety of illnesses (including tumours, colds and flu, arthritis, and tuberculosis). Large changes in the chemical composition (proteins, carbs, lipids, minerals, and vitamins) have been observed in the algae species under study. which depend on a variety of environmental parameters, including the time of year, temperature, light, salinity, location, and storage conditions (Daves et al., 1998) (Fleurence, 1999; Saviano et al., 2006).

Seaweeds are regarded as an economically valuable natural resource and a rich source of remarkable medicinal compounds that are crucial to the pharmaceutical sector. However, there is a dearth of information and scientific evidence about the therapeutic potential of these herbs. In order to determine the toxicity of medicinal plants as a first step before examining other therapeutic potentials of any natural extract, numerous studies have been carried out (Badakhshan et al., 2009; Wangchuk, 2018). In addition to being a rich source of remarkable medicinal compounds that are significant to the pharmaceutical industry, seaweeds are regarded as an economically valuable natural resource. (Dhargalkar and Pereira, 2005). By applying standardized methods, phytochemical screening evaluates the phytochemical components found in natural extracts. (Audu et al., 2007; Prasad et al., 2008; Santhi, 2011) .Several research have been done recently to examine the medicinal potential of seaweeds, and they have identified marine algae as an exceptional source of active biochemical substances. (Torres et al., 2014) This Present study focused on phytochemical screening and analysis bioactive compounds of Ethanolic extracts of best one Occupies GC-MS Analysis.

2.MATERIALS AND METHODS:

2.1. SAMPLE COLLECTION

Three different seaweeds species, belonging to Phaeophyta (Brown)***Sargassum wightii***, Chlorophyta (Green) ***Halimeda tuna*** and Rhodophyta (Red) ***Amphiroa fragilissima.*** samples were collected from inter-tidal and sub-tidal habitat in Hare Island, Thoothukudi at Gulf of Mannar.

2.2 PREPARATION OF EXTRACTION:

The collected seaweeds are drying at room temperature. After the drying seaweeds were cut into small pieces by means of a chopper and powered in a grinder. The grinder samples were then stored in the freezer for further study. The seaweed powder was

successively extracted using solvents of increasing polarity according to (Arokiyaraj et al, 2009) with slight modification. 8gs of sample substances were extracted with 80ml solvents. They are five types of solvents namely acetone, ethanol, benzene and diethyl ether. 8gs of samples is taken by conical flask and 80ml of solvent is used. And the extract for 24hrs at room temperature. The conical flask is covered by cotton and Aluminium foil is used. The conical flask is 150 degrees in the shaker for 2 hours. After removing the conical flask and filtered by the extract. And the extract is evaporated by the solvent.

2.3 PHYTOCHEMICALS ANALYSIS:

In the phytochemicals analysis of the selected red seaweeds (***Amphiroa fragilissima***,), Green seaweeds (***Halimeda tuna)*** and brown seaweeds (***Sargassum wightii)***

the fifteen different types of secondary metabolites. alkaloids, terpenoids, steroids, coumarin, tannin, saponin, flavonoids, quinones, anthraquinones, phenols, protein, carbohydrate, glycosides, catechin and fixed oil test) were tested in five different extracts using in procedure of Harborne (1998).

2.3.1.TEST FOR ALKALOIDS:

1ml of extract in a test tube and a few drops of Mayer's reagent. A dull white precipitate the presence of alkaloids.

2.3.2.TEST FOR TERPENOIDS:

1 ml of extract and one tin bet is added in a test tube. In a 1 ml of thionyl chloride was mixed. The appearance of pink colour is presented in the terpenoids.

2.3.3.TEST FOR STEROIDS:

1 ml of extract and added to the dissolve of 1 ml chloroform. Mixed with the few drops sulphuric acid (H2SO4). The bluish red is presented in the steroids.

2.3.4.TEST FOR COUMARIN:

Take 1 ml of extract and 10 percentage of NaOH is added. The present for yellow colour is coumarin.

2.3.5.TEST FOR TANNIN:

1ml of extract and let acetate is mixed in the test tube. The white precipitated in the tannin is presented.

2.3.6.TEST FOR SAPONIN:

1ml of extract and mixed with distilled water. The copious later is formed by the presence of saponin.

2.3.7.TEST FOR FLAVONOIDS:

1ml of extract and added the magnesium turnings. And added the con. HCl. The appearance of red colour is presented in flavonoids.

2.3.8.TEST FOR QUINONES:

1ml of extract and mixed with the con sulphuric acid (H2SO4). The red colour presented in the quinones.

2.3.9.TEST FOR ANTHRAQUINONES:

1ml of extract and added in the few drops of aquarium ammonia in a test tube. The pink, red or violet colour is the presence of anthraquinones.

2.3.10.TEST FOR PHENOLS:

1ml of extract and mixed in the 2 ml of distilled water. A few drops of 10 percent in peri-chloride. The presence of blue or orange colour in phenols.

2.3.11.TEST FOR PROTEIN:

1ml of extract and 1 ml of nitric acid HNO3 is added. The test tube is a few minutes for boiling. After the 20 percent of NaOH is added. The presence of orange colour is protein. It is also called xanthoproteic test.

2.3.12.TEST FOR CARBOHYDRATE:

1 ml of extract and equal volume of Fehling A and Fehling B is added. The test tube is a few minutes boiled. The brick red is presented in the carbohydrates.

2.3.13.TEST FOR GLYCOSIDES:

1ml of extract in a watch glass and added the. The mixed with the con. Sulphuric acid. The presence of paste form in green colour is glycosides.

2.3.14.TEST FOR CATCHIN:

1ml of extract in a test tube and few drops of enrich reagent is mixed. And add the few drops of con HCl. The presence of pink colour is catechin.

2.3.15.TEST FOR FIXED OIL TEST:

One drop of extract in a brisk in filter paper. The appearance of the spot is present in fixed oil tests.

2.4. GC-MS Analysis

GC-MS allows the measurement of various metabolites. This comprises a number of volatiles such as ketones, aldehydes, alcohols, heterocyclic compounds, isocyanates, isothiocyanates, sulphides, lipids, and hydrocarbons up to 12 carbons, which all can be directly measured. Additionally, various non-volatile or semi-volatile metabolites including sugars, sugar-phosphates, sugar alcohols, organic acids, amino acids, lipids, peptides, long-chain alcohols, alkaloids, amines, amides, etc. are accessible after derivatization. For flux analysis amino acids, organic acids and sugar derivates are the most important compounds to be considered. Currently there is a wide range of instruments available varying in the type of ionization and the mass separation. Single-quadrupole mass spectrometers with electron impact

(EI) ionization are the most often used type of instrument. Compared to other instruments they are relatively low cost and offer a range of advantages such as high robustness, high sensitivity and high accuracy of the measured labelling patterns.

3.RESULT AND DISCUSSION:

3.a. PHYTOCHEMICAL ACTIVITY OF SEAWEEDS

The phytochemical screening of seaweed extracts revealed the presence of with other extraction such as Benzene and Di-ethyl ether. Phenols found to be plentiful as reported by wang et.al (2013). Alkaloids, Terpenoids, Steroids, Coumarin, Tannin, saponin, Flavonoids, Quinones, Anthraquinones Phenols, Protein, carbohydrates, Glycerides, Catechin and Fixed oil test were perceived and identified in all the samples under study. The obtained result can be used as an initial step for further identification of bioactive compounds from ethanol extracts of seaweed Halimeda tuna comprises14 positive results. In showed the presence of all test except saponin and more reaction compared with benzene and diethyl ether solvents. In the first diagram, the present study carried out different phytochemical activity of different extraction methods. The result showed that seaweed Halimeda tuna activity in ethanol solvent exhibited the high compare. (Fig.1) (Table I, II, III and IV)

3. b. GC-MS ANALYSIS OF ***Halimeda tuna:***

Phytochemical components in ethanolic extract of ***Halimeda tuna*** by GC-MS report. Based on Fleurence et al., 2012, Peinado et al., 2014, in the GC-MS anaysis postulated the presence of 39 compounds from the ethanolic extract of ***H.tuna*** .From the results, it was observed that the presence of + or - . Born alone Major components like 2,2-Difluoro ethane, Oxirane, Hydrazine, Methyl Hydrogen disulfide, Ammonium acetate, 2-Propanone-1-methoxy Silane, Di-siloxane, Benzaldehyde, Cyclotrisiloxane, Benzaldehyde, and Propanedionic acid and etc. Above this component were identified on the GC-MS value (Fig:2)

TABLE: I

ACETONE:

S.No.	TEST NAME	Halimeda tuna	Sargassum wightii	Amphiroa frailisima
1	Alkaloids	+	+	-
2	Terpenoids	+	+	-
3	Steroids	+	+	-
4	Coumarin	+	+	-
5	Tannin	+	+	+
6	Saponin	-	+	-
7	Flavonoids	-	-	-
8	Quinones	+	+	-
9	Anthraquinones	+	+	+
10	Phenols	+	+	+
11	Protein	+	+	+

12	Carbohydrate	+	+	-
13	Glycosides	+	+	+
14	Catechin	-	-	+
15	Fixed oil test	+	+	-

+ represent Positive - represent Negative

TABLE: II

4.2 ETHANOL:

S.No.	TEST NAME	Halimeda tuna	Sargassum wightii	Amphiroa frailisima
1	Alkaloids	+	+	-
2	Terpenoids	+	+	-
3	Steroids	+	-	-
4	Coumarin	+	+	+
5	Tannin	+	+	-
6	Saponin	-	-	+
7	Flavonoids	+	-	+
8	Quinones	+	+	-
9	Anthraquinones	+	-	+
10	Phenols	+	+	+
11	Protein	+	+	-
12	Carbohydrate	+	-	+
13	Glycosides	+	+	+
14	catechin	+	+	+
15	Fixed oil test	+	+	-

+ represent Positive - represent Negative

TABLE: III

4.3 BENZENE:

S.No.	TEST NAME	Halimeda tuna	Sargassum wightii	Amphiroa frailisima
1	Alkaloids	+	+	+
2	Terpenoids	+	+	+

3	Steroids	-	+	-
4	Coumarin	+	+	-
5	Tannin	-	+	+
6	Saponin	+	+	+
7	Flavonoids	+	-	-
8	Quinones	+	+	-
9	Anthraquinones	+	+	+
10	Phenols	+	-	+
11	Protein	+	-	-
12	Carbohydrate	+	-	-
13	Glycosides	-	+	+
14	catechin	+	+	+
15	Fixed oil test	+	+	-

+ represent Positive - represent Negative

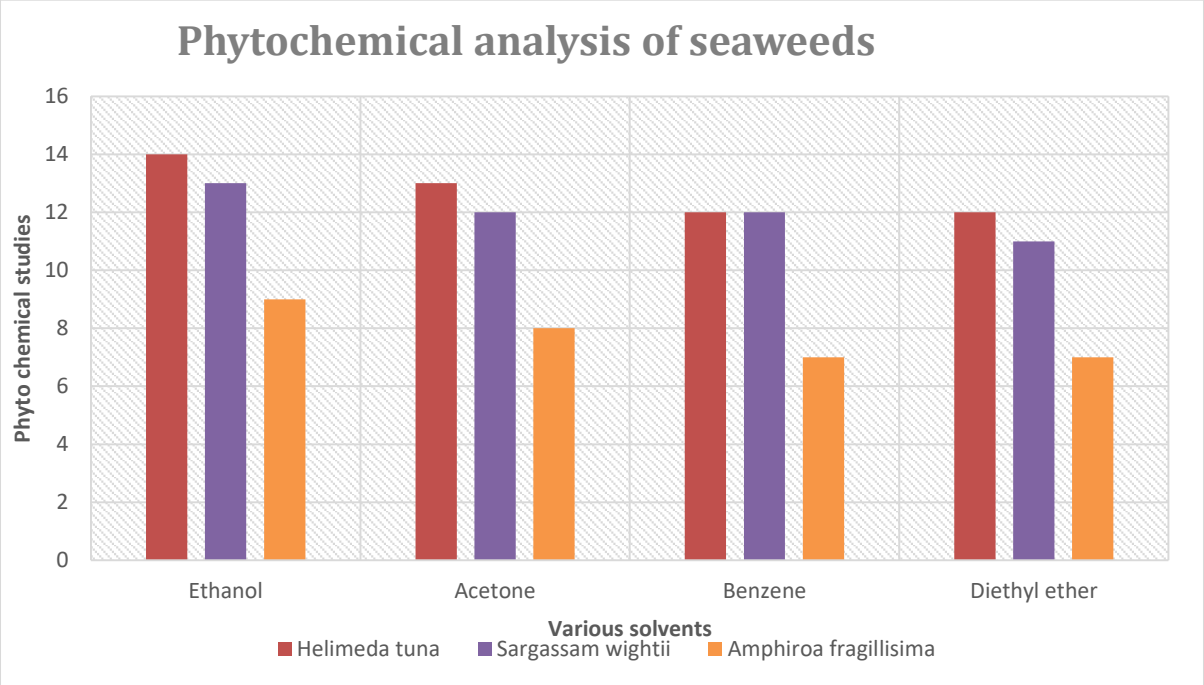
TABLE: IV

4.4 DIETHYL EITHER

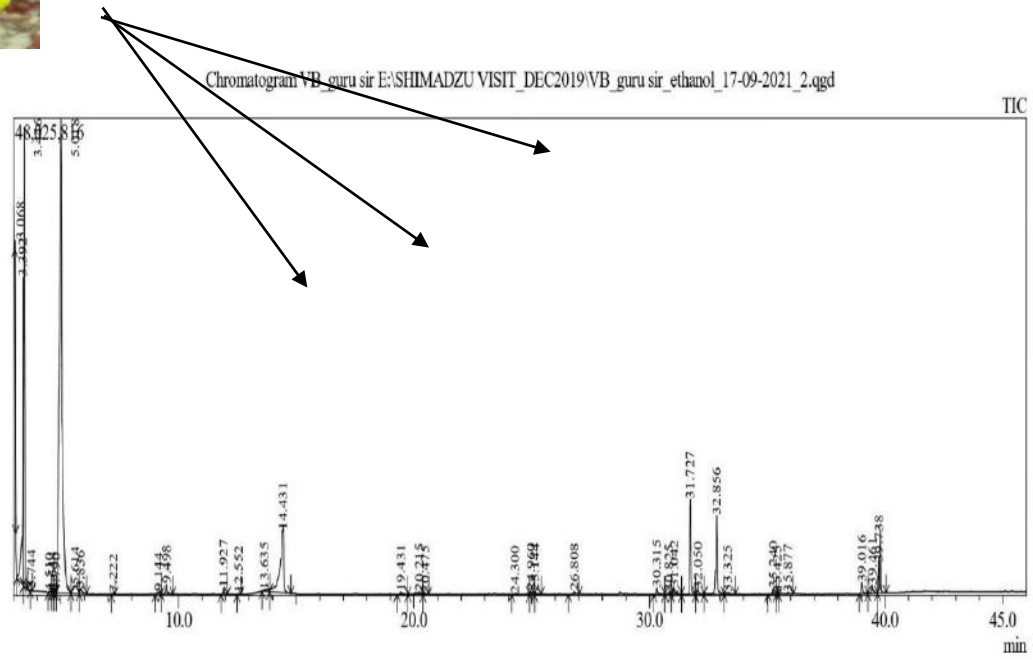
S.No.	TEST NAME	Halimeda tuna	Sargassum wightii	Amphiroa frailisima
1	Alkaloids	+	+	-
2	Terpenoids	+	+	+
3	Steroids	-	+	-
4	Coumarin	+	+	+
5	Tannin	+	+	+
6	Saponin	-	-	-
7	Flavonoids	+	+	+
8	Quinones	+	+	-
9	Anthraquinones	-	-	+
10	Phenols	-	-	+
11	Protein	-	+	-
12	Carbohydrate	+	+	-
13	Glycosides	+	-	-
14	catechin	+	-	+
15	Fixed oil test	+	+	+

+ represent Positive - represent Negative

Phytochemical analysis of Seaweeds-Figure-1



GC-MS Analysis of Halimeda tuna: Figure :2



5.CONCLUSION:

The Ethanol solvent of ***H.tuna*** extraction for phytochemical analysis of these seaweed has sufficient action of whole works. In GC-MS Analysis, ***H. tuna*** extract has 39 components that Acetates (36.45%), Di-siloxane (29.52%), Retinaldehyde (4.26%), Cyclopentasiloxane, Hexa decamethyl (3.36%), and Lupeol (3.02%) are studied. Therefore, ethanolic extract of *Helimeda tuna* could be seen as a good source for using drugs. The presence of secondary metabolites is responsible for the development of many more novel therapeutic agents which is future may serve for disease resistant.

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Stock Price Prediction using Deep Learning and Machine Learning: A systematic Literature Review

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Abstract : The current study concentrates on the literature review and also concentrates on several studies to analyse and examine the data. The present study also focuses on the different methods that have been used by the researcher to gather and examine the data. In the present study data from the years 2004 to 2022 has been taken into consideration, further, 34 papers have been taken to successfully complete the studies. In the study, four areas have been concentrated that include classification, association, clustering and estimation. Moreover, in the conclusion of the overall study, four areas have been focused which involve sentiment analysis, technical, and fundamentals. The study also includes a mixed analysis to examine and understand the data. To determine the stock prices thirty-one methodologies have been used. Long Short-Term Memory (LSTM), Multilayer Perceptron (MLP), Random Forest (RF), and Support Vector Machine (SVM) are among the most extensively employed methodologies in the field. Furthermore, the MLP (Multilayer Perceptron) approach demonstrates superior performance with an accuracy rate of 71.63%, while the LSTM (Long Short-Term Memory) method achieves an accuracy rate of 70%. It is recommended to employ a combination of machine learning approaches with ensemble techniques, deep learning, and the careful selection of input qualities during the pre-processing stage in order to enhance accuracy.

Keywords: Machine learning, Deep learning, Stock price prediction, Long Short-Term Memory (LSTM), Multilayer Perceptron (MLP), Random Forest (RF).

1. INTRODUCTION :

The analysis and forecast of stock prices pose significant challenges within the realm of financial affairs. This might be attributed to the inherent characteristics of financial markets, which are characterised by high levels of risk, volatility, dynamism, and uncertainty (Zarandi, Hadavandi, & Turksen, A hybrid fuzzy intelligent agent-based system for stock price prediction, 2012). The stock market offers two primary approaches for making investing decisions, namely fundamental analysis and technical analysis. In addition to doing an analysis of these forms, it is important to consider that stock prices are subject to the effect of various factors, including economic policy, current news, political events, and investor sentiment (Ma & Liu, 2008).

Every method of analysis possesses unique characteristics for the purpose of analysing or forecasting stock prices. Technical analysis is a quantitative approach used to forecast price movements by examining historical market data (Lunde & Timmermann, 2005). Technical analysis incorporates several qualities derived from past market data, including but not limited to date, opening price, closing price, highest price, lowest price, volume, and other pertinent technical data. Fundamental analysis encompasses the examination of broader economic and industry conditions, alongside the financial state and managerial competence of a company, in order to anticipate fluctuations in prices (Ivanov, et al., 2014). Fundamental analysis is the utilisation of fundamental data derived from the company. The study encompasses sentiment analysis, which involves the examination of sentiment in several domains such as news sentiment, social media sentiment, and investor opinion (Lin, Yang, & Song, Short-term stock

price prediction based on echo state networks, 2009). Furthermore, it is common practise to employ a synthesis of both technical features and mood attributes in many applications. The amalgamation of technical and fundamental characteristics.

The COVID-19 pandemic has had a discernible impact on the stock market and economic growth in Indonesia, as demonstrated by the observed decrease in stock prices across many industrial sectors (Hadavandi, Shavandi, & Ghanbari, 2010). However, it was observed that there was an increase in stock investors during the epidemic. The primary driver of this surge can be attributed to the phenomenon known as FOMO, or the fear of missing out, as individuals are motivated to invest in equities that have experienced significant growth during the pandemic. Numerous novice stock investors, driven by the fear of missing out (FOMO), engage in trading without acquiring adequate knowledge, resulting in significant financial setbacks (Schumaker & Chen, 2009). Stock forecasting plays a crucial role in facilitating investors' ability to generate profits and contribute to the recovery of the stock market in light of the ongoing epidemic. The data obtained from the organisation (Assaleh, El-Baz, & Al-Salkhadi, 2011). The study incorporates sentiment research through the examination of news sentiment, social media sentiment, and investor sentiment. Furthermore, it is common practise to employ a fusion of both technical features and mood attributes in many applications. The amalgamation of technical and fundamental characteristics (Ou & Wang, Prediction of Stock Market Index Movement by Ten Data Mining Techniques, 2009).

2. Research Methods :

The utilisation of a Systematic Literature Review will serve as a valuable resource for examining and evaluating the existing body of literature pertaining to the forecast of stock prices. The concept of a literature review in the field of research involves the systematic identification, evaluation, and interpretation of all existing research material in order to address specific research inquiries. In accordance with the guidelines outlined in the systematic literature review, one of the essential steps is the articulation of research questions, which serve as the primary objectives of the study and facilitate a focused approach to the research endeavour. Please elucidate the search methodology, encompassing the identification of data sources and databases, as well as the specific keywords employed during the search process. Subsequently, the data should be chosen in accordance with pre-established criteria. Inappropriate studies will also be screened. In order to enhance comprehension for readers, the research flow is visually depicted in Figure 1.

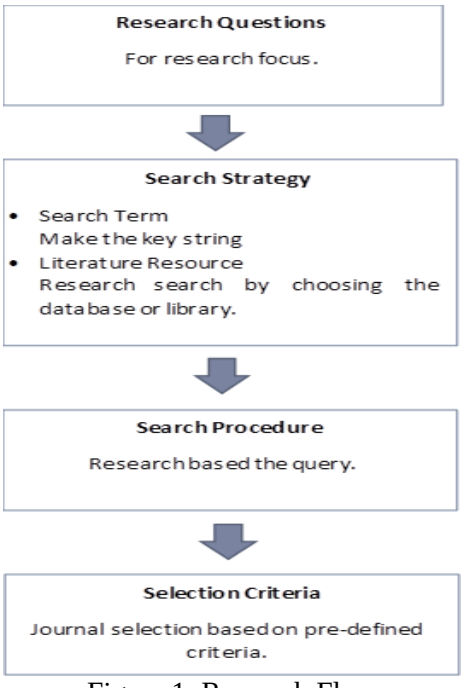

Figure 1: Research Flow

Research Inquiries

To maintain research concentration, it is imperative to establish clear research topics. The design of the Research Question was based on the PICOC framework, as proposed by reference. This framework encompasses the key elements of Population, Intervention, Comparison, Results, and Context. Table 1 presents the PICOC framework employed for formulating the study inquiries.

Structure	Description
Population	Stock Market
Intervention	Stock Forecasting, Stock Prediction, fundamental analysis, sentiment analysis, Technical Analysis,
Comparison	Stocks
Outcomes	Methods of stock prediction, Accuracy of Prediction of stock return,
Context	Research in stock forecast

Table 1 : PICO Framework

According to the PICOC table, research questions are formulated to determine the anticipated outcomes of a certain research study. As a result of this rationale, the subsequent inquiries will be formulated:
RQ 1: What are the current research topics being investigated in the domain of stock prediction?

RQ 2: Which analytical approach is predominantly employed in the prediction of stock market performance?

RQ 3: What are the methodologies employed in the prediction of stock market performance?

RQ 4: What is the most effective methodology for predicting stock market performance?

Search Strategy

The process of formulating an effective approach to conducting research or gathering information, typically involving the identification of relevant keywords and databases. In order to establish a search string, it is necessary to initially establish keywords along with potential alternatives. This ensures that the material selected will be pertinent to the topic at hand. This systematic literature review will exclusively consider papers that are written in the English language. The search query is constructed using the following keywords:

The concepts of the stock market, stock price, and stock index are fundamental components of financial markets.
Two commonly used methods in financial analysis are sentiment analysis, fundamental analysis, and technical analysis.
After the definition of these search keywords, a search query is generated using a boolean operator for the subsequent stage. The utilised search queries are:

The present research focuses on the intersection of three key concepts within the field of finance: the stock market, stock price, and stock index. Additionally, it explores the relationship between these concepts and three analytical approaches: sentimental analysis, fundamental analysis, and technical analysis. Lastly, it investigates the potential use of these approaches in forecasting or predicting future market trends.

3. Literature Search

The present study employs a search strategy that involves the selection of a digital library or database for the purpose of conducting a comprehensive review. This phase suggests utilising a database or library that is pertinent to the research being conducted. The various digital libraries that have been used in the research will improve the quality of the complete study which will help in getting meaningful results from the study. For the process of conducting article searches many of the digital databases have been used.

The website IEEE Explore (ieeexplore.ieee.org)
ScienceDirect, a widely recognised online platform (accessible at sciencedirect.com),
Springer, a reputable academic publishing company, can be accessed through its online platform, springerlink.com.
The study concentrates on the information and data that has been gathered between the period of 2004-2022.

Portal	Result Based on keywords	Download Journal
IEEE Explore	149	83
Science Direct	621	193
Springer	3023	423
Total	3794	699

Table 2 : Papers Retrieved

4. Procedure for Conducting a Search

The numerous processes that are used by the researcher to complete the research has been described in this particular section. Overall, the complete procedure of article selection focuses on using the keywords to conduct a search depending on the query formed. Further, the results are sorted depending on the required year and type of article. A deep analysis and observation of the abstract and title are done to remove irrelevant information. On the other hand, the relevant information is determined to successfully complete the research. A proper and systematic comprehensive analysis is done of the relevant information to get meaningful and logical insights from the study.

Criteria for Selection

In this particular study this section includes removing and eliminating items to ensure that required criteria is met. The compilation of articles from start to finish is presented in Table 2, which displays a total of 3794 items that were obtained based on the query. A total of 699 items were downloaded. Upon careful examination of the exclusion criteria and the required criteria, a total of 34 articles were chosen for subsequent investigation.

5. The Current Prominent Themes in the Domain of Stock Price Forecasting

The objective of this study is to identify the current research topics being explored in the domain of stock prediction. The analysis is conducted by categorising 34 chosen papers according to their research topic. The study subjects can be categorised into four distinct areas.

The objective of this study is to utilise many algorithms, such as Artificial Neural Networks [19] and backpropagation artificial neural networks, as well as MLP, RNN, and other Neural Network methods, to make estimates, forecasts, or predictions of stock prices. Furthermore, the utilisation of regression analysis, specifically Lasso regression, is employed.

Methodology Employed in Stock Prediction

In the realm of stock prediction, a multitude of machine learning techniques are employed to explore the potential for identifying the most effective approach in forecasting stock values. The research conducted between 2016 and July 2021 revealed the utilisation of up to 31 algorithms aimed at achieving optimal accuracy. Figure 6 illustrates the various strategies employed.

6. The Predominant Approaches in Stock Forecasting

According to the data, it is evident that the methods most commonly employed are Multilayer Perceptron (MLP) and Long Short-Term Memory (LSTM), with Random Forest and Support Vector Machine (SVM) being utilised to a lesser extent. Hence, it is plausible that this approach retains the capacity to forecast stock values in forthcoming periods.

7. The Optimal Approaches for Stock Prediction

Several techniques are employed to enhance the accuracy of stock prediction. The prediction outcomes vary based on the dataset and attribute types, although employing the same methodology. These studies frequently present their findings without offering sufficient details regarding the rigour and validity of the research methodology employed. Consequently, only a limited number of studies can be effectively summarised (Ou & Wang, Prediction of Stock Market Index Movement by Ten Data Mining Techniques, 2009).

The study findings elucidate the accuracy metric, revealing that the Multilayer Perceptron (MLP) achieved a 71.63% accuracy rate in forecasting stock prices through the utilisation of technical analysis. According to recent research findings Lu (2010), trading systems have demonstrated equivalent or superior classification outcomes in terms of buy, sell, and hold decisions when compared to the traditional approach of buying and controlling stocks. These findings suggest that trading systems can be effectively employed across different stock markets, even over lengthy time periods. The research conducted on analysing stock prices using technical analysis yielded a Root Mean Square Error (RMSE) of 0.0348, as created by the Artificial Neural Network (ANN) Backpropagation algorithm. The Long Short-Term Memory (LSTM) model demonstrates a 70% accuracy in predicting stock prices by including technical analysis with sentiment analysis derived from Twitter data (Naik, Ramesh, Manjula, & Govardhan, 2012). In contrast, the Random Forest model, employed for fundamental research, achieves an accuracy of 66.30%.

The approach exhibiting optimal performance coincides with a compilation of the most commonly employed ways. Consequently, the utilisation of certain of these methods remains highly intricate for the purpose of conducting additional research (Lin, Yang, & Song, Short-term stock price prediction based on echo state networks, 2009). The approaches recommended for implementation in future study are the Long Short-Term Memory (LSTM) and Multilayer Perceptron (MLP) methods. Nevertheless, it is vital to do further research utilising the identical dataset in order to determine the optimal algorithm among these alternatives.

Based on empirical evidence, there are several factors that contribute to suboptimal levels of accuracy (Lu, Integrating independent component analysis-based denoising scheme with neural network for stock price prediction, 2010). One such factor is the absence of a comprehensive market study, which can be mitigated by employing a diverse range of research methodologies to enhance accuracy. Pre-processing is a crucial step in achieving optimal accuracy. To enhance the accuracy of the model, it is advisable to do attribute selection, specifically feature selection, prior to inputting the attributes. Next, endeavour to employ a range of potential algorithms or hybrid models to determine the optimal approach for forecasting stock prices (Ghosh, Comparative study of Financial Time Series Prediction by Artificial Neural Network with Gradient Descent Learning, 2011).

A proposal is put out to conduct a synthesis of several forms of analysis. Furthermore, it is vital to allocate greater focus towards pre-processing procedures, specifically pertaining to the selection of features from the input data that will be utilised. This investigation revealed that the utilisation of deep learning also yielded enhanced accuracy.

This literature review aims to validate and examine the patterns of research subjects, the analytical approaches employed, the methodologies utilised, the most often employed methodologies, and the methodologies that demonstrate superior performance. This literature review employs the research methodology proposed by Ye & Wei (2015). A comprehensive compilation of 40 studies conducted between 2016 and June 2021, with due consideration given to predetermined study criteria. This study encompasses four primary research areas, namely estimation, classification, clustering, and association. It has been evaluated from the findings that the research topic account for 65% in the study,

further estimation is 28%. Moreover, clustering in the research account for 5% and the association comprised of 2% in the entire study (Agrawal, et al., 2013).

On the different analytical methodologies used in the present study, researches were conducted that includes fundamental analysis, technical analysis, sentiment analysis or combination. Proper and effective use of historical stock data is involved in the technical analysis. On the other hand, the fundamental analysis includes data generated from steady fundamentals. Furthermore, the process of sentiment analysis is done to determine and understand the perception of the general public on the stocks. Additionally, it is employed in a synthesis of both analytical approaches (Wang & Choi, 2013). Based on the findings derived from the comprehensive examination of relevant literature, it was observed that a majority of research studies, accounting for 56%, employ technical analysis and technical attributes or datasets as integral components of their investigations. Additionally, a significant proportion of studies, including 23%, integrate both technical analysis and sentiment analysis methodologies. The study involved the integration of fundamental and technical analysis, resulting in a 15% increase in accuracy. Additionally, a 3% improvement was observed when just relying on fundamental analysis, and another 3% improvement when using sentiment analysis. However, no research was discovered that examined the combined use of sentiment analysis and fundamental analysis. Overall, three distinct kinds of analysis were employed in this investigation.

This evaluation identified a total of 31 algorithmic techniques employed in the present investigation. The methods of MPL and LSTM have emerged as the prevailing approaches, followed by RF and SVM. The selection of performance approaches is hindered by the presence of diverse data sets and qualities. However, it is acknowledged that the use of MPL can yield a detection accuracy of 71.63% in the realm of stock price identification through the application of technical analysis (Guo, 2022). Moreover, it has been shown that LSTM achieves a performance accuracy of 70% in the domains of technical analysis and sentiment analysis. The proposed methodology is expected to yield favourable outcomes when implemented with appropriate approaches and meticulous pre-processing methods tailored to each specific data collection.

In subsequent investigations, this systematic literature review aims to conduct a comprehensive analysis by employing a variety of analytical approaches. Furthermore, the utilisation of ensemble approaches in conjunction with combined machine learning methods is anticipated to provide superior outcomes. It is anticipated that the incorporation of deep learning methods would further enhance the performance. The identification and evaluation of influential input features are crucial for advancing research in this field.

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Impact of phosphate solubilizing microorganisms and *Rhizobium phaseolus* on *Phaseolus vulgaris* amended with rock phosphate and biogas spent slurry.

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Abstract: Phaseolus vulgaries seeds were inoculated with Rhizobium phaseolus, Phosphate solubilizing Microorganisms (PSO) along with rock phosphate in mud pots which contain spent slurry of biogas plant and soil. This experiment was carried out in 4 treatments with control (T1, T2, T3, T4 and T0).The samples were collected at seedling, preflowering, blooming and end stages to learn the phenotypical nature includes, the length of root, stretch of shoot, prime apex, and both wetted and dried weight, number of nodules, nutrient content and biochemical constituents which included NPK and chlorophyll contents. The plant which was supplied by R.phaseous, PSO with rock phosphate has recorded the highest parameters in the above said morphological characters and biochemical constituents compared to control and other application mixtures. The NPK content were also increased from seedling stage (1.262%, 0.28% & 0.26%) to flowering stage and declined in the final stage of its growth due to the utilization of these elements for the yield of the product. Soil analysis of microbial survey during seed stage revealed that, the control field contained very low THBP of $19x10^6$±0.160 cfu/gm. The high amount of THBP, THFP and TPSMP were seen in the R. phaseolus + PSO + RP in the order ($100x10^6$±0.264cfu/gm), ($80x10^3$±0.637cfu/gm) and ($158x10^3$±0.390cfu/gm) respectively. The minimum load observed in control ($20x10^3$±0.415cfu/ml).This field report emphasized that PSO and R.phaseolus along with rock phosphate combination played vital role on nodulation, nitrogen fixation and nutrient uptake in P.vulgaries.

Key Words : R.phaseous, Phosphate solubilizing Microorganisms (PSO), rock phosphate, spent slurry.

1. INTRODUCTION:

Bacteria that solubilize insoluble phosphate to soluble play a vital part in the nourishment of plant. The essential macronutrient Phosphorus is required in huge quantities by the plants for the growth and development. The total availability of soil P is high, but the bioavailability to plants is suboptimal because of its high fixation ratio into inorganic and organic insoluble complicated complexes (Isidro BeltranMedina *et al.*, 2023). Sorption, precipitation and immobilization are significant transformations that restrict phosphorous availability in soil either temporarily or permanently (Sivasakthivelan *et al*., 2021). Different genera of bacteria can solubilise phosphate and are *Bacillus, Pseudomonas, Rhizobium, Agrobacterium, Burkholderia, Achromobacter, Aereobacter, Flavobacterium* and *Erwinia.* Enormous amount of PSO population found in soil and plant (Ilumer and Schinner, 2012).

By secreting organic acids, PSO brings insoluble form of phosphate in soil into soluble forms. These acids lower the pH and convert bound forms of phosphate (Rudresh *et al.*, 2004; Raghu and Mac Rae, 1966). N and P incorporate important part in the development and the growth of plants. Due to the high price and frequent non availability of them, the application to the plant is not a satisfied one (Baqual and Das, 2006). Biofertilizers play a vital role in rearing vegetable and cereals (Nair and Naja Chandra, 2001) and the production has been also increased by the utilization of organic amendments (Madhiyazhagan *et al*., 2001). Our country has bagged third place for both manufacturing and utilization of biofertilizer in global level following China and USA (Deepak Bhardwaj *et al*., 2014). Now, biomanure has considered as the important elements of integrated composting system in Indian agriculture.

Therefore to study the importance of *Rhizobium*, PSO with rock phosphate along with biodigested slurry on leguminous plant *Phaseolus vulgaries*, on the growth, nutrition and microbial load in its various stages this trial was undertaken.

2. Literature Review :

When it comes to economic and environmental concerns, biofertilizers have become a source of optimism for the majority of nations. It can help to tackle the issue of the high cost of chemical fertilisers, particularly in developing nations like India, and save the nation's economy (Al Masri, 2001; Masse, *et al*., 2004). After producing biogas, the environment is greatly concerned with how the biodigested slurry is disposed of (Algawadi and Gaur, 1988; Gaur, 1990; Gained and Gaur, 1991; Hedge *et al*., 1994; Rupela *et al*., 2004; Dinesh kumar *et al.*, 2008). It improves crop production and reduces the negative environmental effects of waste disposal since it contains a significant amount of plant nutrients (Singal *et al*., 1991; Vander zed *et al*., 2006). According to Warneke and Siregar (1994), applying biodigested chicken manure enhanced the uptake of nutrients by cabbage. The N, P, and K content of Bermuda grass was increased when Heathman *et al*. (1995) added biodigested poultry manure to the grass. Masse, *et al*., (2004) discovered that tomato plants were able to absorb more nutrients as a result of chicken manure.

Because native soil phosphorus is poorly soluble, crops rarely have access to it. According to Saxena and Tilak (2000) and Nasreen Haqua and Dave (2002), the amount of soluble phosphate in soil is typically quite low, which causes a phosphate deficit and makes soluble phosphate a limiting element in plant nutrition. According to Algawadi and Gaur (1988), Gaur (1990), and Gaind and Gaur (1991), phosphate solubilizes have been used as potential microbial inoculants for crops cultivated in Indian soil that has been treated with RP or Tri Calcium Phosphate (TCP) and has low P availability.

Phosphate solubilizing microorganisms (PSMs) are bacteria or fungi that have the ability to degrade insoluble forms of phosphorus, like phosphates, in the soil and make it available to plants as a soluble form that may be readily absorbed (Rawat *et al*., 2020). There are many different genera of these helpful microbes, for example. Numerous species of *Bacillus, Pseudomonas, Streptomyces, Aspergillus, Rhizobium, Fusarium, Trichoderma, Penicillium, Serratia, Micrococcus,*

Stenotrophomonas, *Acinetobacter*, and *Agrobacterium* have been identified (Rodrguez and Fraga, 1999). This procedure improves the amount of phosphorus that is generally available to plants, which enhances plant development and crop yields. PSMs are frequently present in soil and the rhizosphere and are crucial to nutrient cycling and soil health (Rawat *et al*., 2020).

They are huge category of beneficial microbe including many genera for instance *Bacillus* sp., *Pseudomonas* sp., *Streptomyces* sp., *Aspergillus* sp., *Rhizobium* sp. *Fusarium* sp., *Trichoderma* sp., *Penicillium* sp., *Serratia* sp., *Micrococcus* sp., *Stenotrophomonas* sp., *Acinetobacter* sp., and *Agrobacterium* sp. (Rodríguez and Fraga, 1999). This procedure improves the amount of phosphorus that is generally available to plants, which enhances plant development and crop yields. This procedure improves the amount of phosphorus that is generally available to plants, which enhances plant development and crop yields. PSMs are frequently present in soil and the rhizosphere and are crucial to soil fertility and nutrient cycling (Beheshti *et al*., 2022). PSMs have been used in a variety of biotechnological applications. PSMs are employed in the production of antibiotics, vitamins, and other bioactive compounds in the pharmaceutical and food industries, for example (Sekurova *et al*., 2019); in addition, PSMs have the potential to contribute to the creation of novel and effective bioprocesses for the environmentally friendly production of biofuels and other bio-based products. PMSs are most frequently used in environmental and agricultural engineering. For the reasons outlined above, PMS are used in agriculture to increase soil fertility, improve plant growth and tolerance to environmental stresses like salinity (*Luo et al., 2022),* nutrient deficiency (He *et al*., 2021; Chen *et al*., 2023), etc., and ultimately increase crop yields (Chen *et al*., 2022). They can also be used in bioremediation alongside or in combination with plants

3. Research Objectives:

- To collect the biodigested slurries from biogas plant for organic manure sources.
- To isolate PSO using Hydroxy Apatite Medium (HAM).
- To isolate *Rhizobium phaseolus* from *Phaseolus vulgaris*
- Mass cultivation of both PSO and *Rhizobium phaseolus* .
- Two sets of biodigested slurries were obtained from biogas plant. One set was enriched with rock phosphate and phosphate solubilizing organisms with biodigested slurry and the other set was used as it was without any enrichment as biofertilizers with control. They are as follows

Treatment	Fertilizer combination
T0	CONTROL
T1	ROCK PHOSPHATE (RP)+ SLURRY
T2	PHOSPHATE SOLUBILIZING ORGANISM (PSO)+RP+SLURRY
T3	R.PHASEOLUS+RP+SLURRY
T4	RP+PSO+ R.PHASEOLUS+SLURRY

- To apply these amendments on *Phaseolus vulgars* to compare the growth and nodule formation.

4. Materials and Methods

The methodology of Kannan, (1996) has followed for the isolation of PSO

PSO isolation from soil

↓

Hydroxy Apatide Medium (HAM) preparation

↓

Mass Cultivation

Isolation of *R.phaseolus* from *P.vulgaris*

Selection and Washing of healthy pink nodules.

↓

Surface sterilized by 0.1% $HgCl_2$ for about 4-5 minutes

↓

Nodule extract preparation

↓

Serial dilutions on CRYEMA (Vincent, 1970).

↓

Room temperature incubation(26 ± 2^0C) up to 3-4 days.

↓

Selection of large gummy colonies after 5 days

↓

Isolation, confirmation, purification and stored.

Identification

By following the scheme of Vincent, (1970), biochemical tests were carried out and listed in Table 1.

Table 1. *R.phaseolus*-Biochemical characteristics.

Biochemical parameters	Observation
Microscopy	Gram negative rod
Motility	Motile
Growing ability on Peptone-Glucose Agar	Very poor growth
Congo Red Test	white translucent, glistening colonies evaluated with entire margin
Test of Hofer's Alkaline Broth	-
Test of Lactose Agar	+
Catalase Test	+
Starch hrdrolysis	-
Casein hydrolysis	-
Lipid hydrolysis	-
Gelatin Hydrolysis	-
Production of Indole	-
MR-Test	-
VP-Test	+
Test of Simmons citrate	+

Inoculation In mudpots

Pot Culture experiment was conducted using with biogas spent slurry with soil as substrates. Mud pots with biogas spent slurry, rock phosphate at the rate of 500mg P/ kg of slurry. Water was

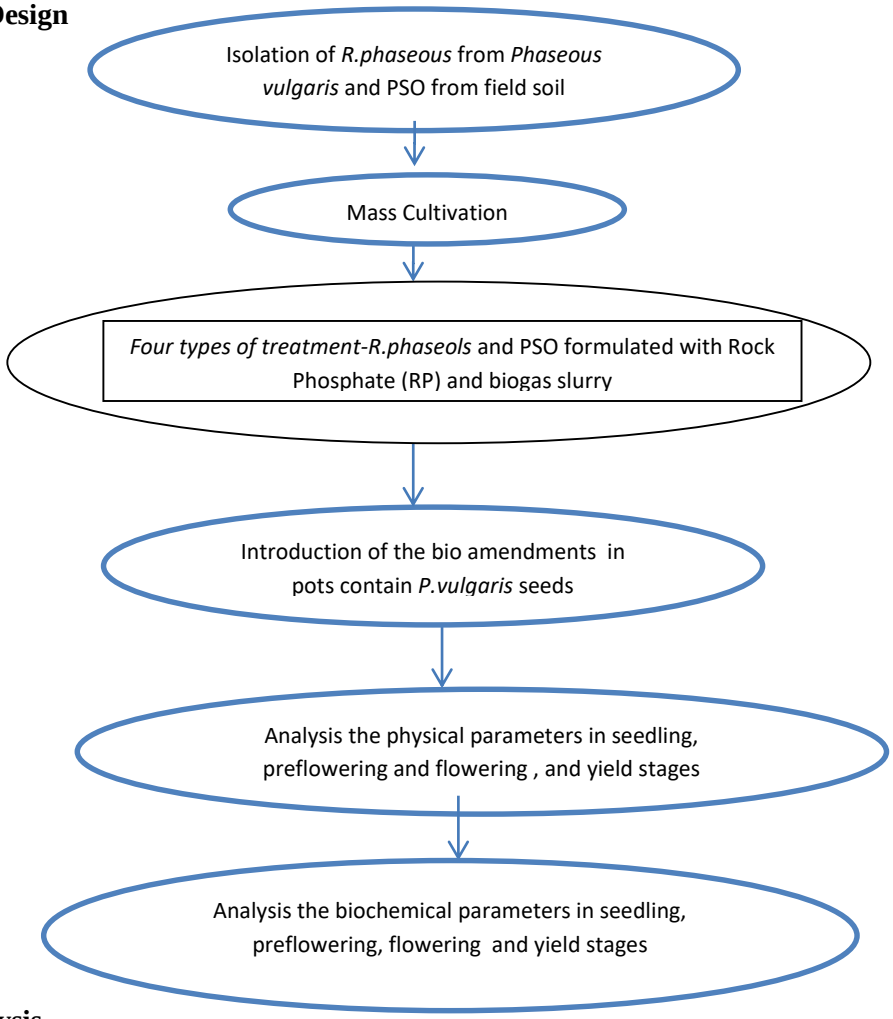
poured to each pot before planting to adjust the moisture content of the slurry. The surface sterilized and uniform sized seeds of *P.vulgaris* were sown and germinated in 4 treatment pots. Experiments were carried out with triplicate of each treatment.

The plants were watered regularly to maintain 60 percent maximum water holding capacity (WHC). On alternative days, the pots were inoculated with *R.phaseolus* and PSO for 10days. Germination count was taken for 10daysafter sowing. Plant growth parameters, nutrient content and microbial load were determined. After processing in an oven at 60^0C for four days, the dry weight was recorded. Nutrient content in shoots were determined by the standard method of Jackson (1958). The experimental design was given in the following table (Table 2).

Table 2. Different treatments for experimental pot plants

Treatment	Nature of the treatment
T0	CONTROL (SOIL&SLURRY)
T1	ROCK PHOSPHATE (RP)
T2	PHOSPHATE SOLUBILIZING ORGANISM (PSO)+RP
T3	R.PHASEOLUS+RP
T4	RP+PSO+ R.PHASEOLUS

Experimental Design



Statistical Analysis

Each value is indicated as mean (±SD) of six samples. Further were subjected to Least Significant Difference (LSD) analysis (Table 10).

5. Results :

Reports of pot soil

Results revealed that the Total Heterotrophic Bacterial Population (THBP) was found to occur in 10^6cfu/gm order and Total Heterotrophic Fungal Population (THFP) is in contemplation of 10^3cfu/gm. In the case of Total Phosphate Solubilizing Microbial Population (TPSMP), the density of microbes was in the conductive of 10^3cfu/gm. Prior to the amendment applications, the THBP, THFP and TPSMP were in the following order $14x10^6$±1.180cfu/gm, $16x10^3$±1.431cfu/gm and TPSMP Table 3).

Table 3. Reports of the pot soil (CFU/ml).

Sampling stage	THBP	THFP	TPSMP
Initial soil sample	$14x10^6$±1.180	$16x10^3$±1.431	$41x10^3$ ±1.078

THBP - as counts $x10^6$cfu/gm
THFP&TPSMP - as counts $x10^3$cfu/gm

Reports of THBP, THFP and TPSMP at treatments (CFU/ml)

Soil analysis of seed stage revealed that, the control field contained very low THBP of $19x10^6$±0.160 cfu/gm. The high amount of THBP, THFP and TPSMP were seen in the *R. phaseolus* + PSO + RP in the order ($100x10^6$±0.264cfu/gm) (Fig1), ($80x10^3$±0.637cfu/gm) (Fig2) and ($158x10^3$±0.390cfu/gm)(Fig3) respectively. The minimum load observed in control ($20x10^3$±0.415cfu/ml) .

The analysis of microbial load of THBP,THFP AND TPSMP during preflowering stage revealed that the maximum load was observed in the treatment pot of *R.phaseolus*+PSO+RP ($110x10^6$±0.358 cfu/gm, 91X103cfu/gm,and 91X103cfu/gm,) respectively. In flowering and final stage also, the maximum microbial load were seen in the pot containing the mixed amendments followed by *R.phaseolus*+RP inoculated pots, PSO+RP inoculated pots and RP alone inoculated pots. The least count was observed in the control pots in all stages (Fig 1,2,&3).It was clear that, there was an increase in the number of THBP, THFP and TPSMP from originated stage of soil analysis to end stage. Also it was observed that the increased population in THBP, THFP and TPSMP was seen in *R.phaseolus*+PSO+RP applied pots.

Fig 1. THBP at various stages on different experimental treatments

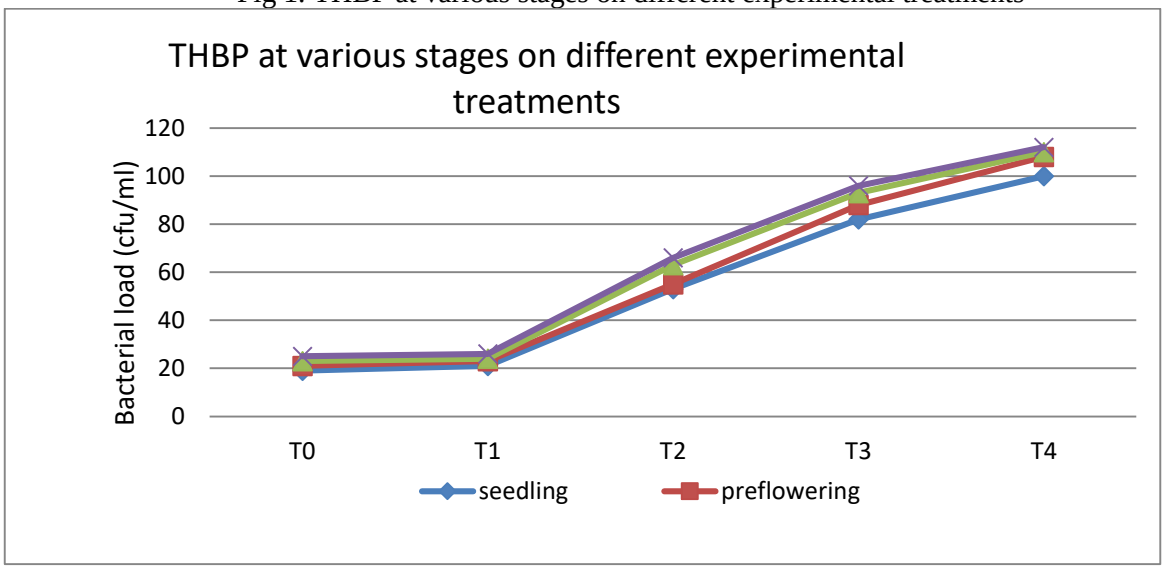


Fig 2. THFP at various stages on different experimental treatments

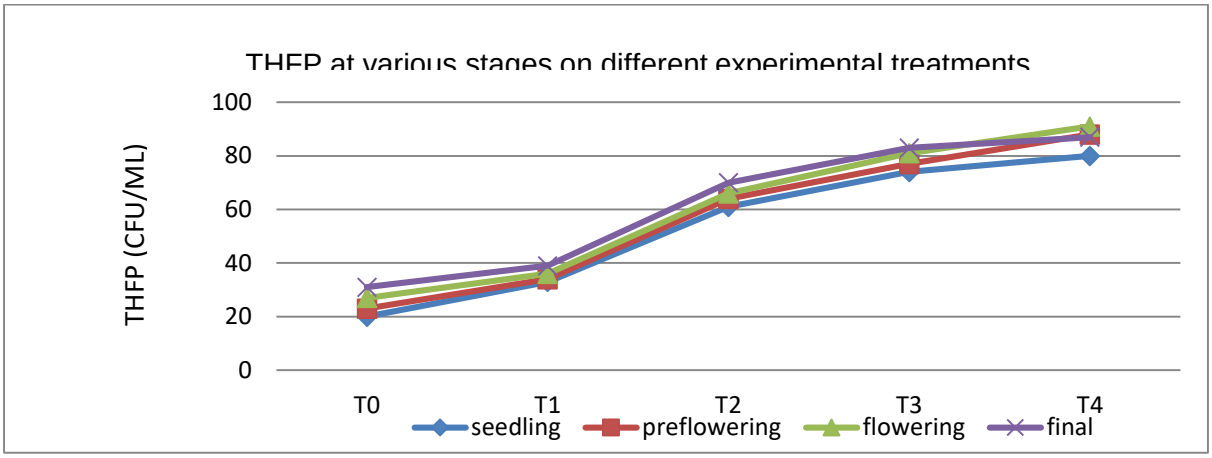
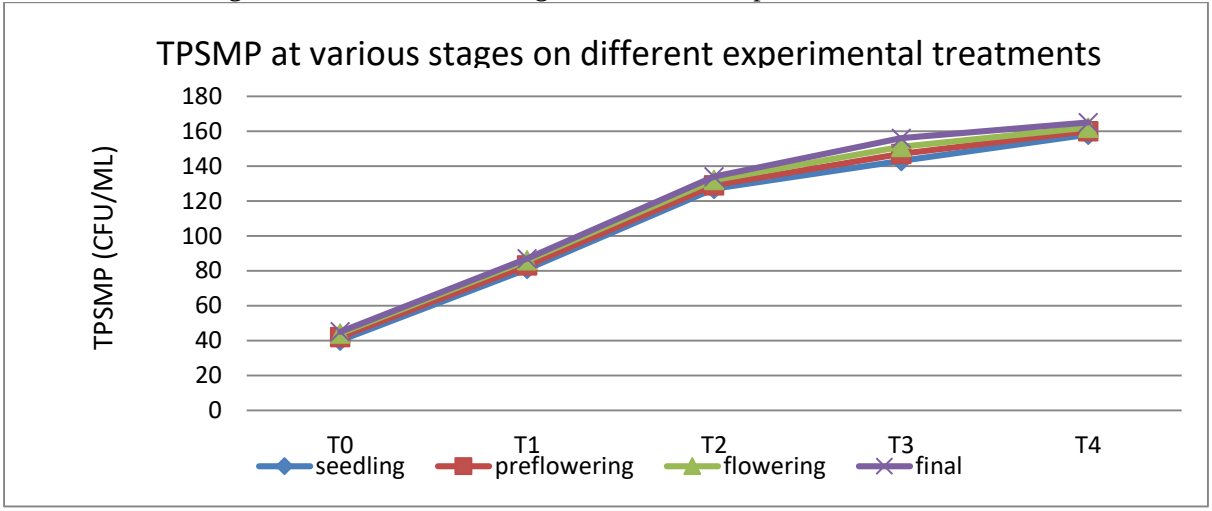
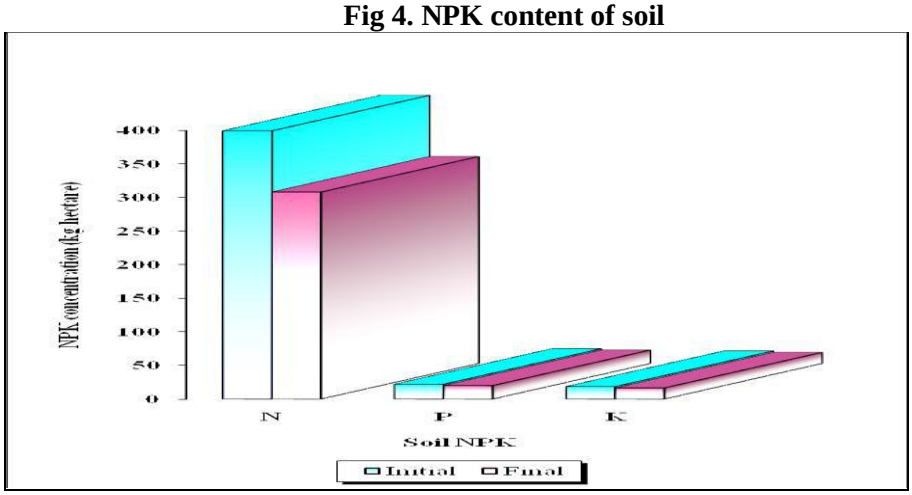


Fig 3. TPSMP at various stages on different experimental treatments



Before and after application of manure, the applied NPK level indicated that, there was a notable decrease from initial NPK to end stage utilized by plants for growth and yield (Fig 4). Phenotypical and biochemical parameters at different stages reported that, there was an observable progress in the tallness and dry content of pots contained RP, PSO, enriched biodigested slurry and *R.phaseolus*.

Fig 4. NPK content of soil



Impact at pre-flowering period

The notable phenotypic characters were more in the plants growing with *R.phaseolus*+PSO+RP as compare to other biodigested organic amendments (Table 4).

Table 4.Impact of manurial sources on morphology and chlorophyll content at pre-flowering period

Manurial sources	Pre-flowering stage					
	Root length(cm)	Shoot length(cm)	Total height(cm)	Wet weight(g)	Dry weight(g)	Chlorophyll content(mg/lit)
T0	3.9±0.190	5.0±0.289	8.9±0.557	5.9±0.100	0.760±0.110	0.140±0.109
T1	4.2±0.150	5.1±0.793	9.3±0.656	6.1±0.360	0.680±0.014	0.142±0.001
T2	4.5±0.193	5.3±0.468	9.8±0.917	6.2±0.017	0.660±0.105	0.152±1.009
T3	4.7±1.265	6.2±0.036	10.9±1.014	6.5±0.014	0.640±1.010	0.158±0.108
T4	5.3±0.070	6.8±0.610	12.1±1.058	6.8±0.155	0.720±1.006	0.182±0.014

Mean±Standard Deviation.

Impact at blooming period

The maximum phenotypic and chlorophyll content were seen in *R.phaseolus*+PSO+RP applied pots (Table 5).

Table 5 Impact of manure on the morphology and chlorophyll content at blooming period.

Manurial sources	Flowering stage					
	Root length(cm)	Shoot length(cm)	Total height(cm)	Wet weight(g)	Dry weight(g)	Chlorophyll content(mg/lit)
T0	8.8±0.080	15.3±0.265	24.1±0.964	4.553±0.056	0.491±0.008	0.426±0.007
T1	7.4±0.361	21.1±0.300	28.5±0.656	7.320±0.019	0.572±0.007	0.482±0.015
T2	9.1±0.265	23.6±0.265	32.7±0.656	7.381±0.016	0.714±0.005	0.526±0.006
T3	9.8±0.700	25.4±0.872	35.2±0.654	9.881±0.055	0.9.1±0.265	23.6±0.265
T4	11.2±0.200	34.2±0.854	45.4±1.637	9.433±0.014	0.618±0.002	0.448±0.002

Mean±Standard Deviation.

Impact at final stage

In final stage, the maximum root length, wet weight, dry weight, the maximum shoot length, and total height of plants were seen in *R.phaseolus*+PSO+RP treated pots (Table 6).

Table 6. Impact of manurial sources at final stage

Manurial sources	Final stage					
	Root length cm)	Shoot length(cm)	Total height(cm)	Wet weight(g)	Dry weight(g)	Chlorophyll content(mg/lit)
T0	10.4±0.458	18.6±0.557	29.0±1.039	6.21±0.046	0.52±0.006	0.397±0.009
T1	10.2±1.200	27.6±0.917	37.8±0.800	14.374±1.151	0.721±0.017	0.363±0.015
T2	11.5±0.700	28.4±0.755	39.9±0.529	12.637±0.012	0.807±0.010	0.472±0.011
T3	12.1±0.361	29.2±0.872	41.3±1.153	9.610±0.019	0.473±0.007	0.394±0.005
T4	13.4±0.608	40.1±0.625	53.5±0.755	18.012±0.024	0.813±0.012	0.353±0.012

Mean±Standard Deviation

The NPK content of *P.vulgaries* plants was increased from seedling period (Table 7) to blooming stage and declined in end stage due to the utilization of these elements for the yield (Table 8).

Table 7. Effect of biodigested slurry on the NPK content of plant during seedling stage

STAGE	N(%)	P(%)	K(%)
seedling stage	1.262±2.608	0.28±0.008	0.26±0.609

Values in Mean±Standard Deviation

Table 8.Effect of manurial sources on the NPK content in *P .vulgaries*Grown at different stages of growth.

Manurial sources	Pre-flowering (%)			Flowering (%)			Final (%)		
	N	P	K	N	P	K	N	P	K
T0	2.126±0.018	0.280±0.002	0.32±0.010	2.760±0.029	0.32±0.010	0.30±0.020	2.4±0.100	0.28±0.026	0.28±0.010
T1	1.898±0.026	0.274±0.004	0.32±0.017	2.868±0.048	0.38±0.010	0.28±0.017	1.8±0.100	0.26±0.017	0.26±0.906
T2	2.126±0.009	0.298±0.005	0.28±0.010	3.000±0.065	0.40±0.026	0.28±0.026	2.8±0.264	0.38±0.026	0.22±0.026
T3	1.926±0.013	0.268±0.007	0.34±0.017	2.768±0.017	0.39±0.020	0.29±0.017	1.9±0.173	0.28±0.017	0.24±0.017
T4	2.826±0.037	0.292±0.004	0.38±0.017	3.845±0.014	0.48±0.017	0.32±0.010	2.8±0.100	0.39±0.010	0.28±0.020

Values in Mean±Standard Deviation

Nodulation of *P.vulgaries* in different amendments

Inoculation with *R.phaseolus*+PSO+RP treated pots (T4) recorded the maximum number of nodules i.e 21 at final stage (Table 9) *Rhizobium*sp and PSO interaction significantly enhanced nodule weight.

Table 9.Influence of *R.phaseolus*, PSO with RP on nodulation of *P.vulgaries* under pot culture condition

Treatments	Germination (%)	No of nodules	Nodules fresh wt(g)	Nodule dry wt(g)
T0	68.7	07	0.134	0.034
T1	69.5	13	0.249	0.091
T2	70.1	16	0.301	0.129
T3	72.6	18	0.311	0.134
T4	74.8	21	0.334	0.136

Table 10.LSD in Dry weight of *Phaseolus vulgaries* during preflowering*, flowering* and final* stages.

Manurials ources	Preflowering Stage*			
	Dry weight (g)	$S.E_x$	Difference from Control	LSD at 5%
To	0.760	0.010	0.18	0.0196
T1	0.680	0.011	0.10	0.0216
T2	0.660	0.005	0.13	0.0098
T3	0.640	0.005	0.12	0.0098
T4	0.720	0.10	-	0.0059
Manurial sources	Flowering Stage*			
	Dry weight (g)	$S.E_x$	Difference from Control	LSD at 5%
To	0.491	0.008	-	-
T1	0.572	0.007	0.327	0.0118

T2	0.714	0.005	0.223	0.0098
T3	0.900	0.007	0.081	0.0137
T4	0.618	0.002	0.127	0.0039
Manurial sources	Final Stage*			
	Dry weight (g)	S.Ex	Difference from Control	LSD at 5%
To	0.52	0.006	-	0.0118
T1	0.72	0.017	0.201	0.0333
T2	0.80	0.011	0.287	0.0215
T3	0.47	0.007	-	0.0159
T4	0.81	0.012	0.293	0.0236

Conclusion

- **During the analysis of Dry weight the difference between control and different treatments included that all the given manurial treatments are highly significant in preflowering stage*, flowering stage*and Final stage* (Table 10).**

6. Discussion :

The peak rise of the chemical fertilizer cost and health hazards paved the path for alternative source of fertilizers in increasing crop production (Logakanthi *et al.*, 2006). Plants inoculated with PSO and *Rhizobium*sp along with Rockphosphate (T4) and T3 yielded the highest germination percentage of 74.8 and 72.6 respectively (Table 9). Inoculation with mixed format gave more number of nodule formation (T4-21numbers) followed by T3, T2 and T1 (Table 9). The minimum number of nodule formation observed in control. A similar result has been obtained in fresh weight and dry weight of nodules also. In this study, the RP+PSO enriched biodigested slurry gave better results next to T3 than non-enriched control pots (Table 4,5&6).Karumi, (2014) observed that application of P increased nitrogen fixation in legumes, presumably the root growth and nodulation.

Inoculation of PSO and Rhizobium with RP T4 significantly increased shoot length when compare to control (Table 4,5&6). The fresh and dry weight of the shoot and root increased with age of the plant and were maximum in T4 treatment (Table 6). This treatment was significantly different from other treatments. Application of RP with PSO increased the availability of P to the plants (Shankaralingappa *et al*.,2002) The same outcome have been reported by Plants inoculated with PSO and Rhizobium along with RP(Table 8).The uptake of nutrients varies accordingly to the variety, soil type, cultural practices followed, and nutrients applied (Metwally, 2018).

Nagarajan and Balachandar, (2001) experiment revealed that biodigested slurry obtained from biogas plant with *Rhizobium* inoculation recorded the maximum plant height, nodules number, and grain yield both in black gram and green gram crops respectively. In this analysis also, the organic manure got from biogas slurry and RP yield good morphological and biochemical observation in experimental plants (Table 4,5&6).

The seedling stage of soil analysis revealed that, the control field contained the lowest THBP ($19x10^6$±0.160 cfu/gm). The highest THBP, THFP and TPSMP were observed in the *R.phaseolus*+PSO+RP applied pots in the in the order ($100x10^6$±0.264cfu/gm) (Fig1), ($80x10^3$±0.637cfu/gm) Fig2) and ($158x10^3$±0.390cfu/gm) (Fig 3) respectively. The minimum load observed in control ($20x10^3$±0.415cfu/ml).The PSO was higher in the inoculated treatments than in no inoculated treatments during crop growth period (Fig 3). Application of PSO along with RP (T4) registered the highest population of organisms (Table 4,5&6).Treatment T3 showed the highest population of *Rhizobium* sp. The inoculated organisms multiplied in large numbers up to the final stage and started to decline at harvest phase.

Wissal Elhaissoufi *et al.*, (2022) revealed that the growth regulators stimulate the growth of the entire plant, as the indole acetic acid that stimulate plant growth by improving the growth of roots and leaves, and also participates in cell division and differentiation and formation of plant vascular system. Anthoniraj *et al*., (1994) reported that there was steep multiplication of inoculated PSO and *Rhizobium* up to final stage and decline during harvest time.

7. Conclusion :

- Due to enormous rise in the cost of chemical fertilizers and health hazards has made to think of alternative source of fertilizers in increasing crop production
- High seed P concentration is consistently promote early plant growth and increase final yield.
- In order to fulfill the theme of action 'Lab to land" process, the biodigested slurry produced after biogas production were applied with and without the enrichment of RP and PSO to the leguminous plant.

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DATA AVAILABILITY

All datasets and statistical report analyses during this study are included in the manuscript.

ETHICS STATEMENT

This article does not contain any studies with human participants or animals

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The future of Agriculture production with the application of Biotechnology

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Abstract: Using methods like genetic engineering, molecular diagnostics, tissue culture, and molecular markers, agricultural technology refers to the use of live organisms and systems in the development of products for human use.Agricultural biotechnology was practical as people have been trying for a long time identify agriculturally important organisms through breeding and animal husbandry. An example of traditional organic farming The technology is the development of disease resistant wheat varieties by crossing different types of wheat until the desired disease resistance was present in a result new variety.Agriculture uses biotechnology extensively to disseminate beneficial traits and boost productivity.this is frequently accomplished by selective breeding, a technique that involves changing an organism's genetics.Whether or not biotechnology in agriculture has a negative impact on human health and the environment, it encourages the growth of crops and animals, reduces the use of pesticides, and increases the nutritional content of products.

Key words: Agriculture, Biotechnology, CRISPR-Cas9.

1. INTRODUCTION :

Traditional biotechnology has been abandoned and replaced by genetic splicing. With genetic splicing, biotechnology in agricultural production is on the agenda. this is often the use of scientific techniques to alter and improve plants, animals and microorganisms to increase their value. Advances in biology were achieved in the 1970s. This gave scientists the flexibility to control DNA, the chemical building blocks that specify the characteristics of living organisms at the molecular level. It also allows for the transfer of DNA between organisms that are more distant than has been possible with traditional breeding technology.

Today, this technology has reached a stage where scientists can target one or more specific genes from almost any organism, including plants, animals, bacteria and viruses, and introduce those genes into another organism. This technology is called biotechnology and therefore the organisms are called genetically modified or transgenic organisms. Transgenic organisms offer a number of benefits beyond humans that have emerged from innovations in traditional agricultural biotechnology. Below are some examples of the benefits of applying the recombinant DNA technology techniques currently available to agricultural biotechnology. When gene splicing reduces dependence on pesticides, we have fewer pesticide residues on food, reduce pesticide leaching into groundwater, and minimize exposure to hazardous products.

However, as mentioned above, there are potential environmental risks associated with this type of technology. Some consumers and environmentalists believe that insufficient efforts have been made to understand the dangers of using GM crops, including the potential long-term consequences. Some opponents of biotechnology believe that transgenic crops can cause cross-pollination with related

weeds, potentially leading to more difficult "super weeds" to control. One concern is that transferring pollen from glyphosate-resistant crops to related weeds may cause glyphosate resistance. Although the perspective of this, although it is extremely small, it is not unimaginable that resistance to a selected herbicide does not mean that the system is immune to other herbicides, so that the affected weeds can always be checked with other products.

Some environmentalists maintain that when transgenic crops are released into the environment, they might have unforeseen and undesirable effects. Although transgenic crops are rigorously tested before being made commercially available, not every potential impact is foreseen. Bt corn, as an example, produces a awfully specific pesticide intended to kill only pests that go after the corn. In 1999, however, researchers at university found that pollen from Bt corn could kill caterpillars of the harmless monarch. once they fed Monarch caterpillars milkweed dusted with Bt corn pollen within the laboratory, half the larvae died. But follow-up field studies showed that under real-life conditions milkweed butterfly caterpillars are highly unlikely to return into contact with pollen from Bt corn that has drifted onto milkweed leaves—or to eat enough of it to harm them.

2. MULTI-OMICS TECHNOLOGY

In plants, functional genomics has identified several genes that control responses to abiotic and biotic stresses .Some genes have been modified to develop resistance to stresses (biotic and abiotic) in cultivated plants.Many new candidate genes have been discovered from the relative genomics of wild plants for stress tolerance (abiotic and biotic) in cultivated plants .For example, a complete sequence map of the high-density buckwheat genome, sequence data available online from the Hi-C and fosmid DNA libraries .A protein interaction was found.

The results highlighted the different expression of Cshdz genes against salinity, drought, high and low temperatures and the association between Cshdz genes and resistant plants. In Solanum americanum, integrated RenSeq and genetic mapping were used to locate the genetic locus that confers resistance to Phytophthora.In wheat, MutRenSeq, a new version of RenSeq, has been used to isolate R genes that confer resistance to stem rust.Whole genome analysis with ChIP-seq identified 21 ABA-associated TFs and their extensive regulatory network Furthermore, a new family of TFs functionally involved in saline reactions and ABA has been identified in Arabidopsis.

Genotyping by sequencing (GBS) is a recently discovered genomic technology to study the genetic diversity of plants at the whole genome level. An F2 population of Brassica olearacea was used to develop a high-density genetic map comprising 879.9 cM genotyped from 4103 single nucleotide polymorphisms (SNPs).

3. TRANSCRIPTOMICS

RNA profiling — realized lately using microarrays, organic miracle, digital profiling, RNA sequencing, and periodical analysis of organic miracle(29) — can identify multiple stress resistance- related seeker genes, inferring applicable gene functions. The available online databases give whole genome-wide transcriptomics data for factory stress responses(,31). In Arabidopsis, transcriptomic analysis under failure and warmth stress linked nearly 770 unchanged reiterations with 53 different specific proteins(32). These findings were verified in sunflower(33). likewise, combined heat and failure upregulated stress cytosolic ascorbate peroxidase1(APX1)(34).

In chickpea, periodical analysis of organic miracle(savant) and coming- generation sequencing(NGS) approaches were used to dissect the overall transcriptome of failure- and swab- stressed shops(,34). also, the subtractive cDNA repression hybridization system was employed in stressed-out chickpea shops(35). A relative microarray approach handed information on functional genes and pathways

crosstalk in multiple stress transcriptomic studies in cotton(36). In sludge, RNA sequencing was performed to know the adverse goods of cold, failure, swab stress, and warmth stress(37).

Li etal. proved differentially expressed genes related to signaling pathways, recap, and metabolism(38). RNA gel spot and microarray combined approaches vindicated that DREB2A, a recap factor, controls the expression position of failure and cold wave stress genes(38). periodical analysis of organic miracle(savant) has been used considerably in shops to check gene- related responses against stresses. as an illustration, in rice, from 5921 expressed genes, nearly,122 markers were anatomized. Of,519 markers by global organic miracle,,131 markers were kind of like distinctive reiterations(39). the mixing of RNA- seq and bulked segregant analysis, called BSR- seq, has the installation to support stress resistance in shops. as an illustration, Bra019409 and Bra019410 were possible seeker genes for clubroot resistance in white turnip(,41). RNA- seq- intermediated organic miracle analysis could accelerate factory parentage by garnering knowledge on host- P relations and relating stress- related genes.

4. PROTEOMICS

The qualitative and quantitative study of total proteins expressed in a cell, tissue or organism is known as proteomics.In the context of stress tolerance in plants, complete proteomes are studied; however, numerous studies have examined the cell wall proteome, organellar proteome, proteogenome, nuclear proteome and phosphoproteome .

Recently, various forms of mass spectrometry have been used to profile the proteome in response to abiotic stress.Mass spectrometry for proteomics provides comprehensive information about the proteome when used in plant stress responses and genome-wide studies. Proteome profiles can be compared to identify the function of certain proteins in biotically and abiotically induced stress signaling and differentially expressed stress resistant proteins. In addition, phosphorylation group proteins play an important role in abiotic stress.A study of a proteomic matrix in water-stressed rice identified signaling proteins and reactive oxygen species.

Various studies have used proteomics to highlight heavy metal stress in Brassica juncea,Glycine max,Linum usitatissimum and Arabidopsis thaliana.Heidarvand and Maali-Amiri (2013) extensively studied the proteomic profile of chickpeas exposed to cold stress.The phosphoproteome of wheat leaves has also been studied.Several isoforms of S-adenosylmethionine in soybeans during floods and droughts have been identified.In tomato, nuclear signaling proteins with crosstalk chloroplast proteins have been reported in drought-stressed plants.Another study used tandem MS and two-dimensional gel electrophoresis (2-DE) approaches in wet barley diets to reveal the proteomic profile.In Eriobotrya japonica, RNA-seq with isobaric tags relative absolute quantification (iTRAQ) has been used to understand the mechanism of cold tolerance.

The results showed 1210 differentially expressed genes (DEGs) and 300 differentially expressed proteins (DEPs); out of 3620 genes, only 27 shared both DEPs and DEGs. The Kyoto Encyclopedia of Genes and Genomes (KEGG) analysis predicted that secondary metabolite biosynthesis and metabolic pathways are common. Real-time validation of quantitative reverse transcription polymerase chain reaction (qRT-PCR) showed that gene expression of phenylalanine ammonia lyase, anthocyanin synthase, and NADP-D-sorbitol-6- phosphate dehydrogenase was consistent with the transcriptome profile. Lou et al. proposed that these three genes play an important role in cold tolerance.

Proteomics is a new technology to identify proteins and signaling pathways involved in plant stress response and plant physiology. Additionally, proteomics improves the understanding of stress-related proteins, which are applied in molecular biology to improve crops.

Thanks to its remarkable success, CRISPR-Cas9 becomes a potential tool to genetically improve desired crop traits, namely disease resistance, nutrient content, adaptation to multiple stresses, architecture and plant yield. In some cases, a specific trait can be potentiated by a negative regulatory gene knockout.

Rice grain weight improved with genetic modification of some QTLs.The yield of maize kernels during drought increased with genome engineering of the ARGOS8 locus.In woody plants, CRISPR-Cas9 produced mutants in the first transgenic generation; this is important because the breeding of woody plants is difficult due to their long lifespan.Another study knocked out the OsGAN1 gene in rice and confirmed that it regulates root length and plant height.Similarly, knockout of the OsABCG26 gene confirmed that this gene regulates pollen exines and anther cuticles, and OsTCD10 played an essential role in cold-stressed rice chloroplasts summarizes the principles of CRISPR-Cas9.

5. CRISPR-CAS9 GENOME ENGINEERING FOR BIOTIC STRESS TOLERANCE

CRISPR-Cas9 genome editing has been successfully applied to several crops, including cotton, corn, rice, and wheat. However, most genome engineering studies target biotic stress such as disease. In wheat, the CRISPR-Cas9 method has been successfully used to eliminate the three homologs of EDR1 to generate plants (Taedr1) with increased tolerance to powdery mildew.

In Arabidopsis, inactivation of the sensitive EDR1 gene increased resistance to powdery mildew.Recessive resistance genes, eIF (eukaryotic translation initiation factor), have been detected in several different hosts, using eIF(iso)4E and eIF4E genes with CRISPR-Cas9 to generate virus-resistant plants in Arabidopsis and cucumber, respectively.CsLOB1 is a susceptible gene for citrus canker (pathogen; Xanthomonascitri);CRISPR-Cas9 has been used to edit this gene to develop resistant grapefruit plants.Moreover, an MLO gene with negative resistance function responsible for powdery mildew susceptibility was successfully mutated by Cas9 knockouts to improve powdery mildew resistance of tomato and wheat.

The use of CRISPR-Cas9 as an antivirus program has split the severe hedgehog virus, reducing viral infection.Rice globular tungro virus (RTSV), linked to the negatively controlled susceptible eIF4G gene, was eliminated using CRISPR-Cas9 to develop resistant rice varieties. Since CRISPR-Cas9, the loss of VWWRKY52 gene function has caused resistance to Botrytis cinerea in grapes (Vitis vinifera). Furthermore, CRISPR-Cas9 has been used to destroy multiple virus genomes, including CLCuK0V, TYLCSV and TYLCV. For cucumber mosaic virus and tobacco mosaic virus, a technology has been developed to modify the RNA virus genomes of sgRNA and FnCas9.

Therefore, molecular immunity against RNA viruses was mediated by sgRNA/FnCas9 expression in Arabidopsis and tobacco. CRISPR-Cas9 successfully targeted OsERF922 against resistance to the resistant fungus in rice. Ethylene-responsive plant factors (ERFs) can control tolerance to various stresses because they are involved in the ethylene (cytokinin) pathway.

Taken together, these reports provide strong evidence that CRISPR-Cas9 can improve resistance to biotic stress in plants. summarizes omics and CRISPR-Cas9 strategies for the production of stress-tolerant cultures.

6. CRISPR-CAS9 GENOME ENGINEERING TO ABIOTIC STRESS TOLERANCE

Abiotic stress tolerance mediated by different genes is a complex trait. Major interactions and interactions exist between components of the metabolic, regulatory and signaling pathways. CRISPR-Cas9-mediated genome editing can be used to alter almost any sequence (based on accessibility to the adant protospacer motif, the PAM site) to reveal its function in the genome.

Molecular breeders have discovered many T genes resistant to abiotic stress and have engineered them in crops. Mutants of the CRISPR-Cas9-generated mitogen-activated protein kinases3 (slmapk3) gene enhanced the defensive response to drought in tomato (Solanum lycopersicum).CRISPR-Cas9 was used to generate mutants in rice to understand the mechanism of protein kinase2 activated by stress ABA. In Arabidopsis under cold stress, CRISPR-Cas9 was used to generate mutants (double and triple mutant cbfs) to determine the role of C-repeat binding factors. In maize, the CRISPR-Cas9 approach was used to increase the expression level of the ARGOS8 gene (negatively regulate the ethylene response) to develop drought tolerance; the promoter of ARGOS8 changed to GOS2.

These mutants had improved grain yield under drought conditions in the field. Furthermore, overexpression of TaCP and SPCP2 increased drought tolerance in ArabidopsisPlants overexpressing melatonin biosynthetic genes have been identified as tolerant to abiotic stress.In hybrid rice, targeted editing of the TMS5 gene led to the rapid formation of temperature-sensitive lines.

Plant breeding activities may have reduced T gene alleles after selection for yield-related genes during domestication programs. Breeders have developed stress-tolerant plants with information about gene function. The examples above demonstrate that CRISPR-Cas9 can modify/knock out genes to confer resistance to a variety of abiotic strains, e.g. B. salinity, drought, temperature extremes, heavy metals and nutrient deficiencies.

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Exploring an Opportunities of IT for Skill Development with Reference to NEP 2020

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Abstract: The Ministry of Human Resource Development (Education) has approved the National Education Policy (NEP) 2020. NEP has given special focus on skill-based education for the students to improve the quality of education and which helps to meet the needs of the industries. This policy recognizes only academic knowledge is not sufficient for the success of students, therefore, it integrates the multiple skills such as communication, critical thinking, problem solving and digital literacy into the curriculum. These skills are helpful to students for getting the jobs in job markets. Today, technology becomes the important part in value-aided education. Information Technology is useful to enhance the academic knowledge as well as any other skill-based knowledge of the students. Skill encompasses imparting students' practical skills and industry-oriented knowledge. Today technology has integrated many skill sets. E-learning plays vital role in education nowadays. Most of the schools, colleges and educational institute prefer e-learning and online assessment by using the various IT tools. This research paper is mainly focused on how the technology and IT supported tool sets are helpful for students to gain and improve their skill-based knowledge.

Key Words: National Education Policy 2020, Information Technology, Skill Development, IT tool sets.

1. INTRODUCTION:

National Education Policy 2020 emphasizes on academia as well as skill development of the students. This policy recognizes that only academic knowledge is not sufficient for employability of students. Their skill development through the various aspect is needed in nowadays to survive and to get the jobs in job market. Many colleges collaborate with industries for the industrial training to enhance the knowledge of current technology of the students. Academic knowledge can be acquired by the traditional way such as offline classes in colleges. In the traditional education system, there is not much emphasis on skill development and even if it is given, the students get only as much education as they get from colleges. The disadvantages may be that teachers at colleges should give as much knowledge as they have. It may be that some teachers may not have the knowledge of new technology and others, if they do, may not have been given proper training of it. Nowadays technology plays vital role in academic education as well as skill development. Keeping this in mind, the Ministry of HRD has focused on online education and vocational education in NEP 2020.

2. Literature Survey:

Government of India designed a digital program named "SWAYAM". It has multiple online courses which is taken by trained teachers. According to Press Information Bureo, Ministry of

skill development and Entrepreneurship (MSDE) has developed over 300 new age courses specifically tailored to meet the needs of industry. These courses are available on internet. Student can use multiple ICT tools, such as laptop, Desktop Computer, Mobile Phones, Tablets to watch the video and learn many more things from these courses. Many colleges have the Projectors and Smart Boards. With the help of internet connectivity and new technology student learn the academic knowledge. Some colleges are using ICT tools for academic education. But since there is not much emphasis on skill development and it is not yet included in the syllabus, the ICT tools are not used as much. NEP has defined the criteria for education is such that 60% academia and 40% online education. This policy has given special focused on vocational education. Student can acquire his/her 40% knowledge and accredited credits from these online courses. This technology is integral to many skill sets, it is necessary to leverage IT for skill development. IT could play a major role in developing various tools and technologies for skill development. Indian Ministry of Skill Development and Entrepreneurship launched Pradhan Mantri Kaushal Vikas Yojana (PMKYC) in 2015 to certify the youth with industry-based skill training. According to Hindu Business Line 33.93 lakh candidates trained and 10.09 lakh people get the jobs under this yojana. Shri Dharmendra Pradhan, Union Minister for Education and Skill Development and Entrepreneurship, launched Skill India Digital. It is specially developed and designed to skill, reskill and upskill through an online training platform. According to Deccan Herald this scheme provides more than 264 skilling online courses from 42,623 centres across the country.

3. Methodology:

The methodology for this paper is conceptual discussion on highlighting the points on NEP Skill Development and technology. Colleges can run different IT courses such as Digital Marketing, Basic Computing, Courses about GST. Colleges can collaborate with industries for the industrial training to enhance the current technology knowledge of the students. It can be done through online sessions, workshops, seminar, or any small duration program/course by industrial experts. It is not possible that these experts always come in the college and take a lecture. For that purpose, video conferencing can be used. Colleges should prepare that much capacity of IT infrastructure to gain the knowledge for individual students.

4. Findings :

Some of the following can be used for skill development.

- E-Content: Teachers should be preparing e-content video of respected subject. These e-contents can be publish using You tube or any other application program. Students understand the topic with the help of e-content.

- Video Conferencing: To develop the skills, based on the new technology and industry-oriented knowledge of the students, college should arrange the guest lecture of industry expert. It is not possible that every time expert come to college and take a lecture. For that purpose, using computer and ICT Projector, guest lecture can be done through video conferencing.

- ICT Labs for Practice: Colleges should prepare that much capacity of ICT labs for doing the practical for individual students. The ICT labs should be installed with all software which is needed to gain the industry-oriented knowledge for students.

- Online short-term courses/seminars/programmes: Colleges should be run some online short-term courses for student of any stream. Colleges should be arranging some seminars or some workshops for the students. New technology should be taught through these courses, and it should be done by respected experts.

Following table shows colleges should have what changes to be done and what actions to be done.

	What Changes to be done	**What actions to be done**
1	Promoting online and open vocational education	Introducing a new learning methods and digital tools, like Massive Open Online Courses (MOOCs) to students
2	Trained teachers with new technology	Encouraging and training teachers to learn new technologies
3	Build IT infrastructure	Providing ICT labs and IT infrastructure for the development of students

5. Conclusion:

Technology plays vital role over the world nowadays. Skill development of the student is very important aspect of student's overall development. IT factor is a very important in technology. Throughout the entire study, the primary focus was to discuss on IT skill development of the student. However, IT skill development is unlike academic education, but it will be beneficial for students' growth. It started basically with how the IT is helpful for value added and vocational education. Then I examined what are the IT tools are needed to gain the knowledge of current technology for the students. Many of the colleges are not have trained teachers with new technology. I recommend that, both the teachers and students in colleges who want to implement NEP, need to make efforts. Both should be aware of the current new technology so that it can benefit the student's development. Colleges also need to build and enhance IT infrastructure for NEP 2020 implementation.

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Emotion Recognition from Bodo Speech Using Deep Learning

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Abstract: Speech is the primary means of communication containing complex information about verbal messages, speakers, language emotions, and more. Emotion is an internal and(or) external action or reaction of the feeling or perception of a speaker about some content or context. It plays a vital role in decision-making on certain points or topics. Speech emotion recognition (SER) is a system that extracts information from speech and automatically recognizes associated emotions with a speech. In this rapidly advancing AI world, applications of SER in marketing, healthcare, customer satisfaction, gaming experience improvement, social media analysis, stress monitoring, and much more are widely innovative and useful experiences. In this study, we propose to model speech-emotion recognition using the Bodo language considering six emotions namely neutral, happy, sadness, angry, fear and surprise. For this purpose, spectral features: MFCC, Chroma, and mel-spectrogram are used. The classification was realized with deep learning, the Convolutional Neural Networks (CNN). Experimental results show that the performance accuracy of the designed model is 80.71%.

Keywords: Emotion Recognition, Bodo Speech, Spectral Features, Deep Learning, CNN.

1. INTRODUCTION :

Speech emotion recognition is an automated system that extracts the information contained in a speech and identifies the present state of the speaker which can be known as emotion. It is nothing but a human-machine interaction system that involves the application of current machine learning and neural network tools. Human-machine interaction is becoming more common like in humans and hence speech emotion recognition (SER) is getting immersed into the research area. However, it is a very challenging task since emotion is a very complex and subjective information of speech. Emotion may vary from person to person in the same context because it depends upon context, culture, society, the place of individuals that belong to, and how the speaker thinks and perceives or interprets a particular context. Emotions are motivational and informational, primarily by virtue of their experiential or feeling component. Emotional feelings constitute the primary motivational component of mental operations and overt behavior [1]. These are intense feelings that are directed at someone or something[2]. Basic emotions

and feelings help organize and motivate rapid (and often more-or-less automatic though malleable) actions that are critical for adaptive responses to immediate challenges to survival or well-being[1].

In the future of this rapidly advancing AI world, SER is going to be a key technology in the development of innovative devices or machines like Human-Computer Interaction (HCI), Human-Machine Interaction (HMI), Human-Robot Interaction (HRI) systems[3], and affective computing[4] which are now becoming extremely important in the upcoming era of the Internet of Things (IoT). We live now in a world where Google Assistant, Siri and Alexa are physically closer to us than other humans. The world is getting more populated with physical and virtual service robots or blended services to accomplish tasks that range from caring for the elderly to assessing the effectiveness of marketing or business campaigns. SER is mostly beneficial for applications, that need human-computer interaction such as speech synthesis, customer service, education, E-learning field, cardboard systems, call service centers, forensics, and medical analysis[5,6,7,8]. For different perspectives and different human relationships like education (teaching and learning), commercial or business (customer and services), patient and doctors (treatment services) etc. understanding human emotions paves the way to understanding people's needs better and, ultimately, providing better service. Therefore, in this article, we are going to build an AI model that can predict the emotion of the speaker by analysing the recorded audio clip of the speaker's voice in the Bodo language. In this area of research on the Bodo language it has been put just one step foot, this is the motivation of developing this study so that this study can help researchers for further study and help local people in different services in the future. The rest of the paper is organized as follows; Section 2 describes the literature review Section 3 illustrates the database, methods and techniques used for feature extraction and classification and Section 4 presents experimental results respectively. Section 5 gives a conclusion.

2. LITERATURE REVIEW :

Researchers have developed emotion recognition in various languages using various approaches. Qin. Jin et al. proposed a model of emotion recognition by merging acoustic and lexical features and training those features with a Support Vector Machine (SVM)classifier to recognize their emotion[9]. W. Jiang et al.[10] proposed a deep neural network for feature extraction from heterogeneous acoustic features, a fusion network for training the model and SVM for the classification of emotion using the Interactive Emotional Dyadic Motion Capture Database (IEMOCAP). They achieved an accuracy of 64%. H.S. Khumbhar et al.[11] proposed emotion recognition using the RAVDESS dataset, MFCC feature and Long-Short Term Memory (LSTM) for classification and achieved a performance accuracy of 80.81%. Rahul B. et al. used the Berlin Emotional Database (Emo_DB) and GMM and K-NN for classification. They reported that the accuracy for angry and happy emotions is 92% and 90% respectively[12]. M. Swain et al. developed an SEM in multilingual (Odisha, Sambalpuri and Kuttacki), using HMM and SVM got an accuracy of 78.81% and 82.14% using HMM and SVM respectively[13]. In the studies[14,15,16,17], the authors used various deep learning techniques in different approaches for their proposed model and they reported different results. Nakisa B.et al. [14] reported that still it is need to investigate other deep learning for evaluation of their performance. Jain U. et al. proposed the feature extraction technique Pitch, energy, formant, MFCC, LPCC with SVM for classification and achieved an accuracy of 98.75% in male utterances and 95% in female utterances[18]. Kandali A. et al. proposed an emotion recognition model in two steps (i)text-independent but speaker-dependent and (ii) text-independent and speaker-independent using MFCC feature extraction and GMM[19]. Kaushik R.et al.[20] used the MFCC-delta feature and Recurrent Neural Network (RNN) and Distributed Time Delay Neural Network (DTNN) and reported that RNN gives better accuracy than DTNN.

3. DATASET AND METHODS :

(A) ***Dataset***

This paper introduces a self-built dataset, the Bodo emotional corpus saved as BS_EmoDB. The dataset contains a total of 3960 [15(no. of sentences) x 2(repeated) x 6(no. of emotion) x 22(no. of the speaker)]

utterance files of .wav format from 15 Bodo emotional sentences from 22 persons, 10 male, and 12 female, covering six primary emotions, namely neutral, happy, sadness, anger, fear, and surprise. Each utterance corresponds to one emotion. Each person has 180 utterances, i.e., 30 utterances for each emotion repeating each sentence twice. The limited age of the speaker is between 15 to 50 years with minimum matriculation are asked to act emotions conducting like interview session delivering them certain situations/conditions or environments verbally relevant to the text. Each utterance was recorded at a sampling rate of 44100 kHz and mono channel through open-source software Audacity and condenser microphone SF-666. After recording audio files are pre-processed. The distribution of the dataset for available emotions is represented in the graph (Fig1). For each class of emotions, there are 660 counts containing a total of 3960. Figure 1 depicts the distribution of emotional speech into six emotional states.

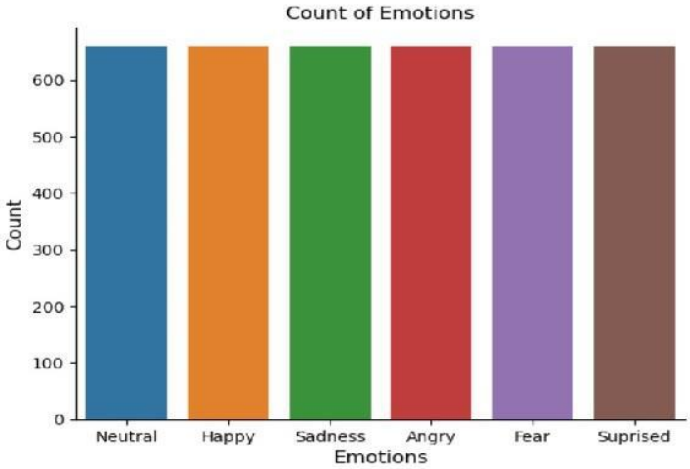

Fig1: Distribution of emotional speech into six emotional states

B. Feature Extractions

For the proposed study, three spectral features namely FMCC, Chroma and mel-spectrogram are considered. Extraction of each feature is implemented with Librosa in Python. Extraction techniques for each feature are described as follows-

(i) *MFCC (Mel-Frequency Cepstral Coefficients)*

MFCCs are particularly useful because they emphasize features of the audio signal that are important

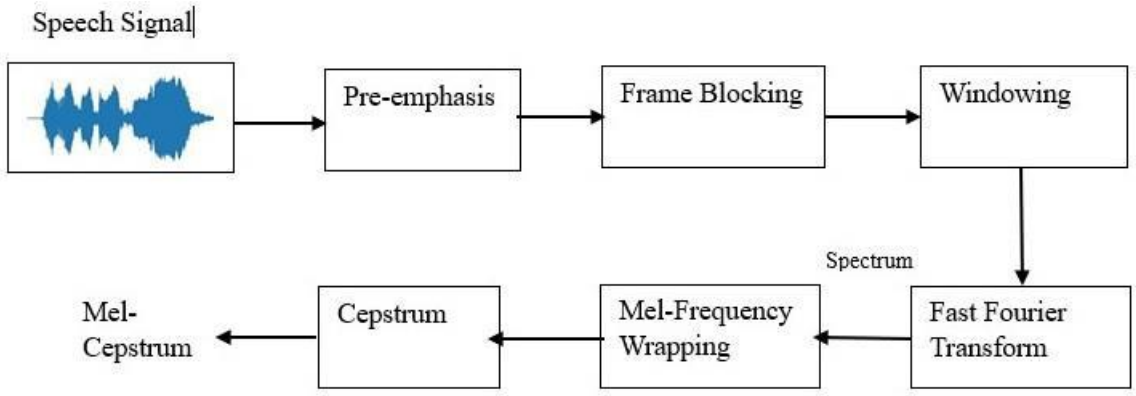

Fig.2 Flowchart for obtaining MFCC coefficients

for human speech perception while discarding less relevant information. This makes them effective for tasks like speaker recognition, emotion detection, and speech-to-text conversion. Figure 2 is the

flowchart of MFCC extraction used in this study.MFCCs are derived by mapping the Fourier transformed signal onto the male scale using triangle or cosine overlapping windows. After taking the logs of the powers at each of the Mel frequencies the discrete cosine transform of the Mel log powers results in the amplitude of a spectrum.A total 40 numbers of MFCCs are determined.Figure 3 is a display of the extracted MFCC feature of "आं आन्जादाव उथ्रिबाय (I have passed the exam)" in happy emotion.

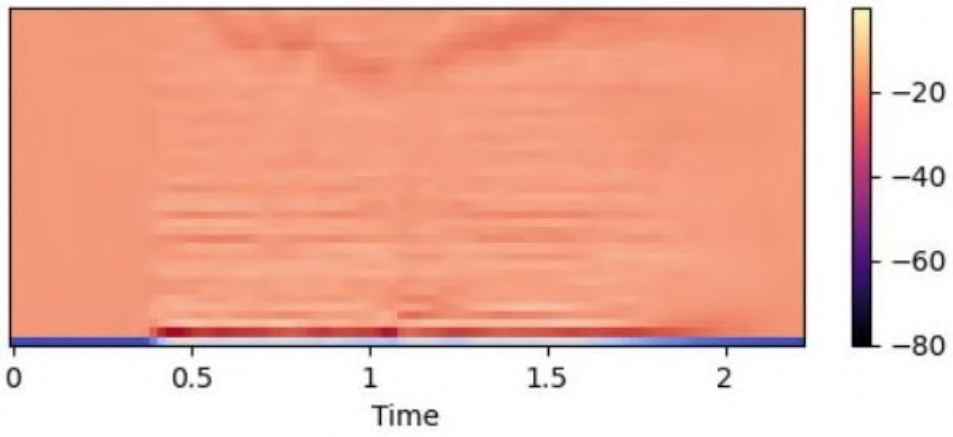

Fig.3 MFCC Feature

(i) Chroma

The **chroma feature or chromagram** is typically a 12-bin feature vector. It represents energy distribution across each pitch class representing the 12 distinct semitones (or chroma). The chromagram is obtained

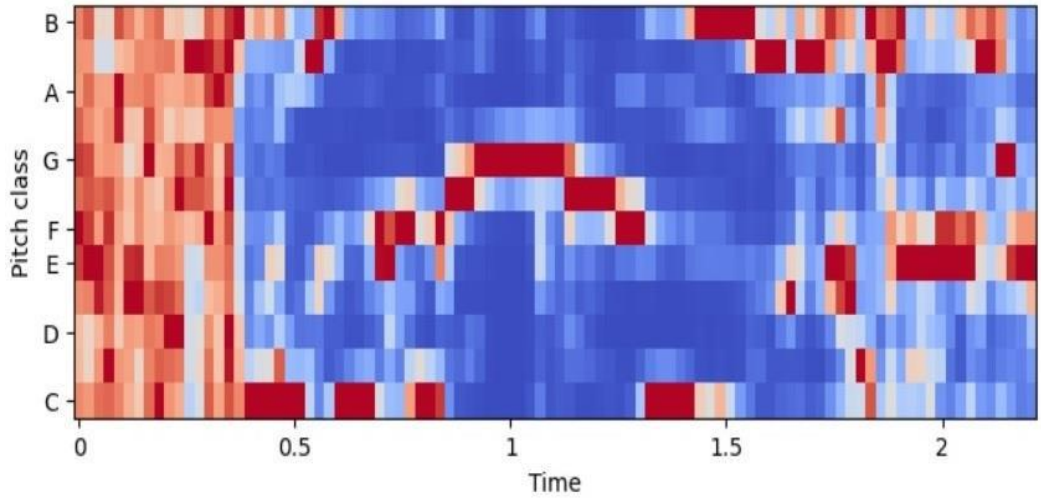

Fig.4 Chroma Feature

by taking the STFT of the audio signal, mapping the frequency content onto the closest pitch class, and summing the energy (log frequency magnitude spectrum) within each pitch class across time. Figure 4 depicts the extracted chroma feature of "आं आन्जादाव उथ्रिबाय" in happy emotion.

(ii) Mel-spectrogram

A spectrogram is a visual representation of the signal strength, or "loudness", of a signal over time at

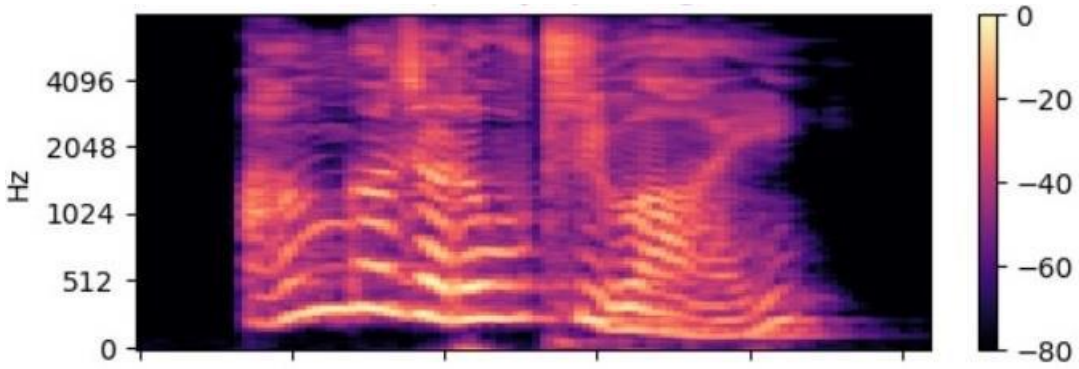

Fig 5 Mel-Spectrogram

various frequencies present in a particular waveform shown by varying the color or brightness. Mel scale is the scale of pitches that can be heard by a listener to be equal in distance from one another. The Mel-spectrogram is generated by converting frequencies into the Mel scale using the Fourier transform. STFT determines the amplitude of various frequencies playing at a given time of an audio signal. Conversion from frequency (f) to mel scale (m) is given by $m=2595 \cdot \log(1+f500)$. Figure 5 is the derived graphical output of the mel-spectrogram of the audio "आं आन्जादाव उथ्रिबाय" in happy emotion.

C. Classification Method

For the classification of emotions, a deep learning method with Convolutional Neural Network (CNN) is used in this proposed study. CNN is a systematic neural network that consists of various layers sequentially. Generally, the CNN model consists of various convolution layers, pooling layers, fully connected layers, and a SoftMax unit or categorical. This proposed model consists of 4 convolutions with Relu activation function with each, 4 max pooling, 2 fully connected and 1 SoftMax layer in sequential form. For feature learning, convolution and pooling are used whereas for the classification process fully connected and SoftMax are used. This sequential network forms a feature extraction pipeline modeling the input in the form of an abstract. The basis of CNN is convolutional layers, which constitute filters. These layers perform a convolutional operation and pass the output to the pooling layer. The main goal of the pooling layer is to reduce the resolution of the output of convolutional layers, reducing the computational load. The resulting outcome is fed to a fully connected layer, where the data is flattened and is finally classified by the SoftMax unit, which extends the idea of a multiclass environment.

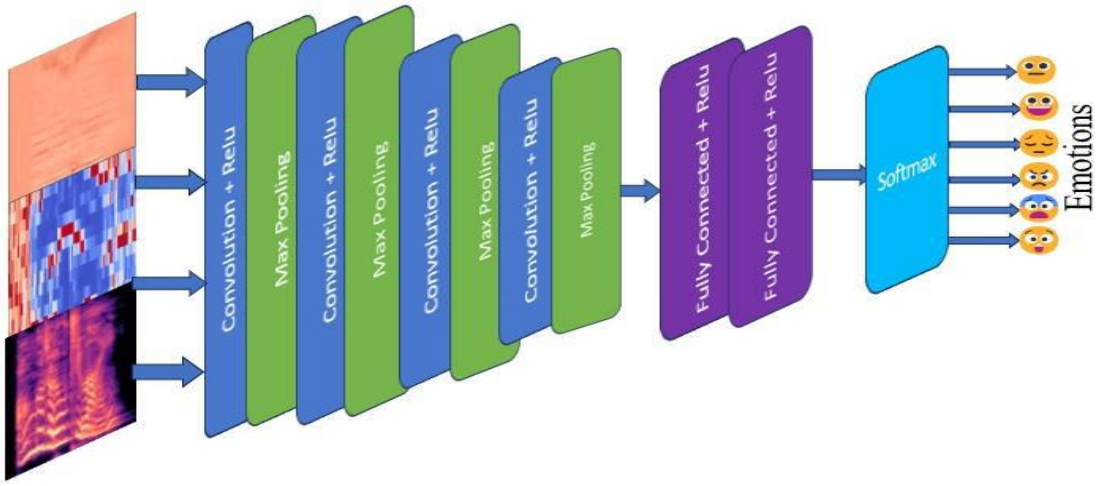

Fig.6 Deep Learning Model Architecture with CNN for SER

4. EXPERIMENTAL RESULTS AND DISCUSSION

For the experimental setup, we used the BS_EmoDB aforementioned in section 3. A. The dataset is split into 80% and 20% into training and testing sets, respectively. In the model, feature learning with CNN and max pooling returned a total of 341,670 feature parameters. In the first two convolution networks, 256 parameters were fed in both and in the other two convolution networks, 128 and 64 parameters were fed sequentially. The model was trained by giving 60 epochs with a batch size of 64. It is found that the learning rate is average. The proposed model achieved an overall accuracy of 80.71%. It shows the model is very good. Figure 7.(a) shows the graph of loss vs epoch under the training and testing dataset. It shows that loss decreases as the epoch increases whereas the loss under the testing set goes on increasing as the number of epochs increases. Figure 7.(b) shows the accuracy vs. epoch graph under the training and testing dataset. It shows that the accuracy of the training increases as the number of epochs increases and that of the testing set increases up to 20 epochs, after 20 epochs it became flattened. Figure 8 shows the confusion matrix of the model representing a class-wise distribution of the predictive performance of an emotion classification model mapping the predictions to the actual classes.

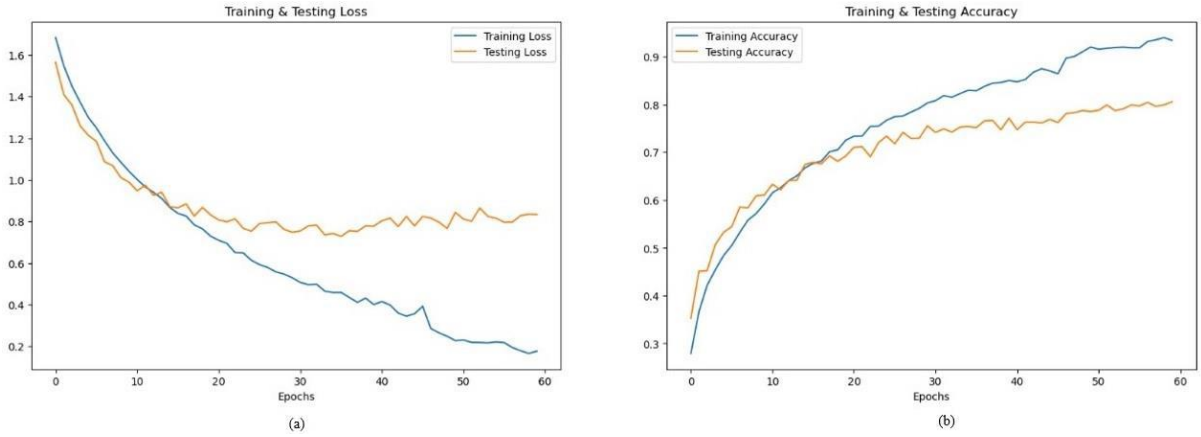

Fig.7 Model Performance Graph with Training and Testing Accuracy and Loss

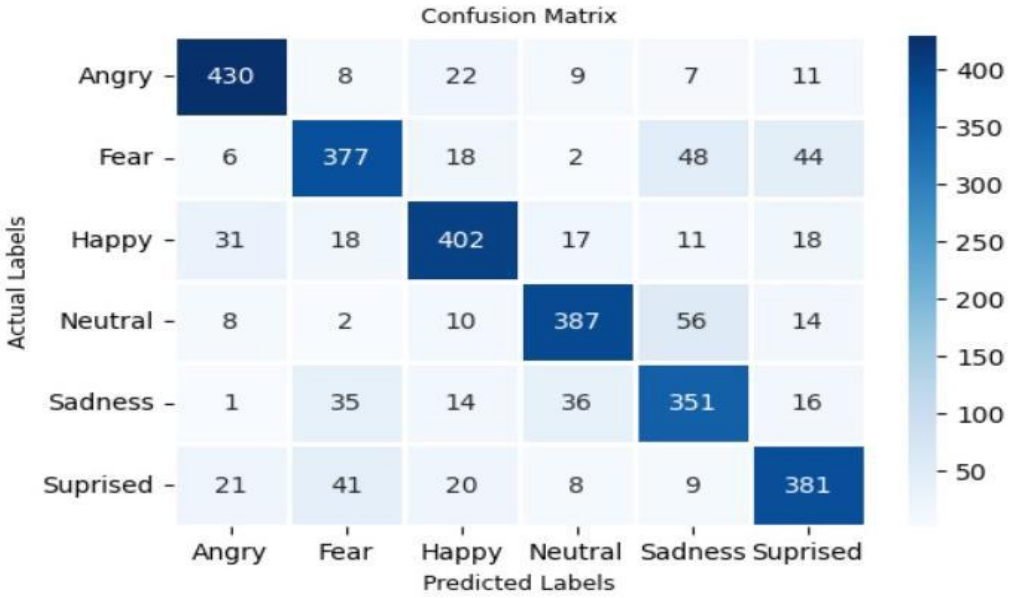

Fig.8 Confusion Matrix of the proposed SER

Table 1: Summary of Classification Report of the model

	Precision	Recall	F1-score	Support
Angry	0.87	0.88	0.87	487
Fear	0.78	0.76	0.77	495
Happy	0.83	0.81	0.82	497
Neutral	0.84	0.81	0.83	477
Sadness	0.73	0.77	0.75	453
Surprised	0.79	0.79	0.79	480
Accuracy			0.81	2889
Macro average	0.81	0.81	0.81	2889
Weighted average	0.81	0.81	0.81	2889

From the figure (fig.8) it is seen that angry emotion achieved the highest correct prediction whereas sadness achieved the lowest correct prediction. Table 1 illustrates the details report of the model performance.

5. CONCLUSION :

Speech emotion recognition is one of the most important problems in the current research trends. Though it has numerous applications including those in, customer service, business, e-learning, etc; it is quite a challenging task The research in speech emotion recognition in various languages including Indian languages is still ongoing. To the best of our knowledge from our investigation, little work has been done in the Bodo language as compared to other Indian languages in speech processing. This paper provides 1 step advancement describing an effective method for emotion recognition from Bodo speech. The experimental result shows that sometimes fear emotion is predicted as surprised and surprised emotion as happy and vice versa. Also, it is seen that sometimes neutral emotion is understood as sadness.

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Examination and identification of antimicrobial activities of *Syzygium cumini* extract

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Abstract: Plants have been used as a source of medicines for chronic and infectious disorders since time immemorial. In present time, herbal medicines are so important because of the side effects of synthetic pharmaceutical products and the safety, efficiency and promising potential of plant derived medicine. Researchers are focused on screening methods used for identification of potential antimicrobial plants. In this study diffusion methods as qualitative technique give an idea of the presence or absence of substances of antimicrobial activity in plant extracts. The dilution methods are considered quantitative assays once they determine the minimal inhibitory concentration. The chemo-preventive role present in consumable fruits, vegetables and beverages so it is essential to discover and characterize antioxidants from natural origin. Three following plant extracts has been used for the assessment of antioxidant potential based on DPPH free radical scavenging method. Natural antimicrobial compounds are secondary metabolites that can be found in plants, animals, and microorganisms. Plants, especially herbs and spices, are been given more attention in natural antimicrobial research. Microorganisms that have been used in food fermentation also produce different antimicrobial metabolites including organic acids, hydrogen peroxide, ethanol, and diacetyl in addition to bacteriocins.

Key Words: *Syzygium cumini,* Antibacterial, Antifungal.

1. INTRODUCTION :

S.cumini is a large, evergreen and densley foliaceous tree with greyish-brown thick bark, exfoliating in woody scales. The leaves are leathery, oblong-ovate to elliptic or obovate-elliptic with 6 to 12 centimeters long (extremely variable in shape, smooth and shining with numerous nerves uniting within the margin), the tip being broad and less acuminate. The plant produces small purple plums, which have a very sweet flavor, turning slightly astringent on the edges of the pulp as the fruit becomes mature. The dark violet colored ripe fruits give the impression the fruit of the olive tree both in weight and shape and have an astringent taste. The fruit has a combination of sweet, mildly sour and astringent flavour and tends to color the tongue, purple.

Historically, plants have provided a source of inspiration for novel drug compounds, as plant derived medicines have made large contributions to human health and well-being. Their role is twofold in the development of new drugs: first: they may become the base for the development of a medicine, a natural blueprint for the development of new drugs, or; second: a phytomedicine to be used for the treatment of disease (Nelson R, 1982). Clinical microbiologists have two reasons to be interested in the topic of antimicrobial plant extracts. First, it is very likely that these phytochemicals will find their way into the arsenal of antimicrobial drugs prescribed by physicians; several are already being tested in humans. It is reported that, on average, two or three antibiotics derived from microorganisms are launched each year (Clark A M, 1996).

2. Material and Methods:

For present study, different extracts and compounds isolated from the *S. cumini* (Bark) were taken. Plant extracts showed significant antibacterial and antifungal activity. Thus it was planned to screen the antimicrobial activity of extracts and compounds isolated from *S.cumini* (Bark). The following extracts and compounds were taken for the screening of antimicrobial activity.

Gram –ve
Salmonella typhi.
Escherichia coli
Klebsialla pneumoniae
Pseudomonas aerginosa
Citrobactusfreundt
Aeromonas hydrophilia
Gram +ve
Staphylcoccusus aureus
Basillus subtilis
Listeria monocytogenes
Streptococcus pyogenes
Staphylcoccus faecalis
Corynebacterium hoffmanii
Fungi and yeast
Following fungi and yeast were taken for the screening:
Rhizopus nigricans
Candida krusei
Curvularialunata
Candida albicans
Aspergillus niger

The extracts and compounds were tested for antibacterial and antifungal activity using Muller Hinton Agar and Sabouraud Dextrose Agar (SDA) plates respectively. Zone of inhibition was measured to assess the antibacterial and antifungal activity. This method depends on the diffusion of various extracts from a cavity through the solidified agar layer in such a way that the growth of microorganism inhibited around cavity containing the extracts and compounds. Growth of microorganism was spreaded uniformly on the surface of Muller Hinton agar with a glass spreader. Wells of 4mm diameter were created with sterile test tube and filled with 200 µl of extracts and compounds using micropipette. After addition the plates were pre-incubated at room temperature to allow diffusion and then incubated at 37^0C for 24 hours. After incubation the diameter of zone of inhibition was measured in mm. The experiments were carried out in triplicate.

3. Results and Discussion:

Analysis of Antibacterial activity of various Extracts of *S.cumini* Bark

The results have shown that hexane extract showed poor activity against all the microorganisms. Whereas DCM extract gave significant zone of inhibition against *P. aureginosa*, *B. subtilis* and moderate with *S. typhimurium*. The ester extract gave significant zone of inhibition against *E. Coli*, *P. Aureginosa* and *S. typhimurium*. Ethanol and Methanol extract showed noticeable activity against *E. coli*, *B. subtilis*, *P. aureginosa* and *S. aureus*. The chloroform and acetone fractions showed lesser activity shown by the formation of smaller zone of inhibition against all the tested microbes.

The results were summarized in the table 4.1 and 4.2; chart 4.1 and 4.2

Analysis of Antifungal activity of various extracts of *S. cumini* Bark

All prepared extracts of *S.cumini* are recessive against *R.nigricans*.Hexane extract has showed poor activity against all fungal strains. DCM and ethyl acetate extracts has showed moderate activity against *C. albicans*whereas ethanol and methanol extracts has indicated significant activity against *C. albicans* and *A. niger.*

The results were summarized in the table 4.1 and 4.2; chart 4.1 and 4.2

Experimental:

The antimicrobial activity was screened by filter paper disc method (C D lee*et al.* 1996: Paris A *et al.* 1996).

Requirements(formula ingredients)	Muller-Hinten Agar(g/litre)
Beef, heart, infusion form	300
Casein acid hydrolysate	17.5
Starch	1.5
Agar	17.5
Distilled water Final pH(at 25 °C)7.3±0.2	1 Litre
Potato Dextrose agar	
Potato infusion form	200
Dextrose	20
Distilled water Final pH(at 25 °C)7.3±0.2	1 Liter
Nutrient Broth	
Peptone	5.0
Beef extract	3.0
Distilled water	1 Litre

Procedure

1) **Prepration of Inoculums:**
   Inoculums of bacteria were prepared in nutrient broth and fungi in Potato Dextrose Agar slant .They were inoculated and incubated for 48 hours in case of bacteria and 5 days in case of fungi.
2) **Preparation of Seeded agar plates:**
   The Molten Hinton agar was poured in sterile petridish to get a depth of 4mm.The medium was left to solidify. There after it was seeded with respective test organisms. For the purpose of seeding, 5 ml sterile water was added to each agar slant culture at fungi. The culture was scrupt to get suspension of fungi spore. A sterile cotton swab was dipped in the culture /suspension and lightly rubbed over the solidified medium. The plate was left for few minutes and then used for the test.
3) **Preparation of the sample:**
   Approximately 10 mg of each sample to be tested was dissolved in 1 ml of the respective solvent.
4) **Determination of the activity:**
   4 mm disc of Whatmann filter paper No.42 were cut and sterilized. The filter paper disc were immersed in the solution of sample, after soaking, the disc was removed and left in a sterile petridish to permit the solvent to evaporate. After about 10 minutes the paper disc were

transferred to the seeded agar plate. Near the periphery of the petridish 4 disc were kept on the seeded agar plate. In the center the fifth disc were also placed which was soaked with the standard solution. After the discs were transferred to the seeded plates the petridishes were incubated at 37^0C for about 24 hours. At the end of incubation each plate was observed for the zone of inhibition. Each distinct inhibition zone was measured as diameter in millimeter. The experiment was performed in triplicate and average zone of inhibition was reported.

Sr. No.	Extracts	Microorganism							
		E. coli	***P.auregiosa***	***K. pneumoniae***	***S. typhimurium***	***B. subtilis***	***S. aureus***	***S. pyogenes***	***L. monocytogenes***
1	**Hexane**	07	03	04	06	02	05	04	05
2	**DCM**	09	14	05	10	08	04	03	06
3	**$CHCl_3$**	05	11	03	08	08	12	14	06
4	**Ethyl Acetate**	20	16	11	18	14	12	09	08
5	**Acetone**	08	03	05	07	03	07	10	04
6	**Ethanol**	19	17	11	08	18	16	11	03
7	**Methanol**	20	10	12	14	17	22	08	04
8	**Control**	NZ	NZ	NZ	NZ	NZ	NZ	NZ	NZ
9	**Standard**	30	25	26	28	26	28	26	26

Table No. 4.1: Antibacterial activity of various extracts of *S.cumini* (Bark) in terms of mean zone of inhibition (mm).

		Extracts								
Sr. No.	**Fungal Strains**	**Hexane**	**DCM**	**$CHCl_3$**	**Ethyl Acetate**	**Acetone**	**Ethanol**	**Methanol**	**Control**	**Standard**
1.	*R. nigricans*	02	04	05	07	04	02	07	NZ	25
2.	*C. krusei*	04	07	06	08	02	04	07	NZ	20
3.	*C.lunata*	03	05	04	08	08	07	09	NZ	28
4.	*C. albicans*	06	14	03	10	04	14	12	NZ	30
5.	*A. niger*	03	05	08	14	06	11	12	NZ	26

Table No. 4.2: Antifungal activity of extracts of *S.cumini* (Bark) in terms of mean zone of inhibition (mm).

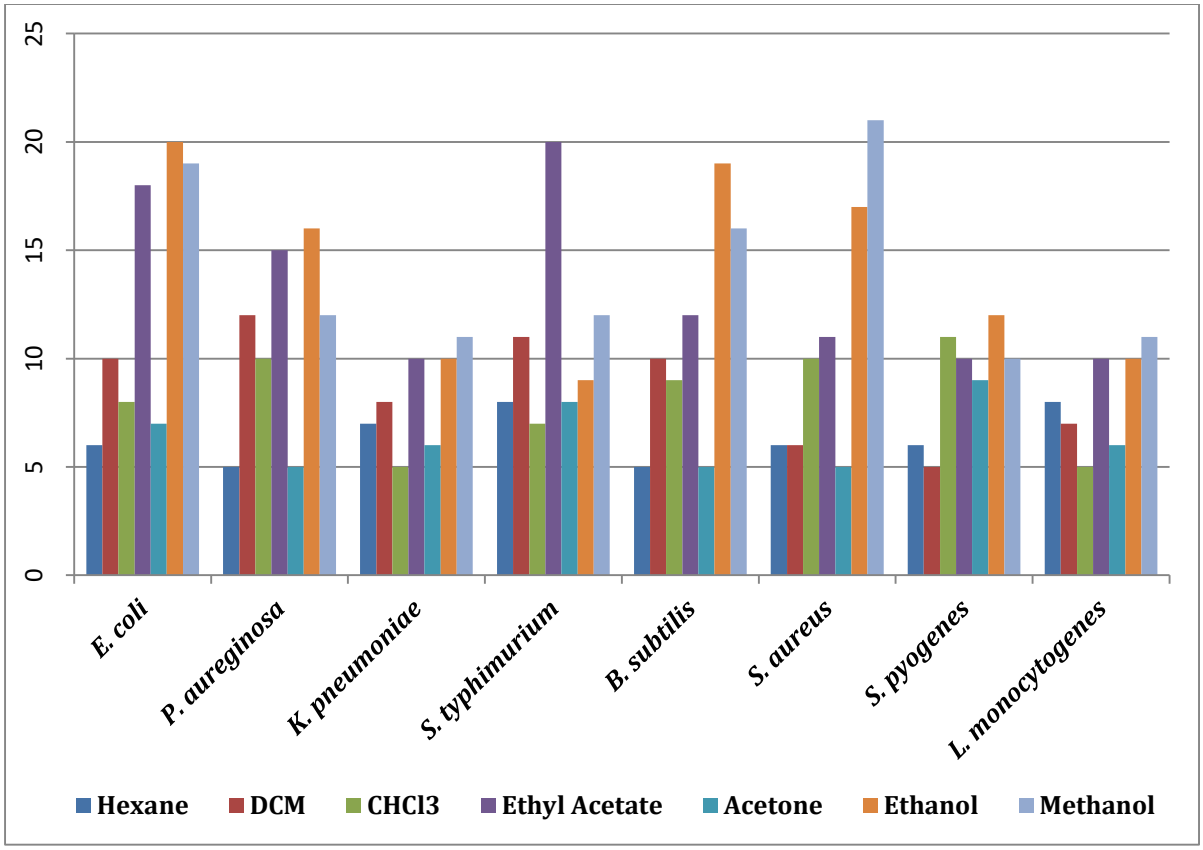

Fig. No. 4.1: Chart representing antibacterial activity of extracts of *S.cumini* (Bark).

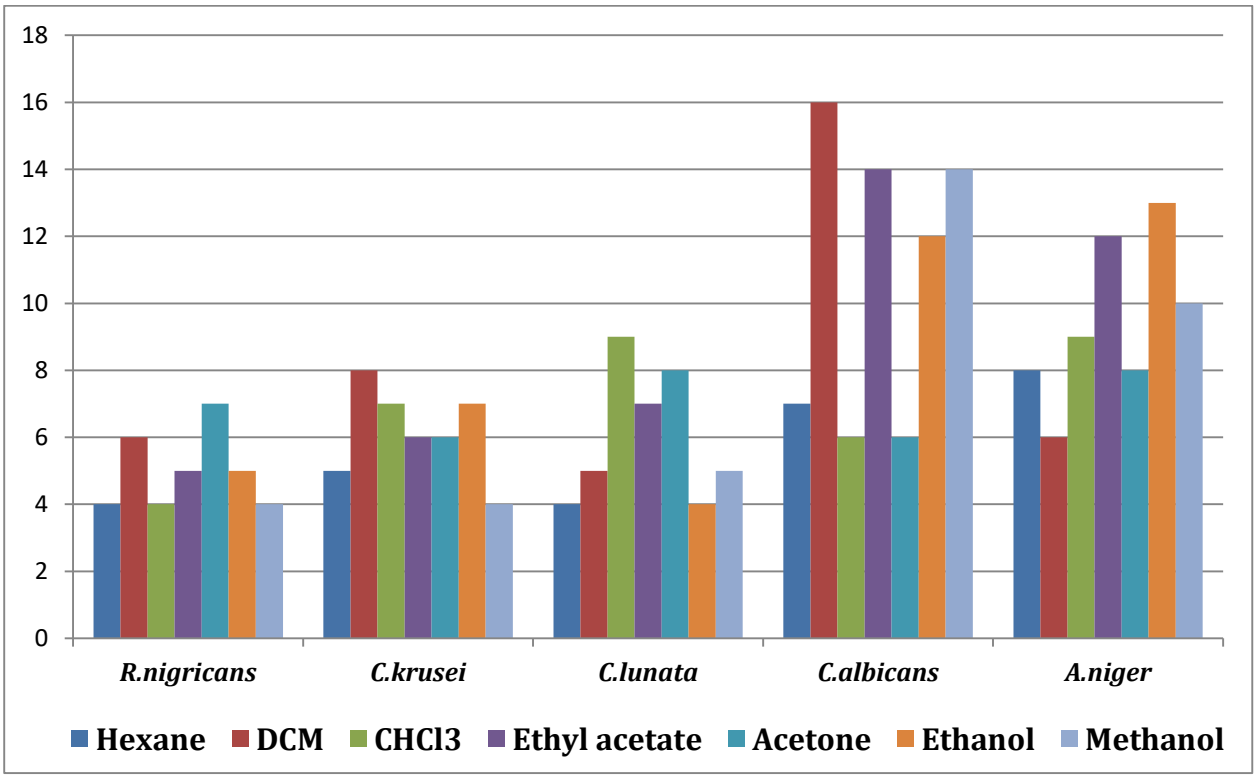

Fig. No. 4.2: Chart representing antifungal activity of extracts of *S.cumini* (Bark)

4. CONCLUSION:

Experimental studies have demonstrated its broad spectrum of antibacterial and antifungal activities against many of bacterial and fungal strains with different diameter zone of inhibition. The broad spectrum of antibacterial and antifungal activities of the plant extract, possibly due to the secondary metabolites such as flavonoids, tannins,phenolic compounds or saponins that were abundant on this plant. Therefore this study paves the way for further attention and research to identify the active ingredients responsible for the plant biological activity. So this study review the role of *S.cumini* (Bark) as therapeutic agents and it can be used in the treatment of infectious diseases caused by resistant microbes.

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