Volume 8, Issue 8(6), August 2019

International Journal of Multidisciplinary Educational Research

Published by
Sucharitha Publications
48-12-3/7, Flat No: 302, Alekya Residency
Srinagar, Visakhapatnam – 530 016
Andhra Pradesh – India
Email: victorphilosophy@gmail.com
Website: www.ijmer.in

Editorial Board

Typeset and Printed in India
www.ijmer.in

IJMER, Journal of Multidisciplinary Educational Research, concentrates on critical and creative research in multidisciplinary traditions. This journal seeks to promote original research and cultivate a fruitful dialogue between old and new thought.

C O N T E N T S

Volume 8 **Issue 8(6)** **August 2019**

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Mettu University, Metu, Ethiopia.

IJMER

ISSN : 2277 – 7881
Impact Factor :6.014 (2019)
Index Copernicus Value: 5.16

2277 - 7881

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Editorial……

It is heartening to note that our journal is able to sustain the enthusiasm and covering various facets of knowledge. It is our hope that IJMER would continue to live up to its fullest expectations savoring the thoughts of the intellectuals associated with its functioning .Our progress is steady and we are in a position now to receive evaluate and publish as many articles as we can. The response from the academicians and scholars is excellent and we are proud to acknowledge this stimulating aspect.

The writers with their rich research experience in the academic fields are contributing excellently and making IJMER march to progress as envisaged. The interdisciplinary topics bring in a spirit of immense participation enabling us to understand the relations in the growing competitive world. Our endeavour will be to keep IJMER as a perfect tool in making all its participants to work to unity with their thoughts and action.

The Editor thanks one and all for their input towards the growth of the **Knowledge Based Society**. All of us together are making continues efforts to make our predictions true in making IJMER, a Journal of Repute

Dr.K.Victor Babu
Editor-in-Chief

IBERD
(International Board for Education, Research and Development)

International Board for Education, Research and Development (IBERD) is a budding organisation founded by a group of professors from University of Mumbai, with the objective of spreading knowledge and gaining insights to new technologies and pedagogy, thereby making a positive societal impact in India and the global community. IBERD emphasises on organisation of innovative academic activities for school children, innovative research programmes for college students and teachers etc.

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About Conference

This multidisciplinary conference aims to bring researchers from varied fields of knowledge on a common platform so as to provide an opportunity to all researchers to network and exchange their ideas in person. It offers the new horizons to the participants to find global partners for future research collaboration. The conference can also help the delegates to establish academic and non-academic international linkages with recognized Universities and higher educational institutes in Israel. The invited lectures by eminent speakers from international organizations and visits to industries, academic and research institutes are the key attraction of the conference.

First International Conference on Empirical and Theoretical Research (ICETR) was successfully held at Jerusalem, Israel from May 27 to June 3, 2019. Delegates from Higher Education, Jerusalem, University of Mumbai, Shivaji University, Kolhapur, Savitribai Phule University, Pune, Janmaitri Multiple Campus, Nepal attended the Conference. The research areas Languages and Social Sciences, Finance, Accountancy and Management, Life Sciences, Physical and Chemical Sciences, Health and Medicine, Engineering and Technology, Environmental Sciences were covered in the conference.

I and my team were happy to organize 1st International Conference on Empirical and Theoretical research (ICETR -2019) at Israel from 28th May - 1st June 2019.

Dr. Yaron Meir, Director, South East Asia, Department of Israel Ministry of Foreign Affairs, Israel and Dr. Uri Resnick of South East Asia, Department of Israel Ministry of Foreign Affairs, Israel inaugurated the conference. Prof. Eric Zimmerman, Director Research Support Office and Global Engagement IDC, Herziliya, Israel delivered keynote address to the gathering. Ms. Emma Afterman, Head of International Policy and Cooperation Strategy and International Affairs Department Council for Higher Education of Israel gave the brief introduction of HE system, the planning and budgeting system, growth in number of colleges and International research Collaboration.


1st International Conference on
Empirical and Theoretical Research
ICETR-2019
Israel


מכון צוקרברג לחקר המים
Zuckerberg Institute for Water Research

Highlights of the Conference

- Opportunity to visit world's one of the most innovative and techno savvy countries.
- Interaction with world class personalities renowned in research and education.
- Gathering of Higher Education Commission, Universities and Institutions in Israel.
- Prospective for student and faculty exchange programme.
- Visit to working plants of technologies like Waste Management, Waste Water Treatment, Irrigation, etc.

Themes

- Languages and Social Sciences
- Finance, Accountancy and Management
- Life Sciences
- Physical and Chemical Sciences
- Health and Medicine
- Engineering and Technology
- Environmental Sciences

Special Thanks to

Hon'ble Ya'akov Finkelstein, Consul General, Consulate General of Israel, Mumbai
Hon'ble Nimrod Kalmar, Deputy Chief of Mission, Consulate General of Israel, Mumbai
Mr. Anay Joglekar, Political Affairs and Special Projects, Consulate General of Israel, Mumbai

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CONSULATE GENERAL OF ISRAEL
MUMBAI

הקונסוליה הכללית של ישראל
מומבאי (בומביי)

6 August 2019

TO WHOM IT MAY CONCERN

It is a great experience to be associated with the International Board for Education Research and Development (IBERD). We are happy to welcome them at Israel for the very First International Conference on Empirical and Theoretical Research (ICETR) 2019.

We are glad to learn that delegates with varied academic expertise in different areas of research visited Israel to interact with Israeli academicians and researchers as part of the conference. They visited reputed research and academic institutes of Israel to explore collaborative research and academic opportunities.

We, at the Consulate General of Israel were happy to facilitate the visit. We look forward to such continued intellectual exchanges and interactions in future!

On a personal note, I congratulate team IBERD for the success of ICETR - 2019 and wish you all the best for your future endeavours.

Regards,

Yaakov Finkelstein
Consul General, Israel

Marathon Futurex, Unit No. A-1301, Wing A, N. M. Joshi Marg, Lower Parel, Mumbai - 400 013.
Tel.: 022 6160 0500 Fax : 022 6160 0599

MINISTRY OF FOREIGN AFFAIRS
JERUSALEM

משרד החוץ
ירושלים

Jerusalem, August 5, 2019

To: International Board
for Education Research and Development (IBERD)

Dear Friends,

It is my pleasure to offer my greetings on the occasion of the publication in the *International Journal for Multidisciplinary Educational Research* of a collection of scientific papers that were presented during a conference held in Jerusalem between May 27th and June 3rd 2019 by the International Board for Education Research and Development (IBERD).

The broad thematic scope of these papers is emblematic of the wide range of disciplines and scientific excellence which were given expression during this conference. The opportunity to exchange views and generate exposure in Israel to ongoing scientific research in India provided an excellent basis for future collaboration.

I was privileged to be invited as a Chief Guest at the conference and was very glad to have had a chance to interact with the organizers and the many participating scholars.

On behalf of the Ministry of Foreign Affairs, I congratulate the organizers of this event and its participants. Scientific collaboration and exchange is a cornerstone of the ever-expanding bilateral relations between Israel and India. We look forward to a continuation of such cooperation and are committed to fostering expanded academic ties between academic institutions in both countries.

In sincere friendship

Dr. Uri Resnick
Asia-Pacific Directorate
Israel Ministry of Foreign Affairs

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Message from Dr. Eric Zimmerman

Greetings to the participants of ICETR 2019 and to the readers of these pages. It was a high honor to address the many esteemed colleagues from India, in Jerusalem. The bilateral ties between India and Israel will continue to grow from strength to strength, in many sectors – including academia, through the good work of caring people such as yourselves. This will serve well the peoples of both countries. I do so look forward to working with you in building these sustainable bridges.

Yours most sincerely,
Prof. Eric Zimmerman
Director, Research Support Office and Global Engagement IDC
Herzliya, Israel

Message from Ms. Emma Afterman
Manager Israel-Asia Academic Relations @ Council for Higher Education

It was my pleasure to present at the International Conference on Empirical and Theoretical Research (ICETR 2019) organized by IBERD. In recent years academic cooperation between Israel and India has been growing, both in terms of joint research projects and student exchange, and we strongly encourage initiatives to foster greater understanding and collaboration between researchers and higher education institutions in Israel and India.

We believe there is much potential to work together in fields of common interest, including science and engineering, agriculture and environment, and social sciences and humanities. In both countries innovation and entrepreneurship plays a strong role in supporting economic growth, and there could be mutual benefit in working together in this field as well.

We believe the future is bright for Israel-India relations and we look forward to working together to further strengthen cooperation in the higher education field!

Message by Dr. Minakshi Gurav, President, IBERD

Greetings!

International Board for Education, Research and Development (IBERD) is a budding organization founded by a group of professors from University of Mumbai, with the objective of spreading knowledge and gaining insights to new technologies and pedagogy, thereby making a positive societal impact in India and the global community. IBERD emphasizes on organisation of innovative academic activities for school children, innovative research programmes for college students and teachers, etc.

IBERD has stepped forward with a small step of International Conference on Empirical and Theoretical Research (ICETER 2019) which was successfully organized at Jerusalem, Israel. We are happy to come up with a special issue of IJMER, publishing 18 research papers presented at this conference. We, the team of IBERD are happy have this issue with IJMER which is indexed in many reputed indexation services. This issue deals with research in different streams from social science to technology.

I and my team are sure that we will work together towards our goal and make this journey memorable!

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

The Study of Wetland Dolvi in Pen Taluka, Raigad, Maharashtra, India with Special Reference of Conservation

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Abstract
The wetland has wide definition. There are many different types of wetland. These include areas of marsh, fen, peatland and shallow water bodies. Most are natural but some are human-made, and they can be permanent or seasonal. The water in wetlands can be flowing or static, and can be fresh, brackish or saline.

We wish to study wetlands in PEN taluka because its very important environmental system. The development in Pen Raigad area because of high urbanisation has created bad impact on the quality and stability of wetlands . We studied wetlands keeping this theme in mind. We want to study basic parameters of wetland water , soil and the botanical part of wetland. The water in a wetland is influenced by activities upstream, and the use of water in a wetland has an impact on the water quality and quantity downstream. For example, high rates of extraction for agricultural use will affect the amount of water flowing out of a wetland, not just the amount in the wetland itself. It is essential to consider these flows when determining management options for wetland. We studied five wetlands. Out which one which is at KARAVI GADAB WETLAND work is presented here. The water quality has degraded because of domestic activities. Fishing is done here. Water is also used for domestic use for general activities. We observed that these wetlands are in grave danger and there is dire need for its conservation. These can be achieved by spreading awareness in area of vicinity of wetlands. We studied PH, salinity, turbidity and botanical aspect of the wetlands in this project.

Keywords: - Wetlands, Waterquality, Botanical Study, Conservation

The topic under study is great concern for researchers because it directly related to the basic thing required for living on this planet, The WATER. The area i.e. pen taluka was taken for this as a part of government in initiative to study and find the exact environment in and around the wet lands in Maharshtra in general and specific in pen taluka. So they involved various NGO and expert from different fields for this study. The Pen taluka is typically located in outskirts of Mumbai and represent a typical example of urbanisation.

The urbanisation always affects the environment first and then gives fruit of development. It deteriorates the ecosystems in that area. The first and foremost natural source which becomes vulnerable is water. We want to study this part and further to make aware the society is general for protection and conservation of the water recourses.

Definition and introduction of wetlands:- There are many different types of wetlands. These include areas of marsh, fen, peatland and shallow water bodies. Most are natural but some are human-made, and they can be permanent or seasonal[1]. The water in wetlands can be flowing or static, and can be fresh, brackish or saline. Marine water that does not exceed 6 meters depth at low tide is also classed as a wetland, and many river estuaries are globally significant wetlands. Wetlands should be studied as part of wider hydrological systems. The water in a wetland is influenced by activities upstream and the use of water in a wetland has an impact on the water quality and quantity downstream.

So we targeted our work to collect the primary data of wetlands in Pen taluka area. Our planning can be summarised in following steps.

1. Collect primary information
2. Collect samples of water
3. Get few photos for activities going around wetland area
4. Analysis of samples
5. Botanical study
6. Study of birds

Actual study

Period of visit to wetland under study is APRIL2019 and MAY 2019 in the month of summer season. We will carry out study in three seasons periodically in monsoon and winter incoming days.

1. We collected and formulated a data of seven wetlands in Pen Taluka.

   There are seven wetlands reported as per government reports which we have received.

   Namely as given in following table.

Sr. No.	Name of wetland	Approximate Area	Status
1	Motiram Talav	More than 50 Acres	Good
2	Daware	More than six acres	Ok
3	Ambegoan Dam	More than 100 acres	Good
4	Shahapada Dam	More than 100 Acres	Good
5	Karavi Gadab	More than 6 Acres	Ok
6	Dolvi	More than 6 acres	Ok
7	Vashi- Odhangi	More than 50 acres	Good

   We found the condition of the wetlands in the study as described in the table above. The wetlands belonging to the dams are in very good condition maintained and protected. Their water quality is good as the water is used for drinking purpose. Other wetlands are not in so good condition.

For the purpose of this study we will consider the case ONLY ONE wetland. One at DOLVI. Is considered here. This the wetland is very much closed to the village.

All villagers use this WL as their source of water for domestic purpose. This excludes the water for drinking purpose.

All sorts of domestic activities (**Anthropogenic activities**) found to take place when we visited the place. It includes

a) fishing, local activity
b) washing of clothes,
c) bathing,
d) farming. vegetables and small local domestic farming

These activities make very bad impact on quality of water. The bathing creates very bad impact on water quality. Soap and shampoo directly enter in to wetland water which affect the quality of the water. Animal use this

water for drinking. Some villagers' uses this water for washing domestic animals. Some of the activities can be seen in the photos given below. These are photos of DOLVI WETLAND.

Sr. No.	PH	Normal expected
1.DOLWL1	8.28	7.00
2.DOLWL2	7.95	7.00

The water seems to be alkaline which is harmful to human consumption. This is due to the domestic activities carried out by nearby humans. Though fishing is observed but which is to very small extent in the summer season. It may be more in rainy season.

THE BOTANICALSTUDY of wetland at DOLVI TALUKA PEN RAIGAD MAHARASHTRA INDIA

We studied the plant which we observed there which are listed below in table

Sr.No.	Name	Botanical name
1	Rui	*Calotropis procera*
2	Jambhul	*Syzygium cumini , Myrtacae*
3	Kalam	*Mitragyna parvifolia, Rubiaceae*
4	Nirgudi	*Vitex negundo, Lamiaceae*
5	Coat Buttons *(WIDE SPREAD WEED AND PEST PLANT)*	*Tridox procumbens, Asteracae*
6	Vanda	*Vanda spp, Orchidaceace*
7	Mexican Poppy	*Argimone Mexicana, Papaveracae*
8	Karanj	*Pongamia pinnata, Fabaceae*

STUDY OF BIRDS – We observed common birds like crows, sparrows, herons, but we have NOT observed King Fisher (Alcedines) during our VISIT.

Conclusion

Wet lands are very important in our ecosystem. It is observed that due to various human activities domestic as well as industrial or developmental, the original wetlands are affected badly. There is clear encroachment on wetlands seen though legal.it is the need of the hour that these wetlands must be protected from all type of disturbances and damages. For that purpose systematic study and action along with awareness in peoples mind in locality is required. In that case we need to give them responsibility and ownership of such wetlands if possible.

I am really indebted to IBERD for giving me opportunity to present this study to My management of PES BHAUSAHEB NENE COLLEGE, UNIVERSITY OF MUMBAI, Government of Maharashtra, Maharashtra wetland committee and grateful to MY TEAM consisting of Dr. A. M. Patil ,Dr. M.H. Salunke, Ap S.B. Chitnis and Mrs. Suniti Dharap (Botanist) who helped me to carry out this study.

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https://www.pmfias.com/wetlands-wetland-ecosystem/

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Communicative English: An Insight of Young Learners in Rural India

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India is a developing country where two third of its population still lives in villages. Most of the rural young Indians get through the primary level of schooling, secondary school level and the higher education without having really acquired the skills of English language. In the seamless world we live today, language skills have become critical. English being the widely spoken language across the globe, 'English Speaking Skills' has become an area of attention amongst the countries of the world. India definitely had the advantage of reasonable level of spoken English skill amongst the youth, who attended formal schooling system. However, there had been a widespread opinion that the quality of communicative language skill in general, English in particular requires serious attention. The academic world is unanimous in finding out methods for enhancing the quality of learners when they communicate in English. The experts are also of the opinion that teaching English, as communicative language needs to be customized, depending on the requirements of the learners who are essentially diverse in nature. It is totally a different case with the young crowd having urban background as they are exposed to usage of English language in many ways. Naturally, the young learners from the towns and cities do well in competitions involving deployment of the skills of English language. Learners from rural India fall short as the result of its inability to get the required exposure to communicative skills in English language.

Let us look at the possible fallouts concerning the young learners from the rural area who are unable to develop the skills of English language.

1. The young learners from the rural India suffer from inferiority complex due to the colonial hang-ups prevalent in India. The mind-set of the people is that if a person is unable to use English language for various reasons, he/she is inefficient and incompetent. Most of the people do not understand that cognitive ability has nothing to do with acquisition of any language, let alone English. The young people from rural area in India are at par with or they are even better than their counterparts from Indian towns and cities as far as their cognitive ability is concerned. Young learners from rural area in India lack behind while using English language than the learners staying in urban area. As a result, they develop low self-esteem and feel hesitant while expressing themselves in English.

2. The young learners from rural India cannot do well in a level playing ground situation when they are set against those from the cities. In the context of globalization, competition at any level involves efficient usage of various skills of English language. To succeed in any competition, the young people are required to use English language effectively. Students from rural areas pay a heavy price for the lack of expression in English language in such a situation.

3. Job opportunities are aplenty for the young people from the cities. Access to Internet and other media interactions makes this possible for them. Besides, knowing English very well makes the difference all the more. The young people of rural areas are not well prepared to face the challenges of this kind on the job opportunities' front for the simple reason that they do not have sufficient exposure to English language usage.

4. The young learners from rural area studying science face uphill task of presenting their ideas effectively in English. They come across two major hurdles- one at the school or college level and another while pursuing related professions. Large number of young learners from rural areas

study core subjects like science and mathematics up to the secondary school having their native tongue as the medium of instruction. Once they enter +2 level, generally called pre-university course or pre-degree course, they have to study subjects such as Physics, Chemistry, Mathematics, Biology, Electronics and Computer Science in English. The student's cognitive ability is never in question but grasping intricacies of challenging subjects having English as the medium of instruction is not an easy task for them. Failure to express themselves adequately and effectively in English exposes them to the danger of non-recognition of their talent and skills. The same is true when such young people take up jobs and research work. English language acts as a villain in an otherwise uncomplicated success story.

Let us now look at the possible causes for the present stalemate.

There is one factor which is mainly responsible for non-performance of students from rural areas in English. It is the lack of exposure of English language usage at home, in the schools and at the college level. We could take a close look at each of these areas.

1. Majority of the parents from the rural areas are not well conversant in English. Most of them cannot use English language. As the result, they cannot expose their children to English language usage. They are more interested in the wages the young leaners will earn for the family rather than taking extra efforts to learn a foreign language.

2. Most of the children from rural areas study in schools and colleges, where, medium of instruction happens to be vernacular. English is taught hardly for an hour each day on working days. The pattern of high school English language is making students lazy. The students do not like to go through their text books; they rather refer to readymade guides. In examination, they write lines to lines from the paragraph as answers to the questions asked to check composition. It naturally mars their skill of reading and understanding. The teachers at the primary and secondary level are not adequately sufficient (not all). They are not willing to update or upgrade themselves.

3. The young people are motivated to learn English, but they lack opportunities to learn it at every stage. They realize the importance of English language. They know how useful English is. They perceive it as a tool of empowerment. Despite it, the young people are deprived of an opportunity to learn English due to the lack of conducive atmosphere in schools and colleges. Lack of facilities like electricity, library demotivates the rural leaners.

4. At schools and in the colleges, English texts are taught. Students are prepared to write answers in English. Barely half the number of the students get through the examination in English. Even those who get through the examination in English, would have hardly learnt to use English in real life situation. Most of English language learning happens in a limited and mechanical way. The real learning of English does not take place. Students reach undergraduate course without having learnt proper usage of English. It is a big social problem causing a rift between rural young ones and urban. Students with little self-esteem and with no definite purpose in life drift along nursing inferiority complex for having not learnt communicative English. Hence their inability exposes themselves effectively. The entire system of education from primary education to higher education gets the blame for the unfortunate stalemate. Generation after generation of students pay the price for the 'system's fault'.

The following remedies can be considered to solve problem

The matter, since it is too urgent and pressing, calls for solutions. Many young leaners from rural India, wants to learn communicative skills of English language. Most of them are motivated to learn the language as they are aware of the rewards waiting for them once they become good at expressing themselves quite well. But unfortunately, the present system of education is quite callous about them. Teachers and the system in which they work are not all that resourceful at this point of time. We might look at the possibilities of correcting the current state of affairs by initiating certain remedial actions. 1. Starting from class-1 at the Primary education, the young ones must be exposed to the communicative skills of English

language by the trained teachers for a particular period of time every day. Authorities of the school should, of course, take care that such an exposure will be fun for the little ones.

Communicative skills of English language get internalized into the personalities of the little children over a period of time. This corrective course of action will boost the confidence of the young people from rural areas of India, which will ensure the first step towards eliminating rural-urban divide that exists at present.

2. Single commands in English, simple tasks to be completed by the children at home and talking to the students in an engaging manner in English, day-in and day-out, would create a lasting impression on the little children at schools that using English language in a day-to-day real situation in life becomes a habit with them. They will feel at ease using English in such an atmosphere. Students from urban areas pick-up English easily mainly due to the atmosphere in the school. Children from rural areas must not be deprived of such an opportunity to pick up communicative skills of English language.

3. Trained teachers play a big role in making the students from rural areas learn English. The school infrastructure must include trained and resourceful teachers who happen to be committed to the course of teaching good English to students. Teachers should have great concern for the students. Commitment and concern for students are the key operative words in bringing out the best in students of rural areas.
According to Schaeffer, one aspect of education is socialization—the life-long process of learning the attitudes, values, and behaviour appropriate to individuals as members of a particular culture. Socialization is the result of interaction with others—family members, friends and even strangers. It also results from exposure to books, films, television and other forms of communication. When learning is formalized and explicit, teaching - learning process is conscious, it is called education'.
Teachers should understand their responsibility and interact with students in such a manner that the students will approach them without any hesitation. Understanding the social background of the student and

exposing them to different tools and means of knowledge, is the responsibility of the teachers.

4. Science core subjects such as Physics, Chemistry, Mathematics, Biology, Electronics and Computer Science would be taught in detail from the +2 level and onwards. The need to teach communicative English intensively at this stage is required for students coming from rural areas. This would help them grasp, understand and share the concepts of the science subjects all the more easily. The students will also be able to interact in English with the teachers and their peer group without any inhibition. The students will be able to get rid of the dread of English language by developing communicative skills in English language in them. The students with the knowledge of English can easily acquire the skills of using internet services in order to acquire more knowledge.

It is really sad that though the students are sufficiently motivated to learn English they are not provided with necessary infrastructure and environment to learn it. These students are not exposed to communicative skills of English language unlike their counterparts in the towns and cities. Students in the rural areas do not lack cognitive ability but they lack the skill of interacting in English due to non-exposure to usage of English language. The colonial hang-up & the resultant mind set of the people create a sense of insecurity among the students of the rural areas. It is a very big social problem and it needs to be addressed soon. All of us, especially teachers teaching English, should take the blame for the prevailing situation, and should move towards evolving methods to teach effectively the communicative skills of English language. Otherwise we will all be responsible for creating a sick society for the posterity where the bulk of the young people from rural India will be nursing inferiority complex and they suffer from low self-esteem with disastrous effect to the society. Young learners from rural India should not be blamed for not succeeding in life due to lack of knowledge of English. The onus is on all of us and we must initiate action to teach the young learners at the early stage. Teaching communicative skills of English language has to be continued for the first 12 years of school life so that the young learners from rural India face life boldly and savour the fruits of globalization. As

Mr. Bhaskar Ghose has rightly pointed out in his article in the 'Frontline' dated July 30, 2004.

"English is there and we need to recognize that it will be there for many years to come and play a vital role in the evolution of India as a major economic and political force in the world. And in other areas as well-creative writing, for example, in which Indian writers have won world renown and respect."

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Solvent Extraction Coupled with Spectrophotometry for Determination of Iron in Tablet, Ore and Alloy

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Abstract
Reagent Acetophenone 2', 4'- dihydroxy semicarbazone, is proposed as a sensitive spectrophotometric reagent for Fe(III). It is synthesized and characterized by NMR, IR and elemental analysis. A selective spectrophotometric method is presented for the trace determination of Fe(III) using A24DHS as spectrophotometric reagent (λ_{max} = 350 nm) in acidic aqueous solution (pH = 3.4). The Beer's law is obeyed in the concentration range from 1 to 5 ppm. The A24DHS forms a 1:2 violet coloured complex. The Sandell's Sensitivity is 0.01024 µg cm^{-2} with molar absorptivity 4048.0 L mol^{-1} cm^{-1}. The proposed method has been successfully applied to the determination of Iron in tablet, ores & alloy.
Keywords: Iron, Spectrophotometry, n-Butyl alcohol, Acetophenone 2',4'-dihydroxy, semicarbazone derivative

1. Introduction

Iron and its compounds are widely used in alloys and various biological samples. Trace concentrations of Iron can also affect the physical and mechanical properties of metal and alloys. Iron is essential to nearly all known organisms. Therefore, precise knowledge of the Iron present in a various samples is required, for which an accurate assessment of the Iron is need of analytical methods for determination at ppm level. Methods such as atomic emission and mass spectrometry[1, 2] which require sophisticated instruments. Some of the reagents used for the spectrophotometric determination of Iron are Bathophenanthroline[3], Mercapto pyridine-1-oxide[4], Pyridazine-3,6-diol[5], etc. However, most of these methods suffer from certain limitation, such as interference by

number of ions[6, 7], of low sensitivity[8].

2. Experimental

The pH measurements were made using a pH meter Elico, Model LI-129, India in conjugation with a combined glass and calomel electrode. Shimadzu UV-Visible 2100 spectrophotometer with 1.0 cm matched quartz cells were used for all absorbance measurements.

3. Synthesis Of The Reagent

Acetophenone 2', 4' - dihydroxy semicarbazone(A24DHS)

Synthesis of ADHS involves two steps.

a) Conversion of Resorcinol to 2',4'-Dihydroxy acetophenone[5].
b) Synthesis of semicarbazone derivative of 2',4'- dihydroxy actophenone[6].

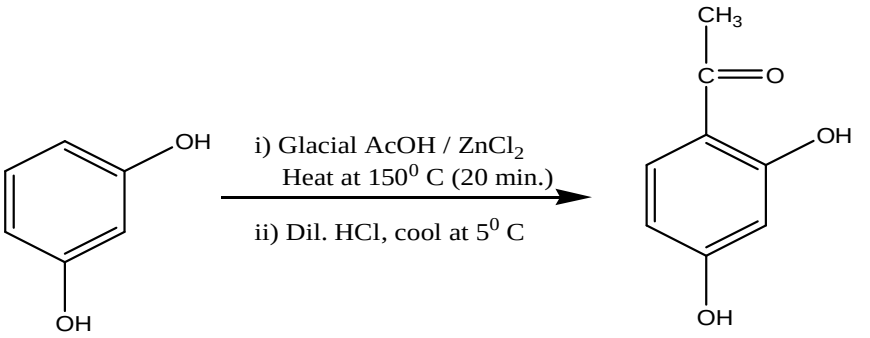
A) Conversion of Resorcinol to 2,4-Dihydroxy acetophenone

Freshly fused and powedered Zinc chloride (0.24 mole) is dissolved in glacial acetic acid (32 mL) by heating in a beaker on a sand bath. Dry Resorcinol (0.2 mole) is added with stirring to the mixture at 1400C. The solution is heated until it just begins to boil and kept for 20 min. At 1500C. Dilute Hydrochloric acid (1:1) is added to the mixture and solution cooled (50C). The separate product is filtered and washed with dilute HCl (1:3). It is recrystallise from hot water containing little HCl. M.P. is 1420C (ref.7). Yield is 84.45 %. (Scheme 1)

B) Synthesis of semicarbazone derivative of 2',5'- dihydroxy actophenone

Equimolar mixture of sodium acetate and semicarbazide hydrochloride is dissolved in minimum quantity of water and then it is added to methanolic solution of 2',4'-Dihydroxy acetophenone. After addition warm the solution and stir the solution about one hour. The pink coloured compound is precipitate out, which is washed and then recrystalised by using 50% ethyl alcohol as solvent. (Scheme 2)

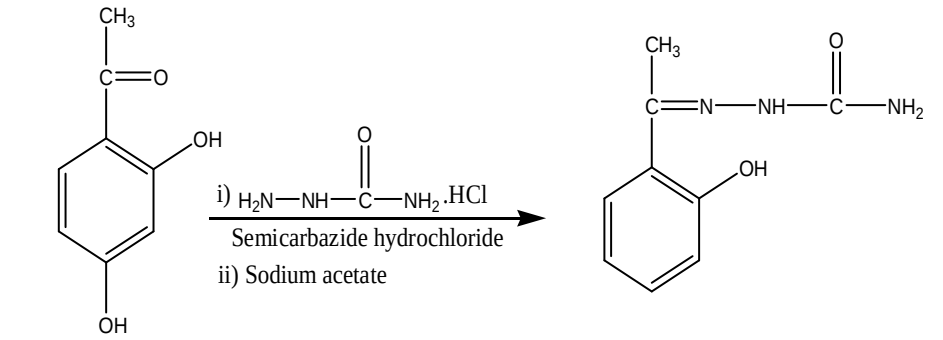
Scheme 1



Resorcinol

2,4-Dihydroxy acetophenone

Scheme 2



2,4-Dihydroxy acetophenone

Semicarbazone derivative of
2,4-Dihydroxy acetophenone

Physical characteristics and Spectral interpretation (Table 1, 2 & 3)

Table 1: The physical characteristics of A24DHS are shown in table.

Compound	Color	Yield (%)	Molecular Formula	M. P (^oC)	Mol Weight
A24DHS	Light Pink	75.25	$C_9H_{11}N_3O_3$	222-224	209.202

Table 2: IR - Spectral data of A24DHS (Elico Infra-Red Spectrophotometer)

Frequency (cm^{-1})	Functional group	Frequency (cm^{-1})	Functional group
3483	$\nu_{(O-H)}$ stretching	1284	C-N stretching
3095	$\nu_{(CH)}$ aromatic stretching	1375, 1173, 1155, 1116	In plane bonds due to aromatic substituted benzene ring
1593	$\nu_{(C=N)}$ stretching	854	Substituted benzene ring
1520	$\nu_{(C=C)}$ stretching	758	$\nu_{(C-H)}$ stretching due to substituted benzene ring
1680	$\nu_{(C=S)}$ stretching	538	Benzene ring deformation
1458	C-O-H bending	1375	(CH_3-C) bending
1323	Ph-C-O stretching		

Table 3: H^1- NMR Spectral data of A24DHS (Bruker NMR spectrophotometer)

The chemical shifts were reported in δ relative to TMS used as an internal standard for NMR.

Solvent	No. of protons	δ in ppm	Assignment
d^6-DMSO	s, 3H	3.39	CH_3-C=N
	s,2H	2.14	-NH_2
	s,1H	2.48	-NH-
	two d, 2H s,1H	6.1 to 7.3	Aromatic Proton
	d, 2H	12.98	-OH

Conclusion from spectra : The spectral interpretation confirms the structure of A24DHS.

4. Procedure For The Extraction:

1 mL of aqueous Iron metal solution containing 5 µg of Iron was added to 2 mL of reagent in 10 mL standard volumetric flask. The pH of the solution adjusted to 3.4 and final solution diluted to 10 mL. The solution was then transferred to 100 mL separating funnel. 10mL n-Butyl alcohol was transferred to the same funnel. The funnel were shaken for two minutes and allowed to stand. Separated organic phase was passed through anhydrous Na_2SO_4 in order to absorb trace amount of water and then collected in 10 mL standard measuring flask diluted up to the mark with n-Butyl alcohol. The amount of Iron present in the organic phase determined quantitatively by spectrophotometric method at 350 nm and that in the aqueous phase was determined by thiocyanate method.

Fe (III) standard solutions

It was prepared by dissolving exact weighed amount of ammonium ferric sulphate in distilled water containing few drops of sulphuric acid.

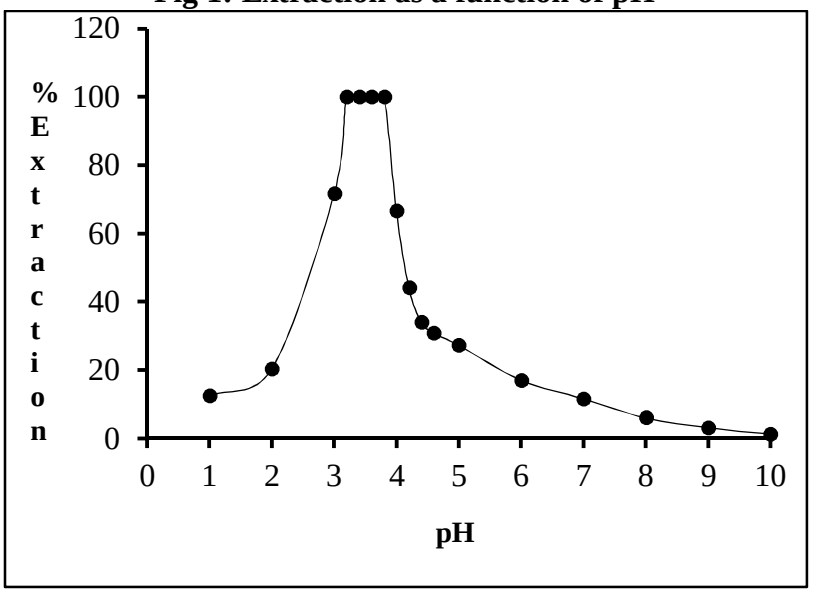
Research & Development of Method:

The results of various studies are discussed below.

5.1 Extraction as a Function of pH:

The extraction of Iron with Acetophenone 2',4'-dihydroxy semicarbazone has been studied over the pH range 1-10 and was observed that percentage extraction of Fe (III) is maximum at pH range 3.2-3.8. Hence, further extraction and determination carried out at pH 3.4.
(Figure 1)

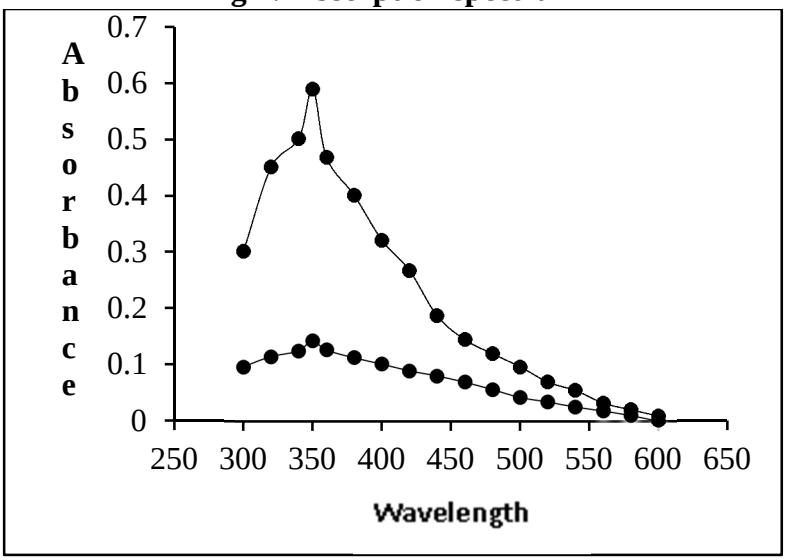
Fig 1: Extraction as a function of pH



5.2 Absorption spectrum:

The absorption spectrum of Fe (III): A24DHS in n-Butyl alcohol shows the maximum absorption at 350 nm. The absorption due to reagent at 350 nm is almost negligible. Hence all measurements were carried out at 350 nm. (Figure 2)

Fig 2: Absorption spectrum



5.3 Influence of diluents:

Extraction was carried out in various organic solvents and it was found that extraction of complex maximum in n-Butyl alcohol. Hence, n-Butyl alcohol was used for extraction of all other measurements.

5.4 Effect of reagent concentration:

It was found that 2 mL of 0.1% reagent is sufficient for the complex formation of the Iron in 10 mL of aqueous solution at pH 3.4

5.5 Calibration plot:

The Beer's law is obeyed in the range 1 to 5 ppm. The molar absorptivity is 3899.2 L $mol^{-1}cm^{-1}$ and sandell's sensitivity 0.0288 µg cm^{-2} respectively. (Figure 3)

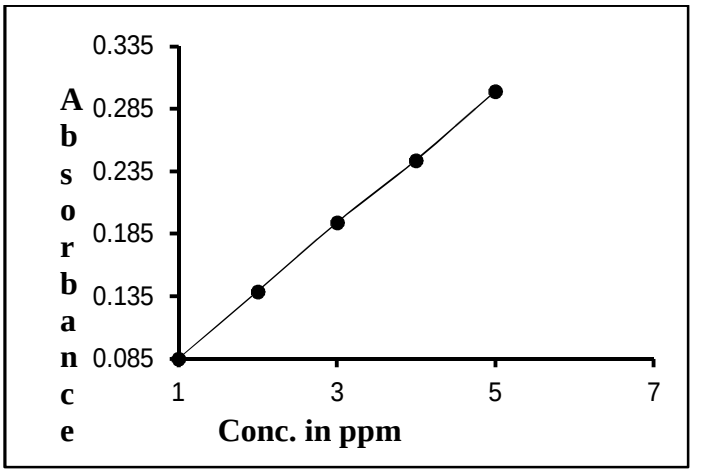


Fig 3: Calibration plot

5.6 Limit of Detection :

LOD[10] (Limit of Detection) of the present method was calculate at 98.3 % confidence level, it was 0.102 µg/mL.

5.7 Effect of divalent ions and foreign ions

The interference of various ions present in various amount is studied and it was indicated no interference in the spectrophotometric determination Iron. The ions which show interference in Iron determination were overcome by using appropriate masking agents. (Table 4)

Table 4: Effect of divalent ions and foreign ions

Sr. No.	Interfering Ion	Masking agent
1	V(V)	Thiourea
2	U (VI)	Oxine
3	Mo (VI)	Citrate
4	Cu (II)	Thiosulphate
5	Ti (IV)	Ascorbic acid

5.8 Precision and accuracy:

The precision and accuracy of the developed spectrophotometric method have been studied by analyzing ten solutions each containing 3 µg of Iron in the aqueous phase. The average of ten determinations was 3.003 and variation from mean at 95% confidence limit was ± 0.00886.

5.9 Nature of extracted species:

Job's continuous variation method, Slope ratio method and Mole ratio method has been used for determination of composition of complex. It shows that the composition of complex is 1:2. (Figure 4)

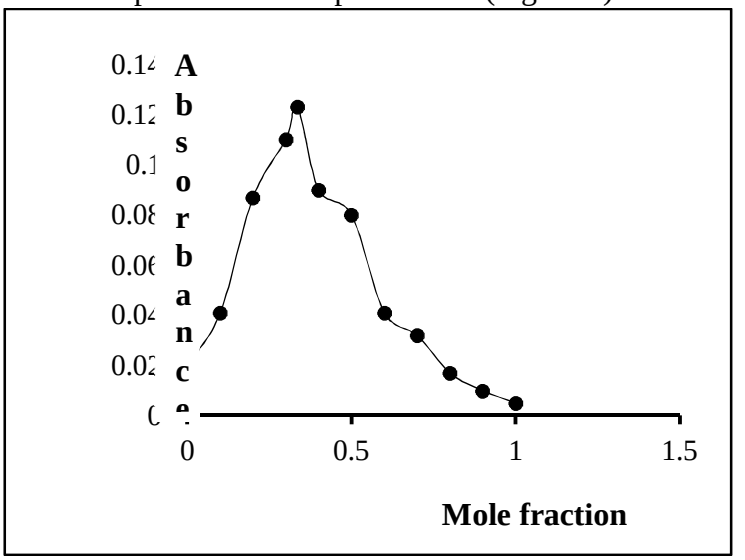


Fig 4: Nature of extracted species

5. Applications:

The proposed method was successfully applied for the determination of Iron from tablet, ores and alloys. (Table 7)

Table 5: Applications

Sr. No.	Samples	Amount of Fe (III)	Amount of Fe (III)
		Standard method	Present method
1.	**Alloy/ Ore (0.3 g)**		
a)	Hematite ore (53.06 % Fe)	0.159 µg	0.156 µg
b)	Elinver alloy (62.7 % Fe)	0.188 µg	0.186 µg
2.	**Pharmaceutical sample**		
	Supradyn (Multivitamin Tablet)	11.17 mg	11.18 mg

6.1 Determination of Fe (III) in alloys/ore

About 0.3 to 0.5 g sample (alloy/ore) was dissolved in 15 cm^3 of aqua–regia. The solution was evaporated to dryness and the residue was treated with concentrated HNO_3 and diluted to 100 cm^3. An aliquot of a diluted solution was used for the extraction and spectrophotometric determination of Fe (III) by present method.

6.2 Tablet

To the Supradyn, Multivitamin tablet 1.0 cm^3 of concentrated HNO_3 was added and evaporated to dryness. It was treated with 5.0 cm^3 of 30 % H_2O_2 every time, till solution become colourless. The colourless solution was then treated with dilute HCl and evaporated to dryness. The residue was dissolved in 10 cm^3 distilled water and aliquot of this was used for Fe (III) analysis by the present method.

6. Conclusion

The developed method is compared with the thiocyanate method for the estimation Iron. The results are comparable with both the methods. The method is simple and does not required any sophisticated instruments.

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A study of Stress among Teachers of Self-financing Degree Colleges in Mumbai

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Abstract
The feeling of stress at workplace has become a common sight today due to external advancement in technology, peer pressure, handling multiple tasks etc. The main purpose of writing this research paper is to find out the different factors leading to stress in an individual. It is necessary to study the different factors leading to work stress and also find its impact on performance of an employee as it is necessary for any organization to ensure smooth day to day functioning and efficient success of Organization. The paper covered different efforts taken by employees as well as employer in order to overcome stress. The research for the paper was mainly focused on degree college teachers working in the vicinity of Mumbai. Data for research was collected from faculty members through an appropriate structured questionnaire. Sample size for research was 102 faculty members.

Keywords: - Employees, self-financing, work related stress, peer pressure

Introduction

Due to globalization universe has become more challenging and competitive in all the sector. To cope up with the challenges and changes, the demand for graduates and post graduates in different sectors have increased tremendously. Various organizations such as health care centers, hospitals, financial institutions, public and private sector undertakings etc. need qualified and skilled professionals to serve as managers, entrepreneurs, doctors, engineers, architects etc. It is the responsibility of the academicians to convert the human being into human resources. So, education has become most pervasive phenomenon in contributing towards the development of any country.

Higher education has become a very important tool in constructing knowledge-based society. It is an important instrument in order to give a cutting edge towards knowledge of all the students while they get their basics from primary education. Aided institutions and self-financed institution serve under higher education. Aided institutions get financial assistance from the government while self-financing institutions generate funds from the fees paid by their students. To survive and to serve the society is a great challenge for any institution today. This depends on the standards of educational system of any institution. The success of any institution largely based on its infrastructure, the curriculum, the students and most importantly the teachers.

Teaching is considered very often as a noble profession. Teachers are the "Nation Builders". The concept of teaching today has undergone a lot of changes. Teaching is not only delivering lectures but also disseminating the professional consultation, conducting academic researches and coming out with the findings so that society at large can be benefitted. Teachers also need to keep themselves updated with new knowledge and new technologies. So, teachers are facing more mental pressure and no longer having a relaxed and stress free work. Stress is the major concern for todays teacher's which has resulted in different health issues among the teaching fraternity

The concept 'stress' was introduced for the first time by Selye Hans in the life sciences in 1936. It means 'stringer', derived from a Latin word. According to Selye Hans, 1936 stress means "the nonspecific response of the body to any demand placed on it". Stephen Robbins (1999) stated the stress as **"a dynamic condition in which an individual is confronted with an opportunity, constraint or demand related to what he/she desires and for which the outcome is perceived to be both uncertain and important".**

Stress may occur due to technological, societal, political changes, financial and also on or the other personal reasons.

Teachers' stress is defined as the experience of unpleasant negative emotions such as anger, frustration, anxiety, depression and nervousness, resulting from some aspects of their work (Kyriacou 2001). Today a teacher needs to be highly qualified and technologically updated. Expectations from the teachers are very high by the different stakeholders.

This puts teacher under lot of stress. Further, increased work load, long working hours, un favorable working conditions, job insecurity, lack of resources etc contribute to the stress among teachers. Insufficient salary and lack of respect also lower down the mental health of a teacher. Ultimately it hampers the competency of a teacher on one side and creates mental, physical and emotional stress on the other. So the main purpose of this paper is to study the stress level among teachers of self-financed degree college and to suggest some measures to cope up with stress.

Literature review

Ophelia Jenifer in her research paper **titled "A Study on Stress among 8TH – 12th Std. School Teachers In Selected Schools of Chennai"**, found that teachers suffer a lot of physical and mental issues due to stress. To overcome that teacher has to go for meditation and yoga sessions. she further added that management need to take initiative to reduce the teacher student ratio so that every teacher can deal with their students in relaxed manner which will reduce their stress level.

Surinder Kaur in her research paper **"Comparative Study of Occupational Stress among Teachers of Private and Govt. Schools in Relation to their Age, Gender and Teaching Experience** "opined that teachers suffers from inherent stress which they carry naturally and also a stress which occurs situationally. She further added that teacher should try to cope up with their own inborn stress and they should use their experience and knowledge to overcome the situational stress.

G.Johnslin Sujitha in her paper **"Job stress among teachers in arts and science colleges – a study in Kanyakumari district"** states that stress has become an integral part of teaching profession. Most of the time it will affect their mental health too. In this state of mind teachers will never be in a position to produce competitive students to face the challenging world, which will hamper the quality of education in the country. She suggests that teachers should be provided free environment for learning and self-development so that they can build self confidence among themselves to cope with the stress.

Harish K A, 2B JeyaPrabha in their research paper **"An Empirical Study On The Stressors Of Teachers And Its Impact On Occupational Stress And Job Satisfaction Of Teachers In Government & Private**

Sectors" found that teachers from private schools are more dissatisfied with regard to salary while making an comparison with teachers from government school. They also concluded that female teachers have high rate of stress compared to male teachers in private schools.

J.N.Jenitta1 , Dr.T.Mangaleswaran, in their research paper **"Factors Affecting the Stress of Teachers; A Special Reference to Trincomalee District"** state that high level of stress prevails among teachers due to different reasons like heavy work load, working conditions, personal reasons etc. proper counselling and training to teachers along with appropriate motivation will help them to overcome stress.

Objectives of study:

1.To understand the concept of stress.

2.To study stress level among self-financing degree college teachers of Mumbai .

3. To find reasons of stress among self-financing degree college teachers of Mumbai.

4.To suggest measures to reduce the stress among self-financing degree college teachers of Mumbai.

Research methodology:

a. Data collection: Primary as well as Secondary data.

b. Method: Probability sampling method is used.

c.Source:- Structured questionnaire is used for data collection

d.Sampling: For the purpose of the study 102 teachers from self-financed degree college of Mumbai were taken.

e.Limitations: Time period for the study was restricted to only one month.

Data Analysis and Interpretation: -

Descriptive Statistics			
	N	Mean	Std. Deviation
Deadlines at work place	102	4.245	.7371
Repetition of work in different manner	102	4.324	.7599

Peer pressure to achieve qualification (achieving the same degree achieved by colleagues)	102	3.598	1.3516
Lack of salary according to qualification	102	4.304	1.0881
Research pressure	102	3.696	1.0697
API requirements	102	3.676	1.2986
Heavy assessment workload	102	4.196	.9015
lack of respect by the students	102	3.216	1.3396
Lecture preparation pressure	102	3.529	1.1749
Working in vacations	102	4.118	1.2211
Election duties	102	2.706	1.6685
Fear of termination and non appointment	102	3.814	1.2644
N.A.A.C work	102	4.069	1.1626
Administrative workload	102	4.078	1.0406
Lack of family support	102	2.814	1.4606
Equated Monthly Installments of different loans	102	3.373	1.6823
O.S.M (online assessment)	102	3.794	1.1968
non cooperative seniors	102	3.559	1.2631
pressure to cope up with technology	102	3.402	1.3295
Long working hours	102	4.010	1.1124
Monotonous work	102	3.971	1.0851
Routine work	102	3.892	1.0427
Supervision duties of examination	102	4.265	1.0042
Paper checking and setting	102	4.029	1.1121

Conducting practical examination	102	3.520	1.5138
conducting viva voce as examiner	102	3.520	1.3768
Guiding research projects	102	3.343	1.3534
Extra curriculum activities	102	3.814	1.2486
Valid N (listwise)	102		

Interpretation

In response of whether which aspects of your job is stressful, for given factors respondents have been asked on a scale of 1 to 5 and From the table it has been seen that **Repetition of work** has the mean value of **4.32** which means that majority of the respondents strongly agree with regards to it causes stress, moreover, **Lack of salary according to qualification** has the mean value of **4.304**, which also indicates that the majority of the respondents are agreeing that lack of salary according to their qualification results in to stress. **Deadlines at work place** has the mean value of **4.245** which means that most of the respondents agree with the statement that deadlines put them under lot of pressure. Majority of the respondents also agree that they have **heavy assessment workload, working in vacations** which has the mean value of **4.118**, which indicates that maximum number of respondents were agreeing with that statement and can be concluded that it creates stress to them. Further, respondents agreed that they have **administrative workload**, as it has mean value of **4.078**, most of the respondents also agree with the statement **Long working hours at work place** as it has the mean value of **4.010**, for the statement, **Supervision duties of examination** and **paper checking and setting**, the majority respondents were agreeing on it as it has mean value of **4.265** and **4.029**, respectively. : These factors also causes stress. The statement **Lack of family support** has the mean value of **2.814**. Which indicates that they do not feel stressful with it. The other statement which have negative view is **Election duties**, which have mean value of **2.706** that means these factors creates less stress for the teachers.

Hypotheses

H_0: There is no significant difference in agreeableness for selected factors that causes stress between male and female.

H_1: There is significant difference in agreeableness for selected factors that causes stress between male and female.

Annova table: -

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Deadlines at work place	Between Groups	.059	1	.059	.107	.744
	Within Groups	54.814	100	.548		
	Total	54.873	101			
Repetition of work in different manner	Between Groups	.639	1	.639	1.107	.295
	Within Groups	57.685	100	.577		
	Total	58.324	101			
Peer pressure to achieve qualification (achieving the same degree achieved by colleagues)	Between Groups	.048	1	.048	.026	.872
	Within Groups	184.472	100	1.845		
	Total	184.520	101			
Lack of salary according to qualification	Between Groups	2.107	1	2.107	1.793	.184
	Within Groups	117.472	100	1.175		
	Total	119.578	101			
Research pressure	Between Groups	.140	1	.140	.121	.729
	Within Groups	115.439	100	1.154		
	Total	115.578	101			
API requirements	Between Groups	4.161	1	4.161	2.504	.117
	Within Groups	166.162	100	1.662		
	Total	170.324	101			
Heavy assessment workload	Between Groups	.140	1	.140	.171	.681
	Within Groups	81.939	100	.819		
	Total	82.078	101			
lack of respect by the students	Between Groups	3.812	1	3.812	2.148	.146
	Within Groups	177.443	100	1.774		
	Total	181.255	101			
Lecture preparation	Between	.195	1	.195	.140	.709

pressure	Groups					
	Within Groups	139.217	100	1.392		
	Total	139.412	101			
Working in vacations	Between Groups	1.153	1	1.153	.771	.382
	Within Groups	149.435	100	1.494		
	Total	150.588	101			
Election duties	Between Groups	1.882	1	1.882	.674	.414
	Within Groups	279.294	100	2.793		
	Total	281.176	101			
Fear of termination and non appointment	Between Groups	.247	1	.247	.153	.696
	Within Groups	161.214	100	1.612		
	Total	161.461	101			
N.A.A.C work	Between Groups	.003	1	.003	.002	.965
	Within Groups	136.517	100	1.365		
	Total	136.520	101			
Administrative workload	Between Groups	.053	1	.053	.049	.826
	Within Groups	109.319	100	1.093		
	Total	109.373	101			
Lack of family support	Between Groups	3.006	1	3.006	1.415	.237
	Within Groups	212.455	100	2.125		
	Total	215.461	101			
Equated Monthly Instalments of different loans	Between Groups	13.471	1	13.471	4.946	.028
	Within Groups	272.372	100	2.724		
	Total	285.843	101			
O.S.M (online assessment)	Between Groups	.934	1	.934	.650	.422
	Within Groups	143.743	100	1.437		
	Total	144.676	101			
non cooperative seniors	Between Groups	.112	1	.112	.069	.793
	Within Groups	161.035	100	1.610		

	Total	161.147	101			
pressure to cope up with technology	Between Groups	.000	1	.000	.000	.991
	Within Groups	178.519	100	1.785		
	Total	178.520	101			
Long working hours	Between Groups	.473	1	.473	.380	.539
	Within Groups	124.517	100	1.245		
	Total	124.990	101			
Monotonous work	Between Groups	.328	1	.328	.277	.600
	Within Groups	118.584	100	1.186		
	Total	118.912	101			
Routine work	Between Groups	3.859	1	3.859	3.642	.059
	Within Groups	105.955	100	1.060		
	Total	109.814	101			
Supervision duties of examination	Between Groups	.014	1	.014	.014	.906
	Within Groups	101.839	100	1.018		
	Total	101.853	101			
Paper checking and setting	Between Groups	.717	1	.717	.578	.449
	Within Groups	124.194	100	1.242		
	Total	124.912	101			
Conducting practical examination	Between Groups	4.783	1	4.783	2.110	.149
	Within Groups	226.677	100	2.267		
	Total	231.461	101			
conducting viva voce as examiner	Between Groups	.025	1	.025	.013	.909
	Within Groups	191.435	100	1.914		
	Total	191.461	101			
Guiding research projects	Between Groups	.571	1	.571	.310	.579
	Within Groups	184.419	100	1.844		
	Total	184.990	101			
Extra curriculum activities	Between Groups	.518	1	.518	.330	.567
	Within Groups	156.943	100	1.569		
	Total	157.461	101			

Interpretation

From the table it has been seen that the statement **"Equated Monthly Instalments of different loans"**, the p value is 0.028, which indicates that researcher Rejects hypothesis for that statement so it can be said that there is a significant difference between agreeableness for this factors causes stress between male and female. While for rest of other selected statements researcher fails to reject null hypothesis, as it has the p value greater than 0.05, so for them it can be said that for rest of the factors other than "Equated monthly instalment of different loans" there is no significant difference in agreeableness **for selected factors that causes stress between male and female.**

Suggestions

1. Establishment of staff academy which will look after creating a fun filled environment in staff room so as to keep the staff motivated and happy.
2. Counselling session for staff by professional counsellors so that internal mental problem can be resolved and which will automatically lead to reduction in stress.
3. Changing discipline norms and make students punishable so as to reduce stress caused to teachers due to their misbehavior
4. Introducing regular yoga and meditation so as overcome the struggle and have a proper work life balance
5. Introducing faculty devlopemnt programs to provide information on overcoming stress
6. Work load of faculty members should be reduced and their additional burden should be minimized
7. Providing quality, me time to the faculty members so that they can enjoy the things they like to do
8. The college could try to create groups of teachers and make them work together. There should be regular change in the members of the groups to maintain friendly atmosphere. This will help to minimize the false commenting by one teacher over another

9. Organizing health and sports camps for teachers so that they are aware about their changing health requirement and they can take the required care.
10. It is ok to be imperfect and to believe to err is human as even teachers can make mistake at the same time college should ensure teachers should not be punished with written explanation memo over small mistakes.
11. College should try to find out if any teacher is facing some serious personal problems and try to provide solution to those problems so that the mental stress can be reduced.
12. Regular management and staff interaction should take place to make the right decision regarding policies and procedures.

Conclusion

The study shows that Repetition of work in different manner, Lack of salary according to qualification, Supervision duties of examination, Deadlines at work place and Heavy assessment workload were the top five factors out of selected that cause stress to the respondents. While Election duties, Lack of family support, lack of respect by the students, guiding research projects and Equated Monthly Instalments of different loans lowest five factors that affects stress to the respondents. Moreover, it can be seen that for "Equated Monthly Instalments of different loans" there is no difference in agreeableness that causes stress between male and female respondents. While for rest of the statement there is no significant different in agreeableness for selected factors that causes stress between male and female.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

Effect of Extracts of Marine Sponge *Axinella carteri* on Haemolytic and Haemagglutination Activity

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Abstract
Marine sponges are considered to be true "chemical factories" producing hundreds of unique chemical compounds, many of which have been isolated and their structure determined, but their biological roles and activities are still largely unknown. In the present study, extracts were prepared in aqueous and organic solvents and were tested for hemolytic, hemagglutinating and blood coagulation activity. Extracts of *Axinella carteri* in acetone and hexane did not cause haemolysis in human erythrocytes while DEAE methanol and DEAE chloroform cause minimum haemolysis. Maximum haemolysis occurred in crude extracts. Extracts of *A. carteri* showed absence of blood clotting as well as failed to agglutinate human blood. Therefore extracts could be used in surgical procedures to inhibit blood coagulation and further study is required to find the type of lectin present in it. This can help in finding and extracting materials from *A. carteri* for medicinal purpose and understand their biotechnological perspective.

Keywords: Marine sponges, *Axinella carteri*, Haemolytic activity, Blood coagulation, Haemagglutination

1. Introduction
Marine biodiversity is the result of a long evolutionary history and has been evolving and diversifying (Burgess, 2012). This amazing, but understudied, species diversity has provided a huge variety of molecules with biotechnological applications. Many of these compounds, which have already been isolated and studied, belong to marine invertebrates, such as sponges, cnidarians, mollusks, arthropods, echinoderms and tunicates (Rasjasa *et al.*, 2011). Among

these compounds are proteins (Pajic *et al.*, 2002) and secondary metabolites (Kuramoto *et al.*, 2004) with a wide range of biological activities.

Haemolysis is due to red blood cells destruction which results from lysis of membrane lipid bilayer. The haemolysis relates to concentration and potency of extract used and furthermore the chemical composition of each extract is related to the haemolytic activity. Various authors (Cariello and Zanetti, 1979; Makarieva *et al.*, 1983; Hirata and Uemura, 1986; Sepcic *et al.*, 1997; Newbold *et al.*, 1999; Rangel *et al.*, 2001; Kossuga, 2008) have reported haemolytic activity using sponge extracts.

The ability of the blood to undergo blood clotting whenever there is an injury to the tissue or blood vessel and then the subsequent dissolution of the clot following repair of the injured tissue is termed haemostasis. Various pharmaceutical compounds find their origins in plant material (Electricwala *et al.*, 1991). Novel anticoagulants of the plant *Jatropha curcas* L used as a haemostatic agent, was reported to have pro-coagulant abilities at high concentrations, but anticoagulant activity at low concentrations (Reddy *et al.*, 2011).

Hemagglutinins are proteins that possess a specific affinity for certain sugar molecules and may attach to receptor groups, if the lectin molecules have two active groups. It is characterised by their action on red blood cell membrane causing the red blood cells to clump together (Savage, 2003). Lectins from marine organisms are one of the promising candidates for useful therapeutic agents because carbohydrate structures, such as proteoglycans, glycoproteins, and glycolipids, have been implicated in certain cell types, and their physiological and pathological functions include host-pathogen interactions and cell-cell communication (Ogawa *et al.*, 2011).

The present study was undertaken to evaluate whether haem agglutination activity, haemolytic activity and blood coagulation takes place in human erythrocytes when they were treated with the extracts of *A. carteri.*

2. Materials and methods

The sponge *Axinella carteri* was collected from subtidal areas of the Arabian Sea at Khar Danda, Mumbai, India (latitude: 18.79 N and longitude: 72.92 E).

Preparation of Sponge Extracts:

10g each of the dried sponge sample was soaked in 200ml of methanol and 200ml of chloroform:methanol (2:1) and kept standing for 24 hrs (Purushottama *et al.,* 2009). Solvents were removed by squeezing the sponge samples and filtered through Whatman filter paper number 1. The solvents were evaporated at low pressure using Buchi Rotavapor R-200 (USA) at 45°C. The resultant compound was finally dried in a vacuum desiccator and labelled as crude methanol and crude chloroform:methanol extracts. These crude extracts were fractionated using hexane (non-polar) and acetone (semi polar). The crude extracts were also partially purified using DEAE Cellulose column chromatography using 0.2, 0.4, 0.6, 0.8 and 1.0 M NaCl in phosphate buffer.

2.1 Haemolytic activity

Human blood was obtained in EDTA solution (2.7 g in 100 ml of distilled water) as an anticoagulant at 5% of the blood volume and brought to the laboratory. 5ml of blood was collected in a tube containing heparin. The blood was centrifuged at 1500 rpm for three minutes in a laboratory centrifuge. Plasma (supernatant) was discarded and the pellet was washed three times with sterile phosphate buffer saline solution (pH 7.2) by centrifugation at 1500 rpm for 5 min. The cells were resuspended in normal saline to 0.5%.

In vitro haemolytic activity was performed by spectrophotometer method (Yang *et al.,* 2005). A volume of 0.5ml of the cell suspension was mixed with *A.carteri* fractions of hexane, acetone, DEAE methanol, DEAE chloroform methanol, crude methanol and crude chloroform:methanol of concentration 0.2 mg/ml, 0.4mg/ml, 0.6mg/ml, 0.8 mg/ml, 1.0 mg/ml in phosphate buffer saline. The mixtures were incubated for 30 min at 37^{o}C. The mixtures were centrifuged at 1500 rpm for 10 minutes. The free haemoglobin in the supernatant was measured in UV-Vis spectrophotometer at 540 nm. Phosphate buffer saline and distilled water were used as minimal and maximal haemolytic controls. Each experiment was performed in triplicate at each concentration. The level of percentage haemolysis by the extracts was calculated according to the following formula.

$$\% \text{ Haemolysis} = \frac{\text{Absorbance of sample} - \text{Absorbance of blank}}{\text{Highest Absorbance for positive control}} \times 100$$

2.2 Blood coagulation

Fresh blood samples were collected from pathology laboratory of Wockchardt Hospital, Mumbai. The procedure was followed using the protocol prescribed in United States Pharmacopoeia (1980). The blood samples were diluted with 8% sodium citrate in the proportion of 1:19 (v/v). It was then centrifuged and plasma component of the blood was separated. The *A.carteri* fractions of hexane, acetone, DEAE methanol, DEAE chloroform methanol, crude methanol and crude chloroform methanol of different concentrations (0.2 ml, 0.4 ml, 0.6 ml 0.8ml and 1.0 ml) were added to 1.0 ml plasma along with 0.2 ml of 1% calcium chloride solution. The clot formation was observed and noted in different concentration of various extracts.

2.3 Haemagglutination

Haemagglutination activity was performed by assay of haem agglutination as described by Mebs *et al*. (1985). Fresh blood sample of blood groups A, B AB and O were collected from pathology laboratory of Worckhardt Hospital, Mumbai. Fresh blood samples were centrifuged and the erythrocytes were separated. 2 % erythrocyte suspensions were prepared in phosphate buffer (pH 7.4). The *A. carteri* fractions of hexane, acetone, DEAE methanol, DEAE chloroform methanol, crude methanol and crude chloroform methanol samples were prepared in different dilutions. From each dilution 1 ml was added to erythrocyte suspension on a blood typing plate and was incubated at 37^{o} C. The plates were left undisturbed for 1 hr at room temperature in order to allow agglutination of the erythrocytes to take place. Positive and negative results were indicated by rough granules and smooth button formation.

3 Results

3.1 Haemolytic activity

The haemolytic activity of different fractions of *A. carteri* is shown in Table 1. It was observed that there was no haemolytic activity with hexane and acetone fractions, very low activity was observed with DEAE methanol and DEAE chloroform methanol fractions while a high activity was observed with crude methanol and crude chloroform methanol extracts. In the present study the haemolytic activity of *A. carteri* is

expressed as percentage haemolysis Figure 1 and reported as mean of three replicates.

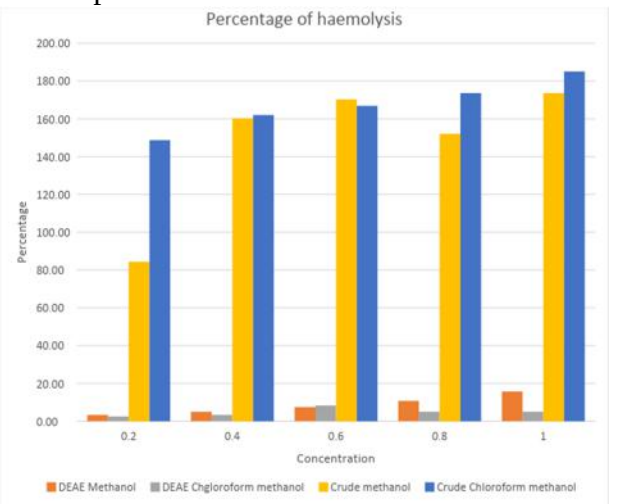

Figure 1: Percentage Haemolytic in different extracts of *Axinella carteri*

The lowest activity was observed with DEAE chloroform methanol with a percentage of 2.48%. The haemolytic activity was found to increase with the increase in concentration of fractions. The highest activity was found with crude extracts of chloroform and chloroform methanol. It also showed concentration dependent activity. Maximum activity was observed in chloroform: methanol with concentration of 1.0mg of about 185.12%. Crude methanol at concentration of 0.2 showed the least activity of 84.30% in crude extracts.

Table 1: Percentage Haemolytic activity in human erythrocytes in different extracts of *A. carteri*

Concentration	**0.2mg/ml**	**0.4 mg/ml**	**0.6 mg/ml**	**0.8 mg/ml**	**1.0 mg/ml**
Hexane	No activity	No activity	No activity	No activity	No activity
Acetone	No activity	No activity	No activity	No activity	No activity

Crude methanol	84.30	160.33	170.25	152.07	173.55
Crude chloroform methanol	148.76	161.98	166.94	173.55	185.12
NaCl M	**0.2M**	**0.4M**	**0.6M**	**0.8M**	**1.0M**
DEAE Methanol	3.31	4.96	7.44	10.74	15.70
DEAE chloroform methanol	2.48	3.31	8.26	4.96	4.96

3.2 Blood coagulation

The various crude and partially purified extracts like hexane, acetone, DEAE methanol, DEAE chloroform methanol, crude methanol and crude chloroform methanol did not have any effect with the human blood plasma. There was no coagulation observed with the extracts at various concentrations of 0.2 ml, 0.4 ml. 0.6 ml, 0.8ml and 1.0 ml.

3.3 Haemagglutination activity

There was no agglutination activity in the human blood of group A, B, AB, and O against the hexane, acetone, DEAE methanol, DEAE chloroform methanol, crude methanol and crude chloroform methanol extracts of *A. carteri.*

4 Discussions

In the present study of haemolytic activity on human erythrocytes with the extracts of *A. carteri*, it was found that the extract in crude methanol and crude chloroform methanol showed high level of haemolysis which exhibited concentration dependent haemolytic activity. This is in agreement with the results reported for haemolytic activity using the venom of *Palythoa caribaeorum*, a Cniderian (Lazcano-Perez *et al.*, 2018). DEAE methanol and DEAE chloroform showed some activity but it was comparatively very low. The extracts in hexane and acetone did not

have any effect on human erythrocytes. Many authors have observed the haemolytic activity of sponge extracts on erythrocytes of human and other animals. The results of haemolytic activity of sponge *Halichondria panicea* on human blood, chick blood and goat blood showed least activity with human erythrocytes compared to other animals (Prahalathan *et al.,* 2009). Studies indicated significant levels of haemolytic activity of the sponge *Renierasarai* extracts (Sepcić *et al.,*1997; Cariello and Zanetti, 1979) and moderate haemolytic activity of extracts from *Saracotragus muscarum* and *Aplysina aerophoba* (Sepcić *et al.,*1997). Haemolytic activity of halitoxin from sponges of the genus *Haliclona* (Schmitz *et al.,* 1978), of aqueous extracts from 48 tropical sponge species (Schmitz *et al.,* 1978) and of organic extracts of *Geodia corticostylifer* (Rangel *et al.,* 2001) were recorded.

It was observed that there was pronounced haemolysis in crude methanolic and chloroform- methanol extracts of *Halichondria panicea* (Purushottama *et al.,* 2009) with chicken blood and human blood while aqueous extract failed to elicit haemolysis in chicken and human blood which is in agreement with present study.

The present study on the effect of different extracts of sponge *A. carteri* on human blood plasma showed that there was no coagulation with any of the extracts indicating that *A. carteri* extracts have no effect on blood clotting. There may not be any compounds in *A. carteri* which can induce blood clotting as was observed in case of cuttlefish ink (Vennila *et al.,* 2011). Procoagulant activity observed in extracts may be due to presence of compounds which are calcium dependant prothrombin activator (Guerrero and Arocha-Piñango, 1992). Compounds known to suppress the extent of coagulation are the coumarins (Pochet, 2004). Warfarin is a coumarin that has the ability to inhibit vitamin K-dependent clotting factors, such as clotting factors II, VII, IX and X (Rang *et al.,* 2007). Normally surgical procedures require that any anticoagulant therapy should be ceased prior to undergoing the surgery, as the prolonged clotting time increases the risk of bleeding episodes (Cordier and Steenkamp, 2012). The extracts of marine sponge *Haliclona tubifera* were found to exhibit anticoagulant activity (Biegelmeyer *et al.,* 2015). The marine environment plays an important role in the search for anticoagulant products, and the vast majority of these compounds are polysaccharides (

Melo *et al., 2004;* Rocha *et al.,* 2005; Drozd *et al.,* 2006). Nevertheless, only a few anticoagulant products were isolated from marine sponges: A sesquiterpene from *Coscinoderma mathewsi* (Kimura *et al.,* 1998) and a peptide from the Australian sponge *Lamellodysidea chlore* (Carroll *et al.,* 2004).

Agglutination can be used to find the blood type and for estimation of number of virus particle (Wei and Koh, 1978). Haemagglutination activity is generated by protein and the protein found in sponges which show haemagglutination contain lectin. It is however pointed out that the size of such a protein varies and that some types of lectin may not trigger hemagglutination (Prahalathan *et al.,* 2009). Haemagglutination in twelve species of sponges was observed and found that it was different for different blood types suggesting the presence of lectin like molecules in the sponges (Moura *et al.,* 2015). Since the sponge *A. carteri* extracts failed to agglutinate human blood, it may be lacking lectins.

Conclusion

Extracts of *A.carteri* in acetone and hexane did not cause haemolysis in human erythrocytes while DEAE methanol and DEAE chloroform fractions resulted in minimum haemolysis. Maximum haemolysis occurred in crude extracts. Hence extracts of *A.carteri* can be used for therapeutic purpose with proper extraction and purification. Extracts of *A. carteri* showed absence of clotting of blood. Therefore, extracts could be used in surgical procedures to inhibit blood coagulation though it is not conclusive and requires further *Invivo* studies to determine the actual effect. The sponge *A. carteri* extracts failed to agglutinate human blood indicating that lectins may be absent or ineffective and further study in this regard is required. This can help in finding and extracting materials from *A. carteri* for medicinal purpose and understand their biotechnological perspective.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

Studies on *In vivo* and *In vitro* Immunomodulatory Activity of Extracts of the Marine Sponge *Axinella carteri*

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Abstract
Marine sponges are well known for their medicinal value. The present study involved the investigation of immunomodulatory activities of extracts of marine sponge *Axinella carteri*. The whole body Methanol and Chloroform:Methanol (2:1) extracts and the different fractions of *A. carteri* were tested for their effects on phagocytosis by *In vitro* and *In vivo* for its immunomodulatory potential. The *A. carteri* extracts in in-vitro study were found to show immune-suppression at low concentrations only in the hexane fraction while at higher concentration it possesses immune-stimulant activity for all the fractions. The pattern of activities observed in the male and female mice were comparable for the *In Vitro* studies. The highest phagocytic index was seen for the Chloroform:Methanol (2:1) hexane fraction as compared to the control. No particular pattern was evident for the other fractions. The standard drug, Cyclophosphamide showed the highest activity

Keywords: marine sponge *Axinella carteri;* immunomodulatory; phagocytosis

Introduction

Since ancient times, marine environment has been documented to be a valuable source of bioactive metabolites including antioxidants, polyunsaturated fatty acids (PUFAs) and sterols[1]. Marine sponges are one of the few a rich source of biologically active secondary metabolites with novel chemical structures. These naturally occurring bioactive substances often have no matches on earth. Sponges are found to be a rich source of bioactive compounds with anti-inflammatory[1,2] antitumor, immunosuppressive or neurosuppressive, antimalarial, antibiotic and antifouling agents[3-8] Immunomodulators are biological or synthetic

substances which can stimulate, suppress or modulate any of the immune system[9] The immunomodulatory activities of the methanolic extract derived from the dried sponge *Spongosories halichondriodes* with medicinal properties have been reported.[10]
The present study was attempted to assess the effect of extracts from the sponge *Axinella carteri* for their immunomodulatory activity on yeast *Candida albicans* and polymorpho nuclear leucocytes of human blood through *In vitro* bioassay. An *In vivo* bioassay for immunomodulatory activity of the sponge extract was evaluated on swiss albino mice of both the sexes.

Materials and Methods

The sponge *Axinella carteri* was collected from subtidal areas of the Arabian Sea at Khar Danda, Mumbai, India (latitude: 18.79 N and longitude: 72.92 E).

Preparation of Sponge Extracts

10g each of the dried sponge sample was soaked in 200ml of methanol and 200ml of chloroform:methanol (2:1) and kept standing for 24 hrs[11]. Solvents were removed by squeezing the sponge samples and filtered through Whatman filter paper number 1. The solvents were evaporated at low pressure using Buchi Rotavapor R-200 (USA) at 45 °C. The resultant compound was finally dried in a vacuum desiccator and labelled as crude methanol and crude chloroform:methanol extracts. These crude extracts were fractionated using hexane (non-polar), acetone (semi polar) and n butanol (polar). The crude extracts were also partially purified using DEAE Cellulose column chromatography using 0.2, 0.4, 0.6, 0.8 and 1.0 M NaCl in phosphate buffer.

Invitro study

Immunomodulatory activity was analysed through *In vitro* phagocytosis of *Candida albicans* by polymorphonuclear cells (PMN) slide method[12]. *C. albicans* cell pellets were resuspended in sterile Hanks balanced salt solution and human serum in proportion of 16:4 and cells were properly mixed in the vortex. Two or three drops of human blood obtained by finger prick method were collected on to a sterile glass slide. The clot was

removed very gently and the slide was slowly drained with sterile normal saline talking care not to wash the adhered neutrophils that were invisible. The slide was flooded with predetermined concentrations crude and fractions (1-5000µg/ml) as well as DEAE fractions of samples and incubated at 37^0C for 15 min, flooded with a suspension of *C.albicans* and incubated at 37^0C for 1 hour and then drained, fixed with methanol and stained with Giemsa stain. The mean numbers of phagocytosed cells on the slide were determined microscopically for 100 granulocytes using morphological criteria. This number was taken as the Phagocytic Index (PI) and was compared with the basal PI of controls. This procedure was repeated for different concentration of crude samples (1-5000µg/ml) in triplicate sets.

***In vivo* study**

In vivo phagocytic activity was determined by carbon clearance assay[13]. Animals consisting of swiss albino mice of either sex weighing 20±02g were procured from National Toxicology Centre, Pune. The animals were acclimatized for 10 days before being used for the experiments. They were housed in a room with controlled temperature (23±2°C) and a 12 hr light/12 hr dark cycle. The animals were fed with standard pellet diet and water *ad libitum.*

The experimental protocol was approved by the Institutional Animals Ethics Committee of the National Toxicology Centre, Pune and conducted according to the guidelines of the Committee for the Purpose of Control and Supervision on Experiments on Animals, India (Research Project number 39/1616.

There mice were grouped (n=3), into control group which did not received treatment while the Standard group was treated with cyclophosphamide 30 mg/kg by intra-peritoneal route. The animals in test groups were treated with 0.2ml p.o. methanol-hexane fraction, 0.4M, 0.6M, 0.8M, 1.0M chloroform DEAE, 0.4M methanol DEAE, 0.6ml methanol DEAE, 0.8 ml methanol DEAE 1.0 methanol DEAE and standard cyclophosphamide for 5 days. On the 6^{th} Day, mice were injected with 0.1 ml of 1% carbon suspension. Blood samples 25 µl were drawn from ROP at 0 and 15 min. The individual test was lysed with 2 ml of 0.1 % of sodium carbonate. Absorbance was measured spectrophotometrically

at 675 nm for determination of optical densities. The rate of carbon clearance, termed as phagocytic index (K) was calculated by following equation.

$K = (\text{In } OD_1 - \text{In } OD_2) / t_2 - t_1$

Where, OD_1- Optical density at t_1 means blood collected at 0 min.

OD_2- Optical density at t_2 means blood collected at 15 min.

Results and discussion

In-vitro study

The crude chloroform:methanol extract and the three fractions of *Axinella carteri* exerted immunosuppressive activity. The suppression of phagocytic activity was observed even at low concentrations of the sponge extracts. No immune-stimulation was observed in any of the fractions (Tab 1 -9).

The crude methanol extract exhibited immunostimulatory effect at 33.93% of magnitude. The immune-stimulation was observed upto 160µg/ml of extract but in decreasing way. The crude extract exerted immunosuppressive effect with increase in concentration. The butanol fraction exhibited immune-stimulation at 4.53% magnitude at 1µg/ml to 1.62% magnitude at 10µg/ml and with increase in concentration of extract exhibited immunosuppressive effect. The hexane fractions exhibited immunosuppression and immunostimulatory activity was not observed. The acetone fraction exhibited immunostimulatory effect at 22.54% of magnitude at lower concentration of 1µg/ml and exerted immunosuppressive effect at increasing concentrations.

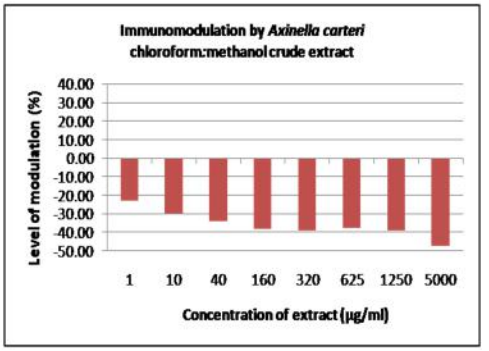
The DEAE fractions of methanol and chl:meth showed similar pattern but the activity observed was approximately 1.5 times higher than that of solvent fractions. Immunostimulatory activity at lower concentrations and immunosuppression at higher concentrations were observed with extracts of the sponge *Halichondria panicea*[14,11]. The results in the present study are contrary to those reported for the activity using salivary gland extracts of Octopus[15]. Components extracted from the marine sponge *Aurora globostellata* from Tuticorin, India showed immunosuppressant potential[3]. It has been reported that immunostimulants increase the resistance against diseases in fishes and therefore there was an excessive interest in the modulation of the non-specific immune response of fish to elevate the

general defence barriers[16,17]. The use of immune stimulants for prevention of diseases in fish is considered as an alternative and promising area[18]. Immunomodulatory effects of bioactive natural products from marine sources are very poorly studied and reported. The results of the *In vitro* PMN function test showed a significant decrease in the percentage of phagocytosis and phagocytic index for successive crude and fractionated extracts.

The results indicate that these extracts suppressed the phagocytic efficacy of the PMN cells by causing more engulfment of the *Candida* cells, thereby stimulating a non-specific immune response. These outcomes are encouraging enough to pursue structure elucidation of the active components.

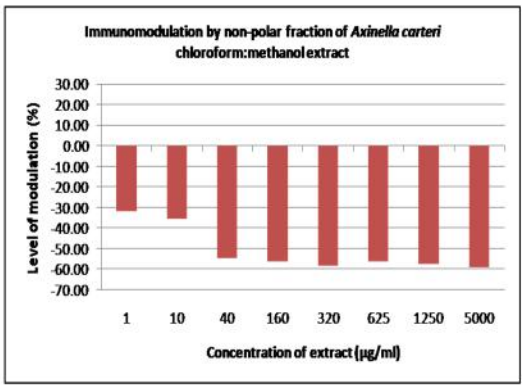
Tab:1 Immunomodulation by *Axinella carteri* chloroform:methanol crude extract

Concentration of *Axinella carteri* chloroform: methanol crude extract (µg/ml)	Phagocytosis %	Phagocytic index	% Modulation
1	70	1.73	-22.83
10	83	1.57	-30.08
40	78	1.47	-34.18
160	65	1.38	-38.19
320	63	1.37	-39.06
625	58	1.40	-37.65
1250	55	1.36	-39.12
5000	75	1.17	-47.62



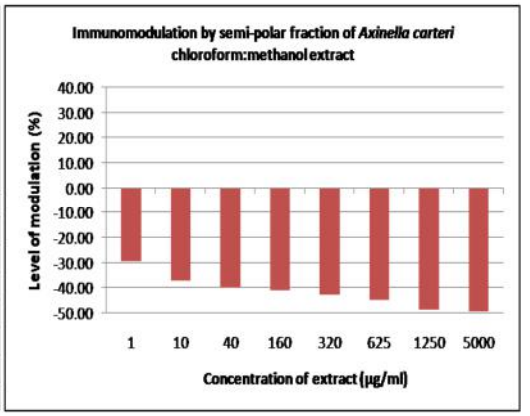
Tab:2 Immunomodulation by non-polar hexane fraction of *Axinellacarteri* chloroform:methanol extract

Concentration of non-polar fraction of *Axinella carteri* chloroform: methanol extract (µg/ml)	Phagocytosis %	Phagocytic index	% Modulation
1	68	1.53	-31.72
10	61	1.44	-35.60
40	55	1.02	-54.55
160	43	0.98	-56.40
320	43	0.93	-58.47
625	40	0.98	-56.47
1250	38	0.95	-57.71
5000	35	0.91	-59.18



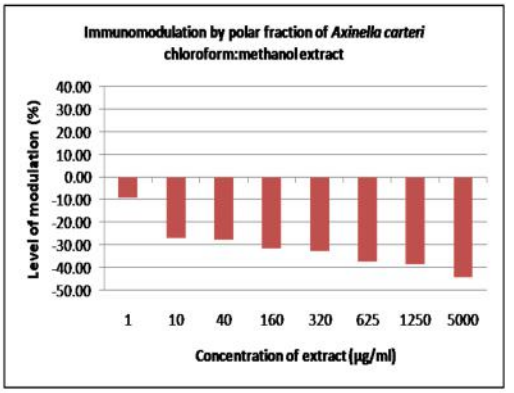
Tab:3 Immunomodulation by semi-polar acetone fraction of *Axinella carteri* chloroform:methanol extract

Concentration of semi-polar fraction of *Axinella carteri* chloroform: methanol extract (µg/ml)	Phagocytosis %	Phagocytic index	% Modulation
1	87	1.57	-29.70
10	79	1.41	-37.27
40	73	1.34	-40.07
160	69	1.32	-41.12
320	68	1.28	-42.88
625	65	1.23	-45.05
1250	69	1.14	-48.89
5000	69	1.13	-49.53



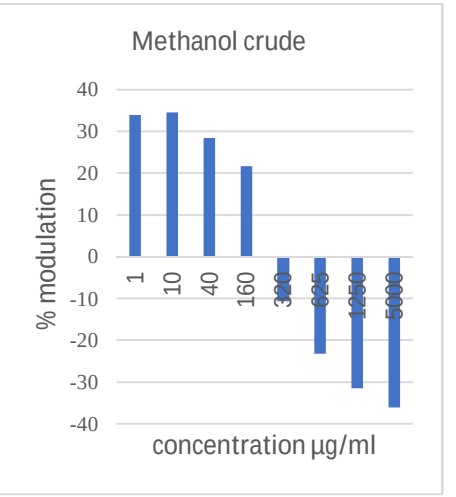
Tab:4 Immunomodulation by polar n butanol fraction of *Axinella carteri* chloroform:methanol extract

Concentration of polar fraction of *Axinella carteri* chloroform: methanol extract (µg/ml)	Phagocytosis %	Phagocytic index	% Modulation
1	84	2.04	-9.12
10	74	1.63	-27.03
40	63	1.62	-27.72
160	62	1.53	-31.60
320	61	1.51	-32.67
625	60	1.40	-37.50
1250	57	1.38	-38.47
5000	52	1.25	-44.39



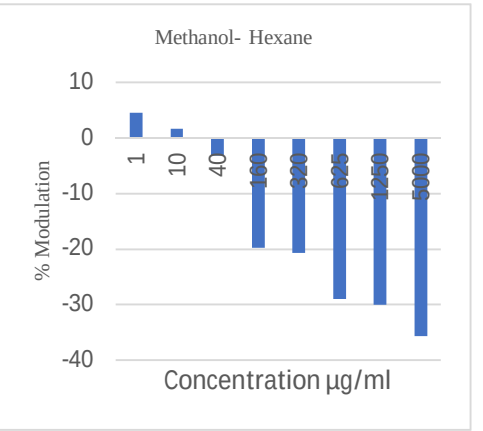
Tab: 5 Immunomodulation by *Axinella carteri* methanol crude extract

Conc. Of *A. carteri crude* methanol(µg/ml)	Phagocytosis%	Phagocytic index	% Modulation
1	88	3	33.93
10	87	3.01	34.44
40	73	2.88	28.42
160	62	2.73	21.69
320	61	2	-10.71
625	61	1.72	-23.16
1250	58	1.53	-31.5
5000	37	1.43	-36.05



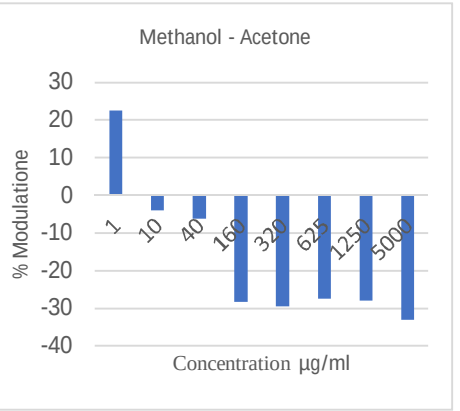
Tab: 6 Immunomodulation by hexane fraction of *Axinella carteri* methanol crude extract

Conc. Of *A. carteri* methanol Hexane(µg/ml)	Phagocytosis %	Phagocytic index	% Modulation
1	82	2.32	4.53
10	76	2.28	1.62
40	71	2.17	-3.17
160	69	1.8	-19.77
320	67	1.78	-20.71
625	61	1.59	-29.01
1250	60	1.57	-30.06
5000	52	1.44	-35.61



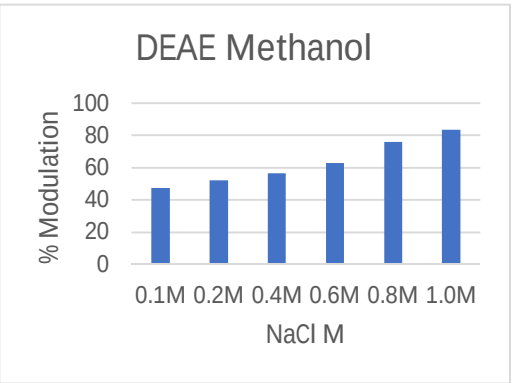
Tab: 7 Immunomodulation by acetone fraction of *Axinella carteri* methanol crude extract.

.Conc. of *A. carteri* methanol - Aetone(µg/ml)	Phagocytosis %	Phagocytic index	% Modulation
1	98	2.74	22.54
10	86	2.15	-3.97
40	79	2.1	-6.19
160	71	1.61	-28.32
320	69	1.58	-29.48
625	64	1.63	-27.46
1250	44	1.61	-27.96
5000	40	1.5	-33.04



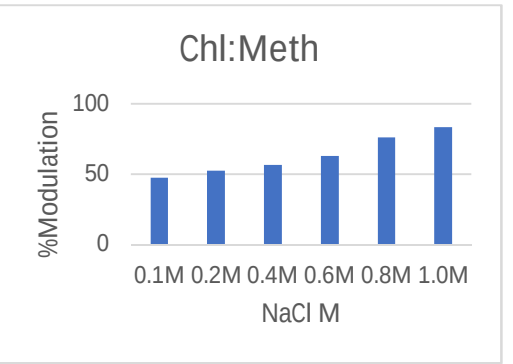
Tab: 8 Immunomodulation of Methanol DEAE Fractions

Conc. Of *A. carteri DEAE* methanol	Phagocytic index	% Modulation
0.1M	0.15	33.33
0.2M	0.18	44.44
0.4M	0.24	58.33
0.6M	0.35	71.43
0.8M	0.42	76.19
1.0M	0.65	84.62



Tab 9: Immunomodulation of Chl:Meth DEAE Fractions

Conc. Of *A. carteri DEAE Chl:*meth	Phagocytic index	% Modulation
0.1M	0.11	47.37
0.2M	0.14	52.38
0.4M	0.16	56.52
0.6M	0.19	62.96
0.8M	0.2	76.19
1.0M	0.21	83.61



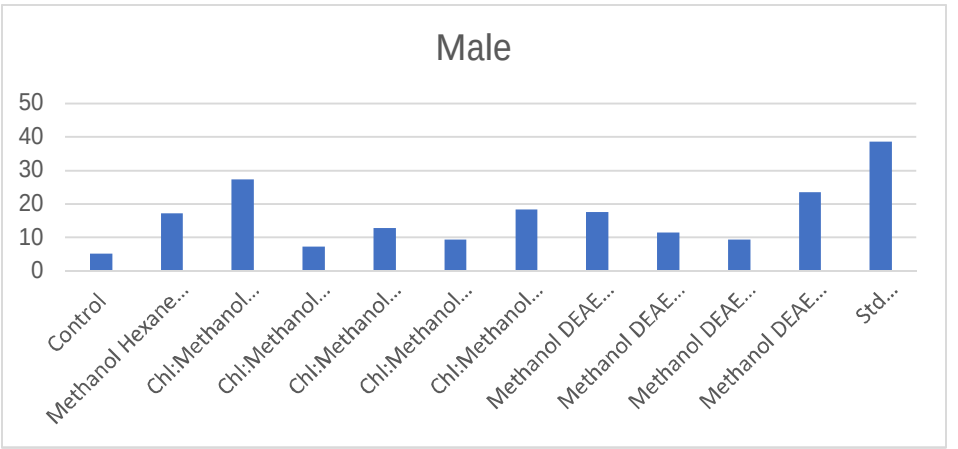


Fig 1: *In vivo* Phagocytosis index in male albino mice using carbon clearance assay in partially purified extracts of *A. carteri*.

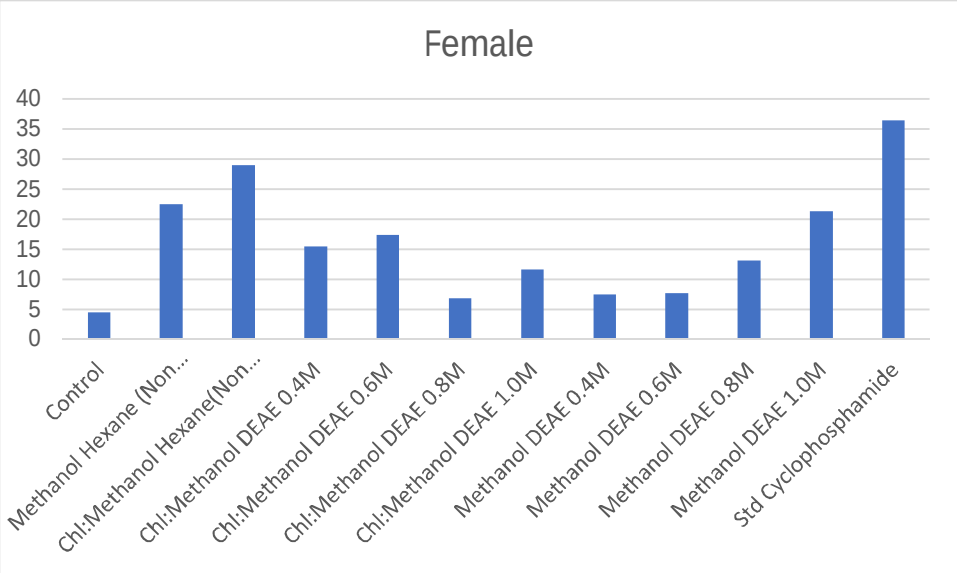


Fig 2: *In vivo* Phagocytosis index in female albino mice using carbon clearance assay in partially purified extracts of *A.carteri*.

***In-vivo* study (Fig 1 & 2)**

The in-vivo study of phagocytosis index by carbon clearance was done on swiss albino male and female mice. High phagocytic activity was observed in Hexane extract with a value of 28.96% in female and 27.43 % in male. It was followed by 1ml DEAE Methanol extract having a value of 23.46% in male and 21.35% in female. The highest phagocytic activity of 38.55% in male and 36.41% in female albino mice was observed in Standard cyclophosphamide. No in-vivo phagocytic activity was detected in acetone extract, crude methanol and crude chloroform methanol extracts of *A.carteri.*

The new strategy for the treatment of various diseases like infections, tumours autoimmune diseases etc. can be developed through studies on immune system. The enhancement of immune system is called immune-stimulation and implies stimulation of the function and efficiency of the granulocytes, macrophages and complement etc., while immunosuppression implies mainly to reduce resistance against infections, stress or chemotherapeutic factors. In the present *In-vitro* study the extracts of sponge *Axinella carteri* in Hexane, acetone, DEAE methanol, DEAE chloroform and crude chloroform:methanol extract was

found to supress the immune system. The crude methanol extract showed immunostimulatory activity at lower concentration while at higher concentrations it was found to reduce the phagocytic effect thus causing immunosuppression. The *A.carteri* extract can thus enhance phagocytic activity of polymorphonucleocytes (PMN) cells by causing more engulfment of *Candida albicans*. This extracts can thus be used in therapeutic medicines to improve the functioning of immune system.

In-vivo study by carbon clearance extract revealed that Hexane extract and Crude methanol extract in lower concentration can stimulate immune response. DEAE chloroform extract can increase the immunostimulation with slight increase in concentration while DEAE methanol was found to be immunosupressent even with slight increase in concentration. It has been suggested that in I*n-vivo* assay macrophages probably secrete a number of cytokines which in turn stimulate other immunocytes and give host the defence ability to encounter the infectious stress[19].

4 Conclusion

The study shows that the extracts of *A.carteri* are dose dependent and their effect on the immuno response can be determined by studying the effect of different doses. The *A. carteri* extracts in *In-vitro* study was found to show immuno suppresion. *In-vivo* study also indicates immuno stimulant effect but only in DEAE chloroform and DEAE methanol extract at low concentration while crude chloroform was not found to have any effect on immune system. The standard cyclosphosphamide was found to show high activity compared to other extracts. The use of *A.carteri* extract needs further detailed investigations for understanding its role in immunomodulation and its use in therapeutic medicine.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

Antioxidant potential of soybean (*Glycine max*) grown under waterlogging stress

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Abstract
Analysis of antioxidant potential was carried out from soybean to determine the effect of herbal extracts (UltraSil and UltraK) and PGRs like GABA (Gamma amino butyric acid), Putrescine, and Biotonic under waterlogged conditions. Foliar sprays of above herbal extracts and PGRs were given at 20 DAP and 45 DAP of soybean seedlings. The foliar application of 0.3% UltraSil, 0.2% UltraK, 10 ppm GABA, Putrescine and 100 ppm Biotonic were applied to both normal and waterlogged plants. It was noticed that H_2O_2 , OH^- and NOx, radical activities were induced due to waterlogging stress as compared to control. This elevation in H_2O_2, OH^- and NOx, radical scavenging activities were due to application of UltraSil, UltraK, GABA, Putrescine and Biotonic. This will helps to improve waterlogging tolerance of sensitive soybean.
Key words: H_2O_2, OH^- and NOx, Putrescine and GABA.

Introduction
In many abiotic stresses ROS are the main cause of serious damages to the membrane systems of various cell organelles in plants. According to Shewfelt and Purvis, (1995) during waterlogging ROS causes enzyme inactivation, lipid peroxidation and oxidative damages to DNA. By scavenging of the free radicals it prevents the oxidation of biomolecules. (Shenoy and shirwaikar,2002). Antioxidative enzymes and low molecular weight metabolites like ascorbic acid, glutathione, proline and glycine betaine are also take part in detoxifying various ROS.
Soybean is an important, protein rich, oil yielding crop. Soybean fulfils the major requirement of protein and minerals in the nutrition of human diet. PGRs have an antioxidative properties that can reduces the effects of

stress. Hence an attempt has been made to study the effect of herbal extracts and PGRs on antioxidant potential under waterlogging stress conditions of important oil yielding crop soybean.

Material and Methods

The present study was conducted in the field of Botany Department at Shivaji University, Kolhapur. Seeds of soybean (Variety JS-335) were sown in the twelve pots with two replications (first 6 with normal irrigation and other 6 with water logging stress). The seeds were allowed to grow for 20 days with equal irrigation of tap water in both the replications. First spray was given at 21st day with 0.3% Ultrasil (*Adhatoda vasica, Cardiospermum halicacabum, Embelia ribes* and Aqua solvent), UltraK 0.2% (*Adhatoda vasica, Catharanthus tinctorius, Embelia ribes* and Aqua solvent) and PGR such as 10 ppm GABA, Putrescine and 100 ppm Biotonic formulation (Cystein, Methionine, Lysine, Valine, ABA, vitamins Nicotinic acid and Riboflavin, Saccharides (Myoinositol), Cytokinine (6 BA) and BSA) respectively to the each pot of normal & waterlogged stress. The same sprays were repeated on 35th days flowering stage. After 2nd spray waterlogging stress was applied for 6 days to the second replication (6 spots). The influence of foliar application of0.3% UltraSil, 0.2% UltraK, 10 ppm GABA, Putrescine and 100 ppm Biotonic on radical scavenging potential of soybean were studied separately for normal irrigated and stress pots.The methods given by Anwar *et al.,* (2006) and Sultana *et al.,* (2008) were followed for the preparation of methanolic extracts. The analysis were carried out to find antioxidant potential by using assays like in H_2O_2, $OH^-$and NOxradical scavenging activity. H_2O_2 radical scavenging activity was determined according to method given by Govindrajan *et al.,* (2003). The method described by Halliwell *et al.,* (1987) was followed to find out OH_2^-radical scavenging activity, and Singh *et al.,* (2009) described the method for estimation of NO scavenging activity was applied.

Results and discussion

The H_2O_2 radical scavenging activity was increased in leaf and root tissue of soybean under waterlogging stress. Further foliar applications of herbal extracts and PGRs was also effective to increase in all waterlogged plants of soybean. (Fig. 1)

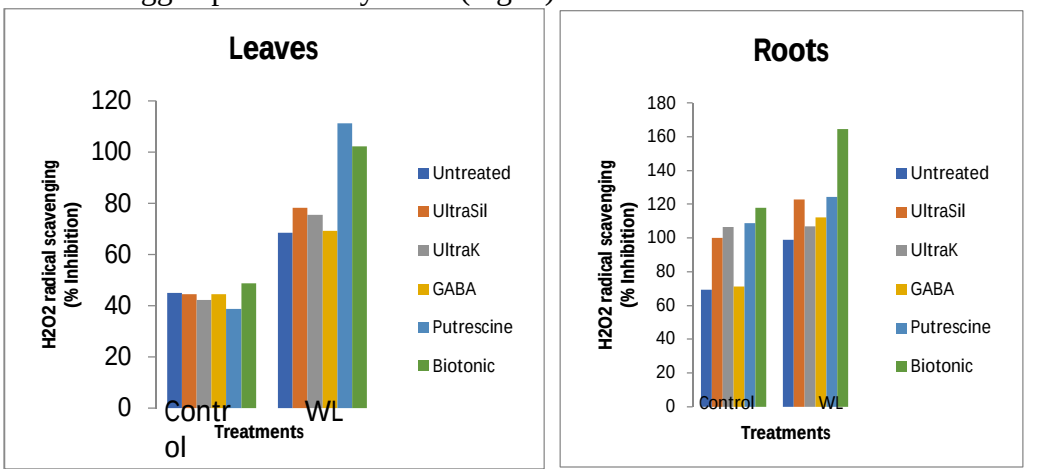

Figure:1. Effect of foliar sprays of UltraSil, UltraK, GABA, Putrescine and Biotonic on H_2O_2 radical scavenging activity of the leaves and roots of soybean under unstress and waterlogging condition

Gill and Tuteja, (2010) noticed that at low concentration H_2O_2 act as signalling molecule for triggering tolerance to various biotic and abiotic stresses.Waterlogging increases rate of superoxide radicals and their products, H_2O_2, can directly attack membrane lipids and inactivate SH-containing enzymes in mungbean and citrus (Ahmed *et al.*, 2002)El-Enany, *et al.*, (2013) noticed that H_2O_2 was increased significantly in shoots and roots of cow pea plants due to waterlogging as compared to control. Exogenous application of polyamines reduced the formation and accumulation H_2O_2 in *Salvinia natans* (Mandal *et al*., 2013)
During waterlogging, the OH^- radical scavenging activity was increased

significantly in leaf tissue and decreased slightly in root tissue of soybean. The foliar applications of herbal extracts and growth regulators increases percentage of OH^- radicals scavenging under waterlogging conditions. (Fig. 2)

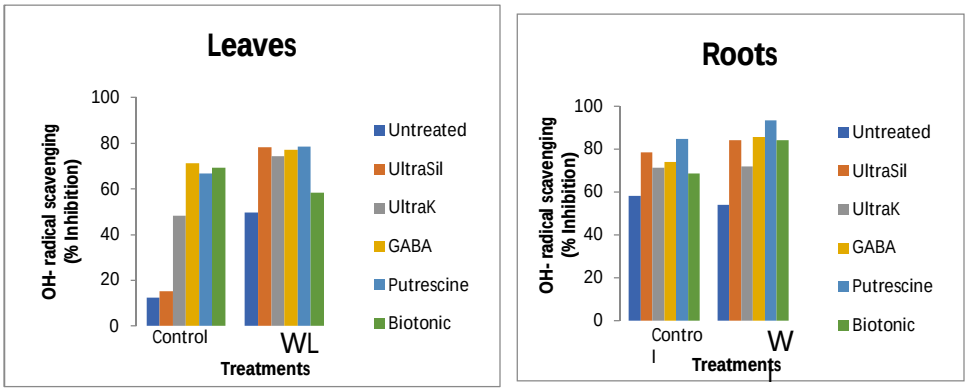

Figure:2. Effect of foliar sprays of UltraSil, UltraK, GABA, Putrescine and Biotonic on OH- radical scavenging activity of the leaves and roots of soybean under unstress and waterlogging condition.

According to Smirnoff and Cumbes, (1989) hydroxyl radicals generated in Fenton type reactions. Hydroxyl radicals causes damages to DNA, proteins and lipids and get neutralize if provided with H atom (Spencer *et al*., 1994). Ha et al., (1998) reported that polyamines act as scavengers of hydroxyl radicals. GABA application effective in scavenging OH^- radicals (Smirnoff and Cumbes, 1989).

During waterlogging, the NOx radical scavenging activity was increased significantly in leaf tissue and root tissue of soybean. The foliar applications of herbal extracts and growth regulators increases NOx radicals scavenging activity in unstressed and waterlogging conditions. (Fig. 3)

Nitric oxide is smaller, unstable and highly diffusible free radical. According to Beligni and Lamattina, (1999) NOx able to destruct ROS and involved in cytotoxic processes mediated by plant tissue. During hypoxia nitrate reduced to Nitric oxide by nitrate reductase and

subsequent oxidation through oxyhaemoglobin are important mechanism to maintain plant cell energetics (Igamberdiev and Hill, 2004). Waterlogging induces NOx production in soybean nodules and that NO is generated from bacteriodal denitrification during hypoxia (Meakin *et al.*, 2007)

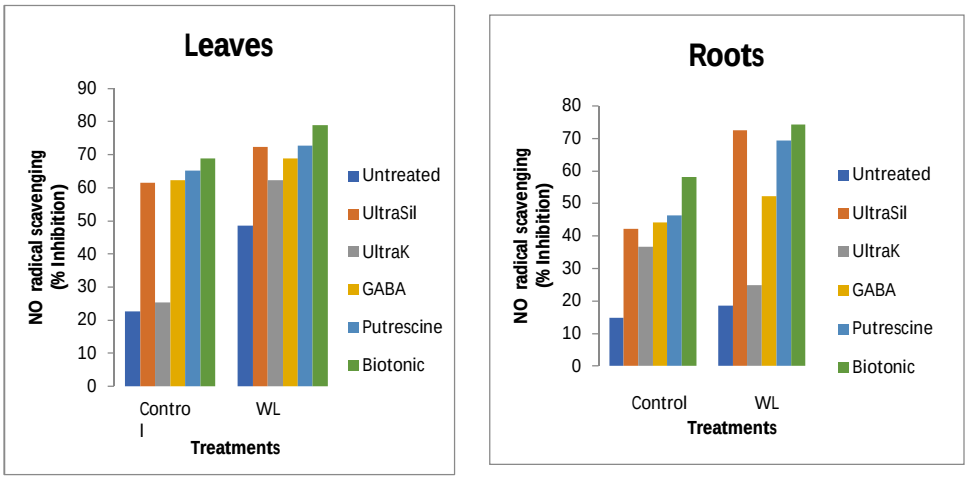

Figure:3. Effect of foliar sprays of UltraSil, UltraK, GABA, Putrescine and Biotonic on NO radical scavenging activity of the leaves and roots of soybean under unstress and waterlogging condition.

The foliar application of herbal extracts and growth regulators considerably increases hydrogen peroxide radical scavenging percentage. The higher potential of hydrogen peroxide radical scavenging in root and leaf tissue might be helpful for reduction of H_2O_2 production. Thus the overall scavenging of H_2O_2 was reduced under waterlogging conditions which might be helpful for reducing its toxic effects on membrane and cell organelles of waterlogged soybean.

The foliar application of herbal extracts and growth regulators shows increase in percentage of OH- radicals scavenging under waterlogging conditions. The higher percentage of OH- radicals scavenging was noticed in waterlogged soybean leaf tissue. The OH- radicals are toxic to the lipid molecules in membranes and damages the integrity membrane structure.

Thus the scavenging of OH- radicals under waterlogged conditions might be helpful for the improvement of waterlogging tolerance of soybean.
The foliar application of UltraSil, UltraK, GABA, Putrescine and Biotonic formulation results in an increase in the NO scavenging activity in unstressed and waterlogging leaves and roots of soybean.The elevation in NO scavenging percentage which might be found beneficial for the protection of various biomolecules from its adverse effects.
Increase in H_2O_2, OH_2^- and NOx radical scavenging activity in waterlogged stressed as well as foliar sprayed waterlogged and unstressed soybean plants. It will found beneficial for the improvement of waterlogging tolerance of soybean and protection of various biomolecules from adverse effects.

Acknowledgement
Authors are very much thankful to Prof. P. D. Chavan, Prof. G. B. Dixit, Prof. S. S. Kamble, Prof. S. R. Yadav, Prof. D. K. Gaikwad, Head deparment of Botany, Shivaji University, Kolhapur for their kind help and support during the preparation of this manuscript.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

In vitro Germination of Fresh and Stored Pollen Grains in *Manilkara zapota*, (L.) P. Royen

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Abstract

The aim of present study is In vitro germination of the pollen grains in *Manilkara zapota*, (L.) P. Royen **Chiku** by using "Hanging Drop Method"(Shivanna and Rangaswamy, 1992). Pollen grains are resting plant organs for In vitro germination uptake of water leads to swelling of the grains and their activation. Therefore, Humidity is a first essential requirement for pollen germination. Other factors which have been found important for pollen germination and pollen tube growth are 1) Carbohydrates –for germinating pollen grains sugar is always necessary it controls osmotic pressure and it serve as respiratory substrate. It prevents the bursting of pollen. Many sugars tested for their ability to promote pollen germination and tube growth sucrose is most effective.

2) Boron- In the form of boric acid has most differentiating effect on pollen germination and pollen tube growth. Boron (10-20ppm) is supplied exogenously. Boron reduces bursting of pollen tubes as well as enhances percentage germination and pollen tube growth.

3) Calcium-on calcium supplemented following features are noticed:

a) The growth of pollen tube is more vigorous.

b) Pollen tubes are more straight and rigid.

The effect of either sucrose or boric acid individually showed good result but sucrose in combination with boric acid and calcium enhances pollen germination as well as pollen tube growth development. Freezing temperature 6^0C and high relative humidity (RH) 55 to 80% seems to be the best method to maintain pollen viability of stored pollen grains for a long period (7 days) of time. During this study, it was observed that low

temperature and high relative humidity is better than the high temperature and low humidity with respect to pollen germination capacity.

Keywords: Chiku, Germination, *In vitro*, Palghar.

Introduction

Pollen is a unique cell that potentially can be used and manipulated to the advantage of the geneticist, breeder, physiologist and farmers. Pollen is a haploid and independent. The ability of pollen to germinate on artificial media is used as a test of viability. The pollen grain used to transport the male gamete to the female part of a flower that is ovule, plays vital role in fertilization (Patel et al., 2012). High crop yield generally depend viable pollen grains. Pollen tube germination can be affected by many factors, including temperature, availability of sucrose, calcium and boron (Sawadis, 1995; Taylor et al., 1997). Calcium is required for maintenance of membrane integrity (Kell et al., 1990; Sheen et al., 1992). Boron is required for the growth and development of vascular plants (Cakmak et al., 1995).

The literature on pollen storage has been reviewed by Visser, (1955), Aslantus & Pirlak, (2002), Bomben et. al. (2006), Dutta et al (2013). Many researchers have same consensus that low temperature and high humidity are the two major factors in storage of pollen grains for a long period of time (king, 1961, Ganeshan, 1986; Shivanna & Rangaswamy, 1992). Last 2-3 decades the tropical tree of *Manailkara zapota* (L.) P.Royen **(*Chiku*)** it is an important fruit trees all over South East Asia grown in home gardens, orchards and plantation. The largest producers of sapodilla fruit are India. It has represented an important species in many rural communities in Palghar District because of local uses as a food and medicine. It is very important commercially as the source of an edible fruit, a latex and timber. The edible fruit is greatly enjoyed and very widely eaten in the tropics. The tree is widely cultivated commercially and in gardens in the tropics for this fruit and also for the latex contained in the sap.

Materials and Methods

In flowering period July and August as well as November and December are shown more flowering but the flowering is observed throughout the year in low quantity of the *Manilkara zapota*, (L.) P. Royen ***(Chiku)***. Pollen grains were collected in the morning time in between 6 a.m. to 7 a.m. in large quantity from the campus of S.D.S.M.College, Palghar, around 200 plants are cultivated. Some Pollen grains were stored in a refrigerator at 6^0C and some are used for the process of germination by hanging drop method in this process the cavity slides are used. The drop of sucrose solution placed in the center of cover slip and the pollen grains are dusted in this sucrose solution drop then the cavity side is inverted on cover slip after applying petroleum jelly on the border of cavity slide it helps sealing of the cover slip. It involves suspending the pollen grains in a drop of nutrient medium (on a cover glass) hanging over a shallow depression. The cavity slides along with the culture medium and pollen grains incubated in humidity chamber at dark places in the Botany laboratory. The pollen germination media was prepared by different percentage of Sucrose Solution (1%-20%). The germination were scored after 2-3 hours of incubation at room temperature in humid chambers. Pollen tube equal to twice diameters of pollen were counted as germinated while other pollen grains were considered as ungerminated. The stored pollen grains are also tested for germination process.

Result and Discussion

During this study, Researcher was observed that freshly 80% pollen grain was germinated in 3 % sucrose solution while stored pollen grain (6^oC) observed 44% of germination in same concentration.

Table No. 01 shows the percentage of Germination of fresh Pollen Grains

Sample Numbers	Different Sucrose concentration	% of Germination
01	1	30
02	2	56
03	3	80
04	4	71
05	5	52
06	6	35
07	7	30
08	8	22
09	9	18
10	10	16
11	11	12
12	12	10
13	13	06
14	14	06
15	15	04
16	16	02
17	17	00
18	18	00
19	19	00
20	20	00

Table No. 02 shows the percentage of Germination of stored Pollen Grains after 04 days

Sample Numbers	Different Sucrose concentration	% of Germination
01	1	15
02	2	27
03	3	22
04	4	35
05	5	26
06	6	17
07	7	15
08	8	11
09	9	09
10	10	08
11	11	06
12	12	05
13	13	03
14	14	03
15	15	02
16	16	01
17	17	00
18	18	00
19	19	00
20	20	00

Table No. 03 shows the percentage of Germination of stored Pollen Grains after 06 days.

Sample Numbers	Different Sucrose concentration	% of Germination
01	1	13
02	2	25
03	3	37
04	4	68
05	5	24
06	6	15
07	7	13
08	8	09
09	9	07
10	10	07
11	11	04
12	12	03
13	13	02
14	14	02
15	15	01
16	16	01
17	17	00
18	18	00
19	19	00
20	20	00

Conclusion

The pollen grains can be transported from place to place after maintaining the humidity and temperature. This knowledge is useful for the fertilization as well as hybridization. Indirectly, this knowledge helpful to increase the crop production.

Acknowledgement

I am thankful to Dr. Kiran Save Principal of Sonopant Dandekar College and the Management of the Sonopant Dandekar Shikshan Mandali Palghar for permitting me to enter the Chikoo garden and collection of flowers and pollen grains , non teaching staff of botany laboratory for the preparation of sucrose medium for the research purpose and other type of help.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

A New Way towards India and Israel Bilateral Relationship

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Abstract

India and Israel both countries share an extensive relations on the global platform in innumerable areas like economic, military and strategic partnership. They also focus on newly emerging areas like tourism, water management, agriculture and other developmental spheres. Both nations share old socio-cultural relations which are documented in historical literature. There was a brief period of cold war politics which kept both the nation away. However, in the post disintegration years, India maintained its relations with Israel like any other Asian nations. As an important nation of Asia and the world, India designates Israel as significantly important partner country.

The cold war witnessed a different mode between relations of both nations due to Palestinian and Israeli conflict. The phase of 1950s to 1990s remained informal as the political heads were not willing to establish direct formal relations with each other. After the end of cold war with changing situations both came together. Till now both of them have strategically preserved their relations. The different ways were opened up in multiple links like diplomatic relations, military and strategic ties, trade and economy, scientific progress and technological developments. As mentioned above, new ties have been established in contemporary areas like tourist industry, water management, and healthcare and agriculture cooperation.

Israel and India today share warm and cordial relations. By considering the strategic importance of both countries they are looking forward to concretize their relations in trade and investment. Greater partnership between the two countries will definitely facilitate and boost the economies of both the countries. Both need to explore the common threats and should take steps to curb them jointly. In the years to come, the Indian talent and Israeli technology will be the best combination to deepen the ties.

Keywords – Diplomacy, Strategic interest, Defence, Trade and investment, Tourism, Technology, Agriculture

Introduction

A historic milestone was established with a six day visit of Prime minster of Israel to India. Though the relations between India and Israel have boomed up after the cold war period, they started since cold war. Rather India shared its close links to the other Asian states since ancient time. On 17th September 1950 India formally has recognized the existence of Israel. As soon as India gave its consent, thereafter the Jewish agency has established an immigration office which further converted into a trade office later became a Consulate.

Both the countries are having commonalities in multiple senses. They have passed through the nationalization process in which religious factor and communities were prominent one. The conflict between religious communities existing between both the nations (viz. Hindus and Muslims in India and Jewish and Palestinians in Israel) have largely affected not only the domestic politics at internal level but also has put an impacts on their external relations. Both the countries have shared the common security concerns related to the Islamic terror support. With the same the neighborhood of both of them was problematic at a certain point. Though both of them have received their independence from the British colonialism in 1947 and 1948, still it took nearly four decades to engage with each other. Today, India and Israel are now progressing in terms of starting ups in various emerging sectors.

Research Methodology

The scholar has tried to use descriptive and analytical methods of research paper writing.
For the same the researcher has used the secondary data from various governmental sites, books and other online sources.

Historical background

The historical relations can be traced way back in centuries. However, India recognized the Israel as an independent state on 18th September, 1950 under Prime Minister Pundit Nehru. Still the relationship of these two countries did not geared up immediately. Rather the traces of partition had an impact on the foreign policy of India which was pro Palestinians. "The Pro Arab foreign policy not only became a party consensus but also became an integral part of the Congress party ethos." [1] Also during indo china war and India Pakistan wars India purchased weapons and arms ammunitions from Israel. This phase also includes the meetings of foreign ministers but did not render any fruitful output as such. As the phase witnessed the cold war period politics, India being a leader of Non Align Movement (NAM) and its closed relations with the Arab world and Soviet Union was bearing the weight on one side. On the other hand side Israel had developed its closed relations with the opposite superpower and the other capitalists' western allies.

Besides their ups and downs, the relations were boomed up after the end of cold war which led India to change its foreign policy towards its neighbors. The changes in international order after the Gulf War and collapse of the USSR brought India and Israel together to normalize their relations. The formal relations were put forth officially in May 1992 which facilitated various areas of cooperation like defense, security issues, technology exchanges and internal security managements. Since the relations started grooming, India which was earlier anti Israeli now changed its turn towards pro Israel. It started taking position in the United Nations platform and Non Alignment Movement meetings to moderate the anti Israeli relations.

Significance of the Relationship

The relationship of India and Israel is significant from many angles. As India was put under the sanctions imposed by international regimes, Israel was the one who forth come to sell the weaponries in times of India's need. It was proved in Kargil War of 1999. Even today Israel and India conducts their crucial defense trade with each other. Another significance of their relationship is in spite of having differences of opinions over the Palestinian issue both countries are cooperating and holding their relations. India's support for Palestinians was seen in its pro- Arab policy as being sensitive towards Muslims community. But in later period it became distinct as India Israel started getting up with each other. For the improvement of areas like water management provisions and agricultural crisis India is strengthening its ties with Israel so that it can implement the solutions successfully. The major significance of their bilateral relationship is they not only had cooperated over the domestic areas but also the on the external affairs and their changing global power equations and according to their strategic interests. Though India publicly kept distance from Israel, they had already made a beginning to develop their relations with Israel before establishing an embassy in New Delhi. Thousands of Indian Jews started travelling to Israel. The deep ties of cooperation can be traced through the following areas.

Defence Co-operation

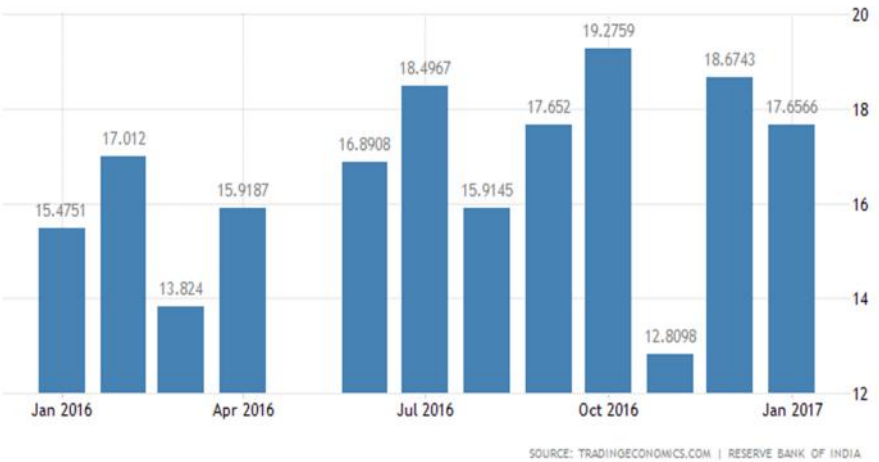
The very important aspect of India Israel relations is security and defense. "In the early 2000s, the Indian army declared its intensions to implement a modernization program to which resources of 10s of billions of dollars would be allocated. Since then, defense deals with Israel have grown exponentially." [2] Technological advancement plays a crucial role in modernization of defense equipments which Israel sells to other countries. Recently India and Israel have signed a deal to strengthen their defense ties. "The defence contract was preceded by the conclusion of a $ 777 million deal, signed on 25th October, 2018 between IAI (Israel Aerospace Industries) and BEL (Bharat Electronics Limited) for the supply of four Barak 8 LR SAM systems to the Indian Navy." [3] Like Rafael advanced defense system Israel and India's DRDO had jointly developed this Barak 8 LR SAM missile. It was successfully tested by the Indian navy. Besides

this India and Israel had signed various bilateral agreements related to arms and ammunitions. Also both of them are working on the up gradation of the weapons together. Indian envoy while participating in panel discussion of annual AIPAC 2019 Conference regarded Israel as a reliable defense partner.

Economic Co-operation

For commercial activities the resources and opportunities can be explored in both the countries like a huge market can be certainly helpful for the Israeli entrepreneurs and vice-a-versa India can be benefited through the vast research and development department which is actively existing and performing in the industries and institutions. The trade of diamonds dominates. However, with the same sectors like water management, clean technology, medical instruments, biotechnology, nanotechnology and training sessions are some of the areas of economic exchanges.

India and China are the largest trading partners of Israel. This trade as affected in the period of global recession in 2008. Later some initiatives are been taken by the Israel government to gear up the commercial relations. Both the countries have signed free trade agreements. As far as investment is concerned some Indian companies (like Wipro, Tech Mahindra, Infosys) have invested in different spheres irrigation, pharmaceuticals, engineering etc. similarly some Israeli private entrepreneurs have invested in telecom sector, energy, water management technology and interestingly they are planning to set up research and development centers as well as production units in India. Apart from this direct investing, the FDI from Israel to India comes through foreign countries like US and EU.



As close allies of the capitalist countries, an economy of Israel has been more open to trade. It is also one of the founding members of the World Trade Organization. Due to the higher percentage of trade and financial activities the GDP of Israel has always been greater than the India's GDP. There is a notable change in the trading partners of Israel. Earlier India was the central country. Since 2012 this place was grabbed by the China and Germany. Study says that to make concrete relations in economic matters it needs to explore more and more products for trade unlike very few. "From the quality margin analysis, it is evaluated that Indian products such as coffee, not roasted, heterocyclic compounds, polystyrene, plain weave cotton fabric, knitted t-shirts, and vests, non-knitted bedspreads, irons or steel articles, and aircraft parts have developed their export profile in Israel which can be translated to a strengthened long term prospects by increasing market share with higher unit price realization." [4] The countries have reduced the tariffs on the certain consumer goods and capital goods. For an emerging economy like India it is much needed that India must establish its good links with such reliable partner which authenticate the trade growth and overall the general perception of India at the global level. With the same by considering the India's large market and its wide consumer base Israel must explore different areas of cooperation as it is lacking behind as compared to the other nations in terms of its imports and exports.

Science and Technological Ties

In its multiple institutions Israel has developed the research and development departments. Both have signed an agreement over the science and technology cooperation. For the betterment academics have also joined and focus on how to give better outcome. There are exchanges of students in India and vice versa. To promote the research both have explore the funding programs for the students so that there can be more flow of quality people. In science and technology and cyber security are emerging areas on which both are focusing. According to scholars both countries are taking keen interest in setting up an identity of role model for cooperation. "Israel is going to be a significant partner in the Science and Technology programmes like NIDHI that boosts innovation ecosystem in India and can strengthen and accelerate them." [5]A hope was peeped out in the sense that this cooperation will facilitate the India Israel relations to the other level.

Since 2014 in the field of pure science and social science 21 joint research grants have been awarded. In the next year second proposal was submitted for the collaborative research projects by researchers from India and Israel. Providing grants for research has attracted many young scholars. "In November of 2017, India's institute of Management Bangalore (IIMB) opened an Israel Centre on its campus, which will serve as a hub for research, business strategy, technological innovation, and academic collaboration between Israel and India." [6]

Agriculture and Water Management

This is indeed an important area where Israel and India has cooperated at their best level. Both the nations are working for 5 year comprehensive plan for the development of agriculture. Under the program there are 28 centers are established across nine Indian states. "A three year joint programme (2018 – 2020) has already commenced, under which the Centers of Excellence (COEs) are being set up across the country to train farmers about Israeli farm and water management technology." [7] Under the speeches of the head of the states both leaders are very keen to extend their ties of cooperation. This comprehensive plan fulfills the objective of bringing Israeli technology and agricultural practices to India so that the

Indian farmers can be benefited. Also it will definitely fruitful to accomplish the growing food demands of Indian population with sophisticated technology. Prime Minister of Israel Benjamin Netanyahu possessed vision for revolutionizing the Indian farms sector with effective usage of water management supply as agriculture and water management issues are complementary to each other. They have signed Memorandum of Understanding over management of water resources. Israel has the strategy of effectively channelizing the ocean water management for the agricultural purpose especially for the dry land. Under the area of water resource management they have potential for working over the river water pollution which has become a serious threat to India. Adapting certain ways and implementation of those will certainly help India to overcome its challenges of water scarcity and irregularity of its monsoon due to which agriculture affect.

Both the Prime Ministers of respective countries have expressed their level of satisfaction over the three year joint program that they have signed for optimization of proper resources. For complementary to this big project small training sessions are being arranged on regular basis which works as a capacity building for effective implementation of the program. Various agricultural products belongs to the Israeli origin are being widely used in Indian farming process. By getting availed the technical and expertise assistance from Israel India has benefited in horticulture management, nursery, drip irrigation technology and post harvest management.

Cultural Ties

This informal aspect proves always beneficial for strengthening the other relations. It includes tourist agencies, films and television, music across the borders. Young Israelis considered India as an ancient nation and very much attracted towards the tourism. Approximately 35000 Israelis visit India for some or other purpose. Prominent among them come as a tourist and sometimes for business purpose. An embassy at New Delhi has organized several cultural programs in which delegates of both countries participates and celebrates the events. Academic exchanges of the Professors also happened at Tel Aviv University under the MoU signed by

them. The Jew community became prominent which travelled at Jerusalem create close cultural ties. The young Jews are attracted towards Israeli society. From 2013 onwards they meet once in a year as a get together under the program of Annual National Conventions.

Strategic Interest

1. Concerns of Pakistan and Nuclear Issue:

As there are deep ties between India and Israel over the defense and security purpose, Pakistan is worried about the growing relations of both. Also it is skeptic about growing relations of India and Israel accordingly which will destabilize the region. Also the acquisition of Phalcon early warning system by India from Israel that will enable it to get prevention from any attack is of high concerns. Contrary to this both India and Israel did not signed either Non Proliferation Treaty (NPT) nor Comprehensive Test Ban Treaty (CTBT) and though both of them don't have directly nuclear development program but still Israel being among the top 5 sellers of arms and ammunitions provides India different well equipped weapons. This issue suggests that both India and Israel have similar stand at an international level about the possession of nuclear weapons. Also they have concern over Pakistan being a nuclear power. Though India is also a nuclear power it does not throw any challenges. The problem of terrorist organization, especially the Pakistan State Sponsored Terrorism and nuclear weapons possessions shares as a common security concerns and threats for both the countries.

2. Iran:

India and Iran both have developed a significant relationship. The growing ties of India and Iran are of concern for the Israel. Strategically Iran is very important for India for several reasons. Prominent among them are India's energy needs and its access to Central Asia via land locked country Afghanistan. And similarly Iran gets a huge market for its natural resources on which its entire economy is depend. Because of this flourished relationship of Iran and India Israel have its own concern about India. However India should take a balance approach by giving equal importance to both as strategically both the nations are important to India. Like India had handled the issue of Palestinians at par with the Israel.

3. Indian Ocean Strategy:

Israel is very keen to develop its strategic ability to counter Pakistan, Iran and other Mediterranean states in the Indian Ocean Region. This step of Israel goes complementary with regards to the strategic interest of India in Indian Ocean. "The Indians present also seen comfortable with, and appreciative of, Israel's expanding security perimeter and its growing strategic involvement in the Indian Ocean Region." [8]

Way Forward ….

By taking in to consideration the recent developments, both India and Israel have put great remarks on various spheres. Both have certain commonalities with diversities. But in this regard Prime Minister Narendra Modi's visit and Prime Minister Benjamin Netanyahu's visit proved certainly fruitful for both to engage and explore multiple areas of cooperation. These two must try to take their commercial relations at the apex level. In matters of trade there is a need of Free Trade Agreements. India must open up its health sector for the Israeli companies.

Very importantly both need to cooperate for combating terrorist activities and attacks, growing radical activities in neighborhood including in cyber space. A significant relationship that has evolved over nearly 4 decades is still becoming more mature by exploring crucial areas of cooperation. India by protecting its strategic interests India is trying to balance its relations with Israel and Palestine and also with the Arab World. A hope has risen with the great combination of Indian talent and Israeli technology can be the better solution to their any problem. Once this became enrooted within them then surely there will be different regional and international picture of politics.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

Removal of Carbonmonoxide from Flue Gas

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Abstract
Carbon monoxide gas is poisonous for human beings. It is emitted in atmosphere as one of the components of flue gas. The concentration of carbon monoxide in flue gas varies in the range of 10-10,000 ppm. The legislative limiting value for emission is 50 ppm. Its life in atmosphere is 0.3-0.7 years. It combines with other gases in atmosphere and generates more noxious gases. Like another flue gas components, it should be removed at source before releasing the furnace exhaust into atmosphere. The proposed work puts forth a post-combustion adsorption method by which carbon monoxide can be completely removed from flue gas. In a fixed bed adsorber, a dry sorbent is placed on mesh through which the flue gas diffuses and losses carbon monoxide. Both, adsorbent and the product are ecofriendly.

Key words: Carbon Monoxide, Flue Gas, Adsorption, Post Combustion

Introduction
Carbon monoxide is an inevitable component of flue gas. It is left untreated in almost every flue gas treatment plant. Appearance of carbon monoxide in flue gas is claimed as the resultant of inefficiency of furnace and inadequate supply of oxygen. However, it is proved that exhaust of an efficient furnace contains a sizable amount of carbon monoxide[1] and even with supply of excess air/oxygen the concentration of carbon monoxide in flue gas is considerable[2].

A flue gas treatment plant combines a variety of post combustion the removal methods[3] for SO_x, NO_x and CO_2. From 1980's acid precipitation act[4], the emission of acidic gases namely SO_x and NO_x has taken place substantially[5]. Carbon capture[6] (CC) and carbon capture and storage[7] (CCS) are getting adopted as policies by all nations in response to

Copenhagen accord[8] and Parris agreement[9]. The agreement has set the target of reduction in emission called as Nationally defined contribution (NDC). In this scenario removal of carbon monoxide and a method for the same is rarely observed.

Gas separation methods pertaining to carbon monoxide are summarized further: Activated carbon adsorbs carbon monoxide. When 1000 ppm of CO was fed into the pure and impregnated sorbent, it was reduced to 40.2 and 10.4 ppm respectively[10]. Impregnation is done by 34.7% $SnCl_2.2H_2O$ heated to produce AC- SnO_2. Another Tin- activated carbon[11] used for recovery of CO could recover 92.1 to 99% CO with purity 57-77%.

Govind Sethia et al[12] carried-out adsorption of CO on zeolite -X exchanged with magnesium, calcium strontium, and barium using volumetric gas adsorption method. Strontium exchanged zeolite showed maximum adsorption capacity of 28.4 molecules of CO per unit cell. The zeolite molecular sieve synthesized commercially[13] for the purpose have modified framework of SiO_2/Al_2O_3 with 20-100 molar ratio and contain Cu^+ ions to enhance the adsorptive capacity of zeolite for CO. The atomic ratio of Cu to Al is 0.49. A simulated blast furnace vent was composed as CO: 27.5 v/V %, CO_2 : 11.5 v/V%, N_2: 60 v/V %, H_2: 1 v/V % Saturated with water vapor at 1atm and 50^0C. Almost 100% CO was adsorbed by the zeolite.

G. Spoto et al[14] doped H- ZMS by equivalently exchanging monovalent copper. The Cu^+ ions are highly coordinately unsaturated and form $Cu^+(CO)_n$ complexes where (n = 1,2 or 3). Xie et al[15] treated a variety of zeolites including 5A, zeolite -X, zeolite-Y with cuprous chloride and bromide at different concentrations, temperatures, atmospheres and heating hours. They showed a removal capacity of 1.8 mmol to 3.2 mmol of CO per gm of zeolite. In all there are 48 adsorbents which include alumina and silica as a solid support for Cu^+ ions. The adsorption of water on zeolite is very strong. Sircar and co-workers[16] reported that this limits the use of zeolites for removal of CO from flue gas since it contains moisture.

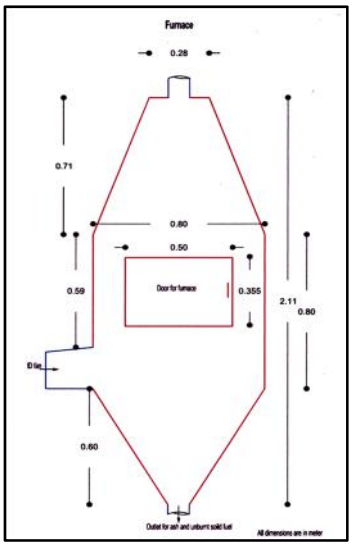
In older methods[17] CO was absorbed in acidic solution of CuCl or ammonical solution of Cu_2CO_3 or Cu- formate. At room temperature and 200 atm pressure. Recovery of CO was done by releasing the pressure and heating the solution to 152^0C. Willum group and Ilse [18] found a method

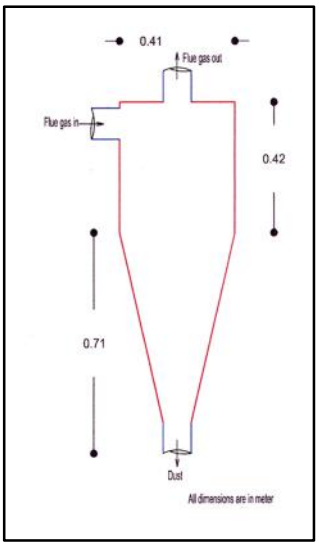
for separation of water gas into carbon monoxide and hydrogen. After variety of trial with cuprous salts, organic acids and phenols they found cuprous ammonium lactate has most favorable properties of adsorbent. It is under trial in semi plant scale. Gardner C-Ray and Paul H Jonson[19] found an improved solvent for CuCl. It is 'Orthoanisdine' which is capable of dissolving cuprous salt up to 20% by its weight. It selectively adsorbs CO in presence of other gases except SO_2 and H_2S at 10-37^{0}C. It needs anti -freezing agent like MeOH. Desorption is done by VSA or TSA. Cho et al[20] prepared a cuprous salt with glucose and ammonia which showed removal capacity of 1.0 mmol per gram of sorbent. Alumina was studied for adsorption of CO by Stanislaus et al[21]. An adsorbent of CuCl with alumina and silica-aluminium carriers was prepared by Tsuji et al[22]. They showed removal capacity of 0.5 to 1 mmol per gram of sorbent. Koichi et al[23] attempted composition of $Cu/Zn/Al_2O_3$ catalyst prepared by impregnation method for removal of CO from water gas shift reaction. Hirai et al[24] reached adsorption capacity of 31.5 mmol per gram of sorbent even in presence of water. They used combination of Cu(I) halide plus Aluminium (III) halide with either polystyrene or activated carbon/graphite. They could remove 1-99% v/V CO in presence of 40,000 ppm water. G.D. Buckley and N.H. Ray[25] found that CO reacts with hydrazine under high pressure to give verity of products depending on conditions employed. A Commercial catalyst[26] is used in air purifier converts CO to CO_2.It is composed of manganese and copper oxide plus salts of sodium, potassium and calcium.

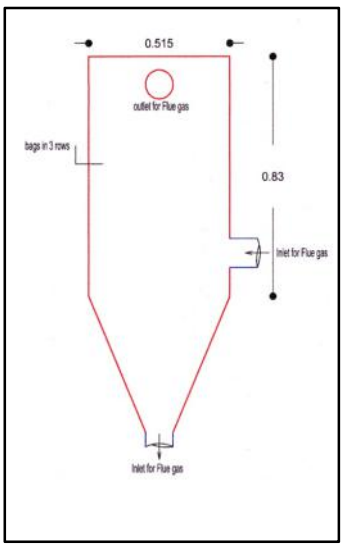
Anand Patwardhan and Mohan Sharma[27] compared the kinetics of absorption of CO in aqueous solution of NaOH and $Ca(OH)_2$ slurries. They suggested a mechanism of reaction in which hydroxyl ion attacks on carbon of CO molecule by lone pair of electrons and 'formate ion' is formed. Michal Bails and Frank S. Stone[28] observed the reaction of CO with O^{2-} ions on CaO and MgO. They found an enthalpy of formation of CO_3^{2-} is 56% of theoretical value of $CaCO_3$ and 47% of theoretical value of MgO. This decrease is due to formation of chemisorbed complexes which include highly conjugated $(CO)_n^{2-}$ anions which impart yellow colour (455 nm) to the oxide.

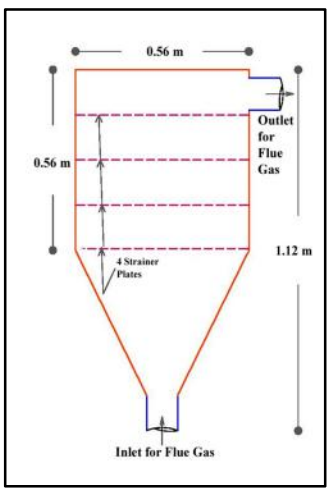
Experimental:

Designing of the system: Pipeline: 6 mm pipe, 3 inches diameter. Steel plates of all device 6 mm









1. Furnace: A real flue gas is generated in a steel furnace using peat coal. The size of the furnace is as shown in the figure. Coal pieces are placed in lower middle part on a grid. FD (forced draft) is provided to supply ambient air for combustion. The flue gas is released from the top of the furnace.

2. Cyclone separator:

Flue gas moves with tangential velocity producing cyclone of flue gas inside. Particles strikes on the walls and slide down into bottom.

3. Baghouse filter: Pulse jet type baghouse filter is designed. Twelve bags covering maximum volume of baghouse. Every bag of size 8×3 inches housed on metallic cage. Material is commercially available. It is a felted type biodegradable material.

4. Water scrubber:

Counter current flow type water scrubber is constructed. Three showers fitted at the top. Four inclined plates built a plane of water alternately. Flue gas entering from bottomside upwards, passes through planes and shower of water of water and leaves from the top.

5. **ID fan**: The velocity of gas is further increased by ID (Induced draft) fan.
6. **The adsorber:** In a cubical box tapered at the bottom, four steel nets are fitted. A cotton cloth is placed on each strainer. Dry sorbent is spread on each cloth manually. Flue gas enters from the bottom and leaves from the top.
7. **Sampling points:** To the pipe at entrance and exit of adsorber three identical thin pipes are welded. These pipes are connected to gas detector.
8. **The control panel:** A panel controlling speed of ID and FD fans, water pump to scrubber, RH meter, temperature measuring thermister in each device is installed.
9. **RH meter + Temp. Thermister:** Relative humidity and temperature of the entering gas is measured near the sampling points of the adsorber.

10. Gas Analyzers:

1. ATS 103M in range 0-200 ppm level and 2. ATS 101M CO in range 0-10,000 ppm

Working

Firing of the furnace

Keep all the valves closed. Keep door of the furnace open. Place 3-4 kg coal and 400-500 gm briquette as fuel on the grid. Ignite the fuel switch on the FD fan and slowly rise its speed. Wait till the smoke gets reduced and coal is red hot. Close the door of furnace, switch off FD fan and open all the valves of pipeline. Fit the RH meter and gas analyzers to their points. Wait for 2 minutes and note down the steady values of concentration of 'in' and 'out' for every gas. Note the observation after every four minutes. The graph of concentration in ppm with time is plotted in the same graph paper.

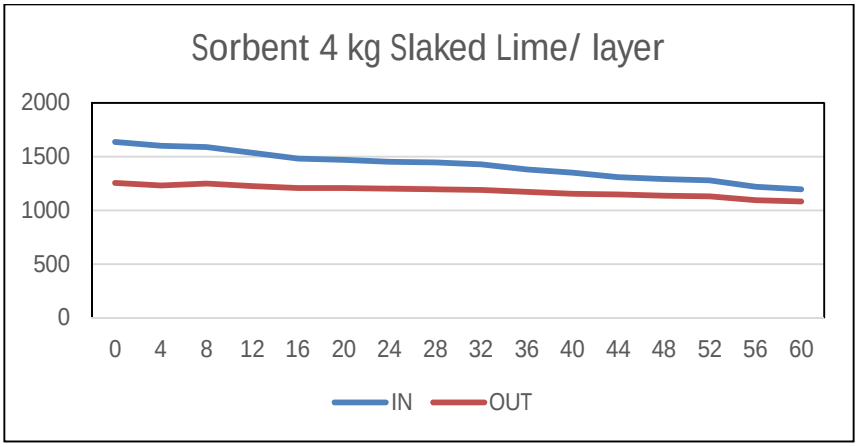
The equation used to calculate the removal capacity is

$$\%\ Noxious\ gas\ removed = \left(\frac{[Noxious\ gas]_{in} - [Noxious\ gas]_{out}}{[Noxious\ gas]_{in}}\right) \times 100$$

Another graph is plotted as % removal V_s Time in minutes.

Table1:Basic Sorbent :A: 4 kg in each layer:

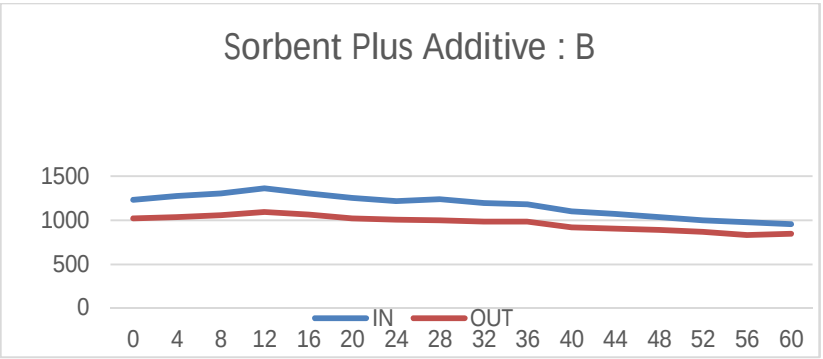
Time in minutes	CO in ppm		Time in minutes	CO in ppm	
	IN	OUT		IN	OUT
0	1636	1258	**32**	1428	1188
4	1604	1234	**36**	1383	1175
8	1591	1248	**40**	1353	1156
12	1537	1228	**44**	1307	1151
16	1480	1211	**48**	1293	1139
20	1470	1211	**52**	1282	1131
24	1452	1200	**56**	1222	1098
28	1447	1199	**60**	1197	1081



Graph:1: Removal by Slaked lime

Table 2: Removal by 4 kg slaked lime plus 1kg salt :Sorbent Plus Additive Mixture B:

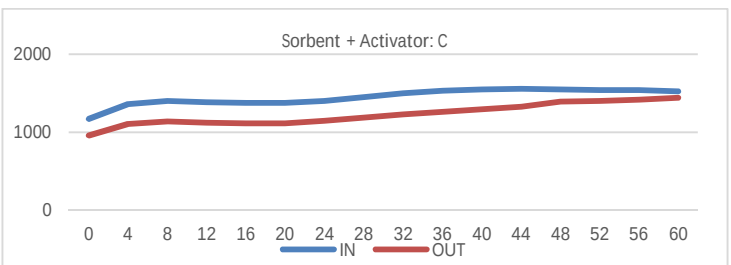
Time in minutes	CO in ppm		Time in minutes	CO in ppm	
	IN	OUT		IN	OUT
0	1235	1021	**32**	1198	986
4	1278	1032	**36**	1179	981
8	1307	1056	**40**	1103	921
12	1364	1096	**44**	1070	906
16	1303	1067	**48**	1036	889
20	1252	1023	**52**	1002	865
24	1217	1007	**56**	976	834
28	1236	1002	**60**	955	845



Graph:2 Removal by Mixture B

Table 3: Removal by Sorbent + Additive+ Activator: Mixture C

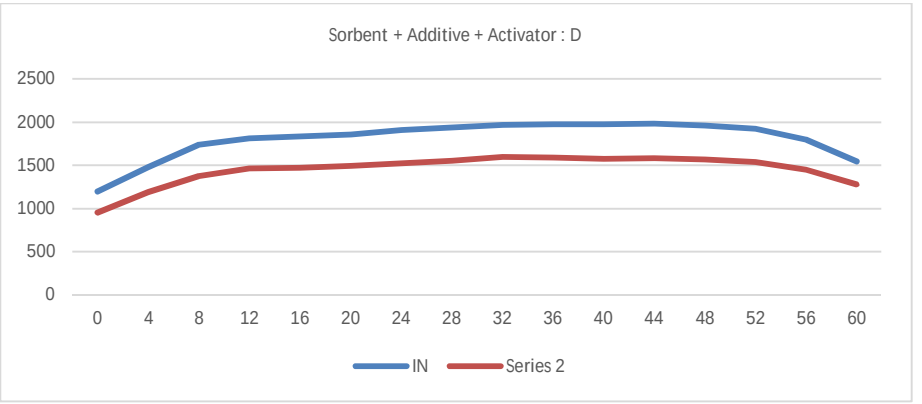
Time in minutes	CO in ppm		Time in minutes	CO in ppm	
	IN	OUT		IN	OUT
0	1165	959	**32**	1501	1226
4	1356	1103	**36**	1528	1263
8	1401	1135	**40**	1549	1289
12	1383	1121	**44**	1556	1324
16	1372	1113	**48**	1544	1387
20	1370	1111	**52**	1538	1399
24	1398	1143	**56**	1538	1412
28	1445	1183	**60**	1520	1437



Graph 3:Removal by Sorbent + Additive+ Activator: Mixture C

Table 4 :Sorbent + Additive + Activator: Mixture D

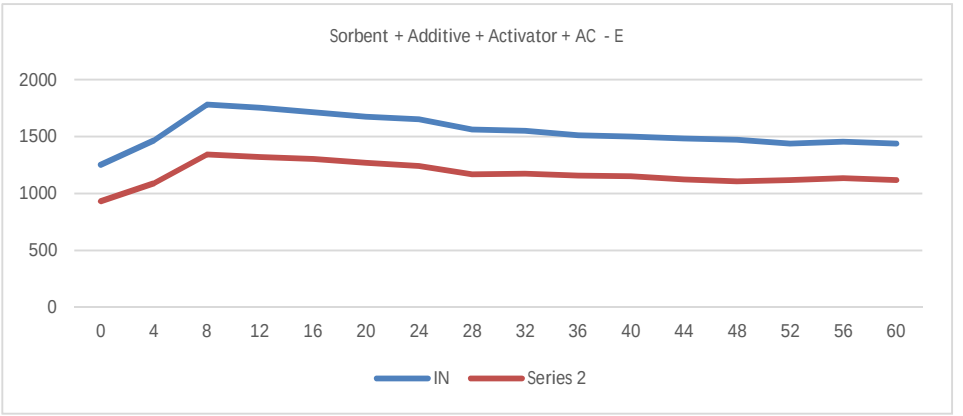
Time in minutes	CO in ppm		Time in minutes	CO in ppm	
	IN	OUT		IN	OUT
0	1198	951	**32**	1970	1599
4	1480	1187	**36**	1975	1594
8	1736	1372	**40**	1975	1574
12	1815	1465	**44**	1981	1585
16	1832	1469	**48**	1960	1567
20	1857	1493	**52**	1924	1541
24	1908	1526	**56**	1800	1453
28	1943	1551	**60**	1544	1278



Graph 4: Sorbent + Additive + Activator: Mixture D

Table 5: Sorbent + Additive + Activator + Active component (AC : 100 g) Mixture E

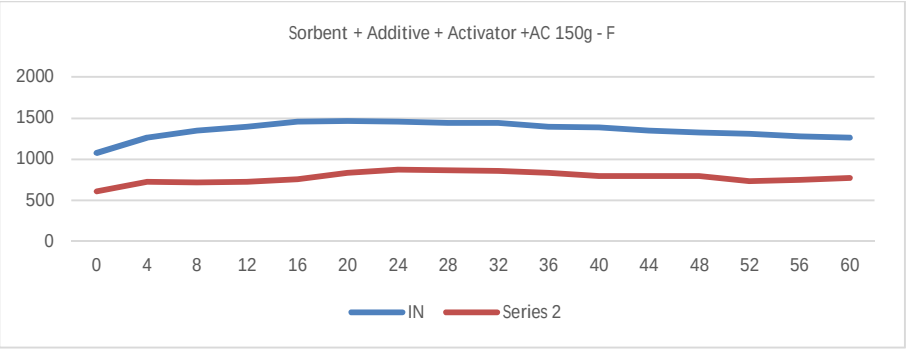
Time in minutes	CO in ppm		Time in minutes	CO in ppm	
	IN	OUT		IN	OUT
0	1250	934	**32**	1553	1172
4	1466	1089	**36**	1512	1155
8	1783	1341	**40**	1502	1152
12	1755	1323	**44**	1486	1121
16	1713	1301	**48**	1470	1109
20	1677	1272	**52**	1438	1119
24	1651	1243	**56**	1456	1135
28	1562	1166	**60**	1437	1119



Graph: 5: Sorbent + Additive + Activator + Active component (AC : 100 g) Mixture E

Table 6: Sorbent + Additive + Activator + (AC : 150g) Mixture F

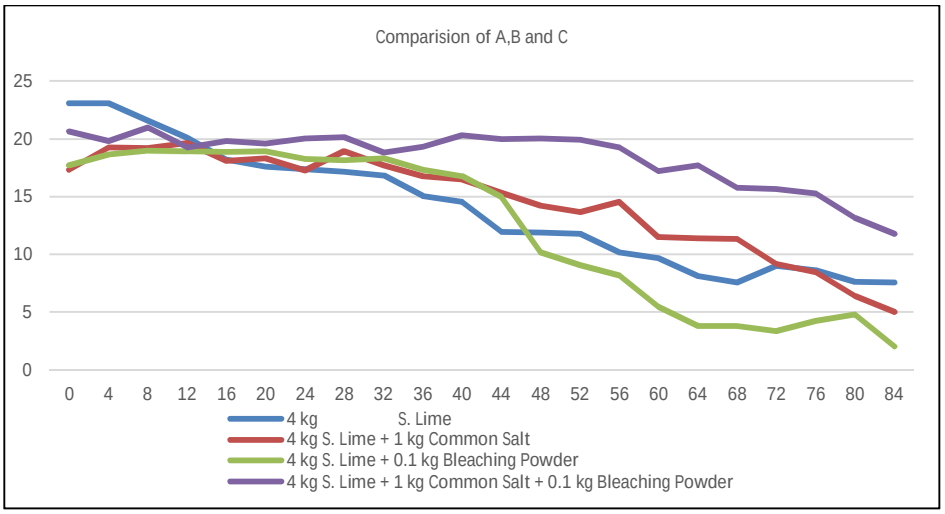
Time in minutes	CO in ppm		Time in minutes	CO in ppm	
	IN	OUT		IN	OUT
0	1076	603	**32**	1443	855
4	1260	722	**36**	1396	835
8	1350	718	**40**	1389	791
12	1396	721	**44**	1344	795
16	1460	756	**48**	1325	790
20	1462	834	**52**	1305	733
24	1456	869	**56**	1275	745
28	1445	865	**60**	1261	770



Graph 6: Sorbent + Additive + Activator + (AC : 150g) Mixture F

Table 7: Comparison of Adsorbents : A,B and C:

Time in Minutes	Adsorber			
	4 kg S. Lime	4 kg S. Lime + 1 kg Common Salt	4 kg S. Lime + 0.1 kg Bleaching Powder	4 kg S. Lime + 1 kg Common Salt + 0.1 kg Bleaching Powder
0	23.11	17.33	17.68	20.62
4	23.07	19.25	18.66	19.80
8	21.56	19.20	18.99	20.97
12	20.10	19.65	18.94	19.28
16	18.18	18.11	18.88	19.81
20	17.62	18.29	18.91	19.60
24	17.36	17.26	18.24	20.02
28	17.14	18.93	18.13	20.17
32	16.81	17.70	18.32	18.83
36	15.04	16.79	17.34	19.29
40	14.56	16.50	16.79	20.30
44	11.94	15.33	14.91	19.99
48	11.91	14.19	10.17	20.05
52	11.78	13.67	9.04	19.91
56	10.15	14.55	8.19	19.28
60	9.69	11.52	5.46	17.23
64	8.12	11.37	3.80	17.70
68	7.54	11.32	3.78	15.77
72	8.99	9.16	3.33	15.68
76	8.64	8.44	4.24	15.28
80	7.64	6.41	4.80	13.16
84	7.57	4.99	2.01	11.79

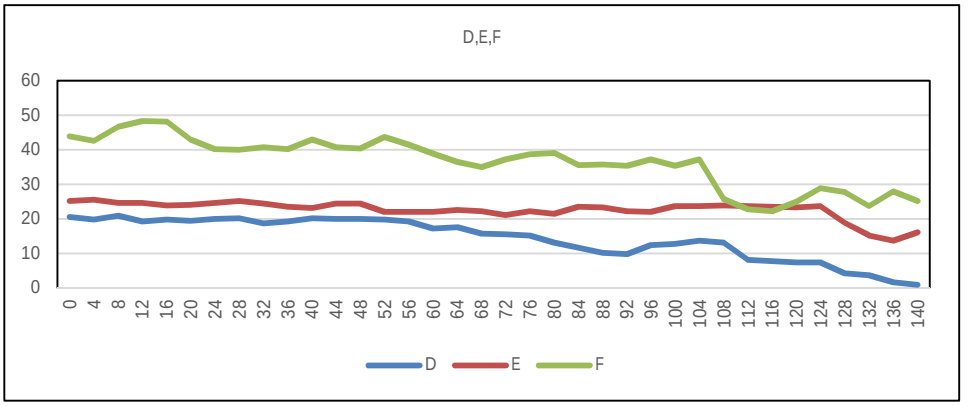


Graph 7: Comparison of A,B andC:

Table 8: Comparison of D, E,F :

Time in Minutes	Adsorber			Time in Minutes	Adsorber		
	D	E	F		D	E	F
0	20.62	25.28	43.96	**72**	15.68	21.18	37.34
4	19.80	25.72	42.70	**76**	15.28	22.34	38.77
8	20.97	24.79	46.81	**80**	13.16	21.53	39.09
12	19.28	24.62	48.35	**84**	11.79	23.59	35.68
16	19.81	24.05	48.22	**88**	10.22	23.45	35.76
20	19.60	24.15	42.95	**92**	9.92	22.21	35.52
24	20.02	24.71	40.32	**96**	12.48	22.15	37.37
28	20.17	25.35	40.14	**100**	12.92	23.77	35.36
32	18.83	24.53	40.75	**104**	13.80	23.86	37.37
36	19.29	23.61	40.19	**108**	13.17	23.99	25.78
40	20.30	23.30	43.05	**112**	8.17	23.81	22.80
44	19.99	24.56	40.85	**116**	7.86	23.56	22.26
48	20.05	24.56	40.38	**120**	7.49	23.49	25.12
52	19.91	22.18	43.83	**124**	7.47	23.83	29.01
56	19.28	22.05	41.57	**128**	4.32	18.91	27.90

60	17.23	22.13	38.94	**132**	3.83	15.34	23.84
64	17.70	22.76	36.59	**136**	1.82	13.71	28.10
68	15.77	22.27	35.10	**140**	1.04	16.19	25.35



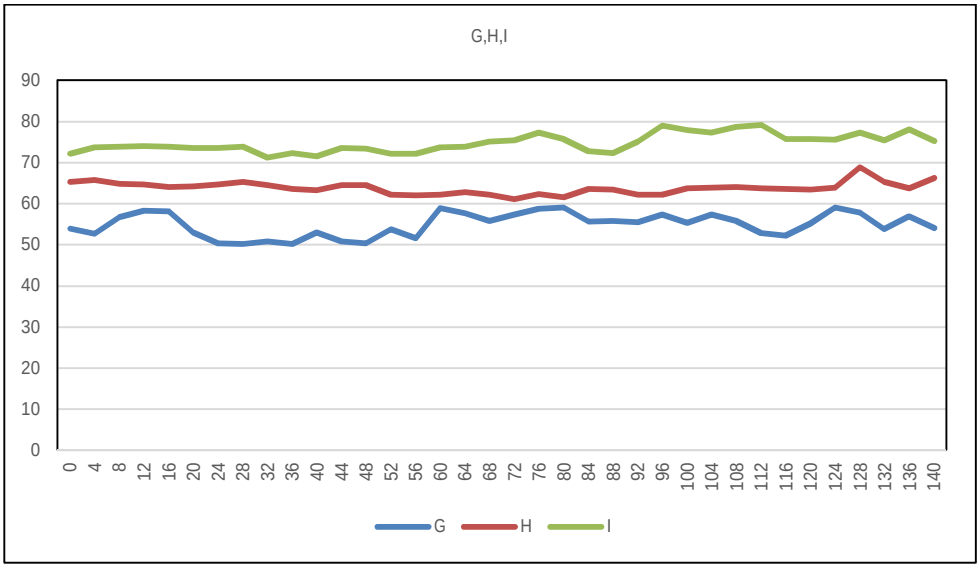
Graph 8: Comparison of Adsorbents D, E,F :

Table 9 : Comparison of G, H, I:

Time in Minutes	Adsorber			Time in Minutes	Adsorber		
	G	H	I		G	H	I
0	53.96	65.28	72.15	72	57.34	61.18	75.36
4	52.70	65.72	73.77	76	58.77	62.34	77.37
8	56.81	64.79	73.86	80	59.09	61.53	75.78
12	58.35	64.62	73.99	84	55.68	63.59	72.80
16	58.22	64.05	73.81	88	55.76	63.45	72.26
20	52.95	64.15	73.56	92	55.52	62.21	75.12
24	50.32	64.71	73.49	96	57.37	62.15	79.01
28	50.14	65.35	73.83	100	55.36	63.77	77.90
32	50.75	64.53	71.18	104	57.37	63.86	77.34
36	50.19	63.61	72.34	108	55.78	63.99	78.77
40	53.05	63.30	71.53	112	52.80	63.81	79.09

Contd…….

Time in Minutes	Adsorber			Time in Minutes	Adsorber		
44	50.85	64.56	73.59	116	52.26	63.56	75.68
48	50.38	64.56	73.45	120	55.12	63.49	75.76
52	53.83	62.18	72.21	124	59.01	63.83	75.52
56	51.57	62.05	72.15	128	57.90	68.91	77.37
60	58.94	62.13	73.77	132	53.84	65.34	75.36
64	57.70	62.76	73.86	136	56.82	63.71	78.10
68	55.77	62.27	75.10	140	54.04	66.19	75.35

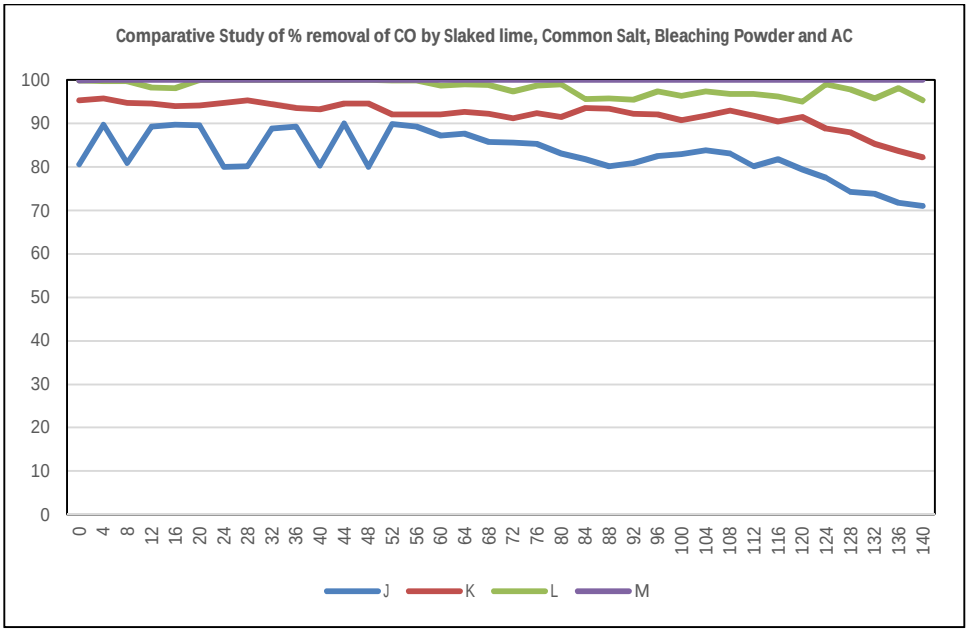


Graph 9: Comparison of G,H, I:

The further mixtures are prepared by adding 50 grams of active component to observe increase in percentage removal.

Table 10: Increment of AC 50 gm each

Time in minutes	Adsorbent				Time in minutes	Adsorbent			
	J	K	L	M		J	K	L	M
0	80.62	95.28	99.96	99.97	72	85.68	91.18	97.34	100
4	89.8	95.72	99.8	100	76	85.28	92.34	98.77	100
8	80.97	94.79	99.81	100	80	83.16	91.53	99.09	100
12	89.28	94.62	98.35	100	84	81.79	93.59	95.68	100
16	89.81	94.05	98.22	100	88	80.22	93.45	95.76	100
20	89.6	94.15	100	100	92	80.92	92.21	95.52	100
24	80.02	94.71	100	100	96	82.48	92.15	97.37	100
28	80.17	95.35	100	100	100	82.92	90.77	96.36	100
32	88.83	94.53	100	100	104	83.8	91.86	97.37	100
36	89.29	93.61	100	100	108	83.17	92.99	96.78	100
40	80.3	93.3	100	100	112	80.17	91.81	96.8	100
44	89.99	94.56	100	100	116	81.86	90.56	96.26	100
48	80.05	94.56	100	100	120	79.49	91.49	95.12	100
52	89.91	92.18	99.9	100	124	77.47	88.83	99.01	100
56	89.28	92.05	99.9	100	128	74.32	87.91	97.9	100
60	87.23	92.13	98.8	100	132	73.83	85.34	95.84	100
64	87.7	92.76	99	100	136	71.82	83.71	98.1	100
68	85.77	92.27	98.9	100	140	71.04	82.19	95.35	100



Graph 10: Increment of AC 50 gm each

Discussion:

Removal of Carbon monoxide from flue gas is not attempted before using real flue gas. A few attempts are made by introducing artificial flue gas which selectively includes CO_2, CO N_2 and moisture. Other reactive gases like NO_x, SO_x, volatile organic matter, particulate matter etc. are inherent components of flue gas and do affect the adsorbent. In fact, design an adsorbent to remove carbon monoxide including all these components is in state of art. Unlike NO_x, SO_x and CO_2, which are reactive and acidic, carbon monoxide is inert. It has low dipole and quadrupole moment. Common adsorbents like activated charcoal, zeolites, earths do not adsorb carbon monoxide quantitatively since its desorption is equally faster. In presence of other components of flue gas the adsorption of carbon monoxide is negligible on these common adsorbents.

Considering the reactivity of carbon monoxide with typical compounds a basic sorbent is selected and its removal capacity is enhanced by certain additives, activators and increasing the proportion of active component in the mixture. A very small amount of free chlorine is added to mixture initially which acidifies then surface of the sorbent. The hydrated layer of sorbents allows the following reactions which result in significant adsorption of carbon monoxide.

Probable Reactions for Removal of Carbon Monoxide:

$CO + Cl_2 \leftrightarrow$

$COCl_2$ $(\Delta H = -107.6 kJmol^{-1})$ Charcoal works as catalyst ……..1

$COCl_{2(g)} + H_2O_{(g)} \leftrightarrow$

$CO_2 + 2\,HCl$ ……..2

$CO_3^{2-} + CO_2 + H_2O \rightarrow$

HCO_3^- (In presence of salt and moisture) ……..3

$CO + H_2O \leftrightarrow H_2$

$+ CO_2$(water

– gas shift reaction occurring in the gas phase) … 4

$CO + H_2O \leftrightarrow$

$HCOOH$ (Slow reaction) ……..5

$CO + CaSO_4 \leftrightarrow$ CaO + SO_2

$+ CO_2$ ……..6

$CO + OH^-$

$\leftrightarrow HCOO^-$ (The adsorption reaction) ……..7

Conclusion

Reaction 1,5,6 and 7 are expected to be predominant in removal of CO. Free chlorine is made available in the sorbent which is less than 1%. Water is in form of moisture which is a constituent of flue gas. $CaSO_4$ is formed by reaction of Sulfur oxides with slaked lime. Probability factor indicates that out of billions of physiosorbed molecules, only a few achieve activation energy and proper orientation to react with each other. To hold a gas molecule by the sorbent bed, physical adsorption is enough. Instead of measuring the chemical reactivity of sorbent towards the gas, the removal capacity is better measured as the 'holding' capacity of the sorbent for the specific gas. This aspect highlights the extraordinary performance by the sorbent. The exhaustive experimental work enlights the need of removal of CO from the flue gas and a definite practicable solution with 100 % removal capacity.

Suggestions

Though the gas detectors are indicating removal of carbon monoxide to a sizable quantity, evidence/s to support the observations by surface analysis methods like SEM, XRD, EDX etc. should be attempted. It is also a task to find a chemical method\s which can estimate or at least indicate presence of carbon monoxide or its sorption products in the sorbent.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

Importance of Yoga

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Abstract
Yoga is considered as an instrument of Self-realization. Yoga is the discipline that is applied to the mind and the senses.
Patanjali is the founder of yoga philosophy. According to the definition of Patanjali, the word yoga is used to denote an outcome of the problem. Yoga is a continuous effort to concentrate the mind and to remove (improve) the mindset.
Yoga is composed of eight parts hence called as ashtanga yoga. These eight parts are Yama, Niyama, Asana, Pranayam, Pratyahara, Dharana, Dhyana and Samadhi. Among them Yama and Niyama are useful more for moral advancement (upliftment), Asana and Pranayam for physical advancement, Pratyahar for mental advancement and Dharana, Dhyan and Samadhi are important instruments for spiritual advancement.

Keywords : Self-realization, Ashtanga Yoga, Moral Advancement , spiritual upliftment.

Introduction
Yoga is derived from the word yuj. Yoga is considered as an instrument of self-realization. The meaning of Yoga in the Vedas is the way or the path. The word Yoga have been found in Upanishads, Geeta, Buddhism. According to Upanishada, yoga means to have a combination of coincidence. This is the combination of soul and spirit. This coincidence comes in realization, devotion and knowledge hence called as Spiritual Yoga.
Yoga is the method, the discovery, the search of Transcedent world. The trick of trying to get the coincidence is yoga. Yoga is the discipline that is

applied to the mind and the senses. The path leading to Samadhi is Yoga. Yoga means reducing all physical pleasures and concentrating on the ultimate goal. Yoga means restraining and controlling cholation. Yoga means the systematic effort of controlling the mental and physical nature of the person, an effort to correct and calm the mind, is an attempt to say Yoga.

According to the Upanishads, Yoga is the continuous internal search of the ultimate truth. Yoga is the sacrifice of all physical pleasures, the sacrifice made for the ultimate reality.
Yoga means sacrifice for all things, abandonment of all desires and feelings of Karma. Humans engage themselves in materialistic things, as they caught in ego, their spiritual progress does not occur. The one who conquers such worldly greed, and who overcomes it, comes near God.

When a person seeks to develop through yoga and progresses in that path, he does not involve in practical pleasure and grief. But separates from it . In this sense, Yoga is defined as the absence of all kinds of happiness and misery. Yoga is expected not to keep any kind of sympathy with all kinds of grief, attachment and desire. The only practice of such rules could be connected with the supreme God, from which one gets the Brahmananda.

After attaining convergence with God, the true nature of ours is revealed and everywhere the Lord appears. When all these practical things become identical with the Supreme Being, then the soul consciousness can separate from the life and see itself. After that, there is no difference between myself and you, all becomes God. Personal selfishness, the limitations of knowledge are destroyed. In such a way, yoga sees unity, equality in everybody.

Patanjali used the word 'yoga' differently. But in the Gita, we have seen that Yoga does not have the same meaning. Geeta has used the word yoga as a medium by various modes such as samkhyayoga, buddhiyoga, karma yoga and bhaktiyoga. In all these trades, yoga has been adopted as a means of companionship. Duties have to be done in Karmayoga and they are not intended to achieve certain motives or to achieve anything, they

are never carried out with any intention of duty ,only when they reach the ultimate goal.

It is obligatory for a person to act, but at the same time, while keeping karma away from the fruits of karma.The karma will give salvation to the individual. Yoga is such a skill. It has been described as Yoga: Karmasu. The art of practicing Kaushalamduty is Yoga. The supreme assimilation with God reveals the universal integrity and the universal equation that separates the person from attachment, race, religion, caste, prestige, dignity, humiliation to all the distinctions has also been called as Yoga.

According to the definition of Patanjali, the word yoga is used to denote the outcome of the problem. According to Patanjali, attachment of Spirituality with harmony can be achieved by the Chittavritti Nirodh. To prevent the destractions, it is also necessary to give up the desire and attachment of material and sensual pleasures, because due to them the mind becomes restless or furious.

According to Patanjali, yoga is a continuous effort to improve concentration and improve the mindset. Patanjali emphasised on specific techniques or customs to create physical and mental discipline in personality. It can be used to get constant control, flexibility, and stability. One needs physical exercise which helps in purity and calmness. The purpose of Patanjali is purely practical in this regard. Because in Yogashastra, Chittashuddhi, knowledge is the means of salvation. It is filled with mental and physical discipline. Hence Patanjali emphasized on Yama, Niyama, Asana, Pranayam, Pratyahara as an external instruments.

Along with controlling the breath, the Upanishads focuses on the Pranayama. The six elements of Upanishads are Pranayam, Pratyahara, Dharana, Dhyan, Tarkaand Samadhi. Apart from this, some Upanishads think that Panchadshang means five parts of yoga, which differs from Patanjali and Geeta Yoga. In short Sankhya and Buddhists have also accepted Yoga more or less in the form of several different philosophies.

Yoga for Health and Integrated Development

In general, considering today'stressful life, point of veiw of new generation, the changing times, the changing thoughts, the mind, the lifestyle and so on. One thing surely comes to mind that we stepped ahead in the era of science and technology but we have lost our livelihoods. The reason is that without realizing the truth of life we are running behind the mirage.

Yoga is as deep and as vast as the sea. Its ultimate goal or final goal is certainly mysterious. Yoga means finding out the inner and outer body, the senses, the mind, the intellect, the ego, the soul, and the quest for interfaith. Yoga is composed of eight limbs and called as Ashtanga Yoga. These eight things are Yama, Niyama, Asana, Pranayam, Pratyahara, Dharana, Dhyanand Samadhi. Among them Yama and Niyama are for moral advancement, Asana, Pranayama for physical advancement (Upliftment), Pratyahar for mental advancement and Dharana, Dhyan, Samadhi for spiritual advancement.

Yoga is a science that concerns with the body and mind. Yama, Niyama, Asana, Pranayam, Pratyahara, Dharana, Dhyanaand Samadhi are mentioned in the yoga, Ashtasutri to remove the distraction between body and mind. These eight steps can be classified into moral, physical, mental and spiritual sources. Body and mind are your capital. Thereby, it is possible to discipline our life and get rejuvenated happiness. We have to use this capital very carefully. It's just that it's a good way to live your life well. This is a very big responsibility. So if we neglect the body, then we are breaking the first rule of moral discipline.

The functions of respiratory circulation, digestion in human body have a hormony with each other. This condition is achieved so that there is no need to pay attention to the body trade as the mind can concentrate on spiritual knowledge. These sensations are related to external things and their impression is reflected. Eventually this impression emerges in the soul. In such a way, knowledge of all things happens through the mirror of the mind. Yoga involves control of all the senses on the mind as the soul

remains unconditional. With the achievement of mental discipline, the soul becomes crystal clear.

Four ways to reach the God of spiritual evolution have been shown by our sages. This path means knowledge, devotion, karma and yoga. If the brain is the center of knowledge, then the heart will be the center of devotion. The actual work is, of course, handmade. Knowledge, devotion, karma and yoga are depending on each other. Without devotion and karma, knowledge does not have any meaning and without respect to knowledge and action, devotion is worthless. Even if the devotion and knowledge have passed from their deeds, then it cannot be called pure. Yoga is the source of purified knowledge, pure devotion and pure karma. Apart from this the foundation of other ways becomes firm. It is the way by people are benefited from tolerance and love. Similarly, being able to purify the body and mind through yoga creates favorable conditions for the installation of the soul in our body.
Asanas and pranayama in Ashtanga Yoga are two things which are not difficult to be observed at all. On contrary, the study of Yama-Niyama that you want to follow, or whatever you want to differentiate between the minds, is easily accessible. Not only this, but when the common people want to do yoga, it is appropriate to think of these two parts asana and pranayam first. It improves behavior, benefits the body, achieves strength, strengthens morale, and gets mental health. Good fortitude and self-restraint gain and hence peace and well-being are attained.

Similarly, intellectual eligibility increases. There is a balance between body, mind and intellect. All these things balance the body, mind and the intellect. Due to all these things, the dullness, anxiety, depression within the body and the mind is filled with excitement, joy, insecurity, concentration, etc. Again, the practice of yoga, reciprocity, belief and meditation can be taken in a little bit.

Even if a person thinks too high from spiritual level, ultimately, body health is essential. Body health is worsening like scorpions. Unhygienic poison once came in is difficult to descend. Asanas-pranayam is the best solution to prevent diseases. It is used as a weapon to destroy the body's

weakness. Such a healthy body can produce huge powers and it is possible to make perfect use of that power. Physiology, mental health, intellectual power can be promoted properly.

Digestion is a very important system in all the systems of our body. If this system works properly then one will get better health, as all systems work properly, because proper process is done on food grains which are good for the body. Because of the Asana, there is an inhalation in the lungs, which in turn gives complete breathing. And the breach of the chest is completed. The excitement is accomplished.Impure air is exhaled through lungs. Due to which body movements are sharpened, circulation is improved. In such a way, the first step should be to develop the digestive system, the circulatory system and the respiratory system. The intensity of asanas has to be increased, in proportion to the results have to be obtained.

The human body is comprised of the endocrine gland.It is also known as an orchestral gland organization. The body and mind of this gland are closely related to both. When there is no balance in the endocrine gland, the physiology becomes worse. But when they are streamlined, fully,proper efficicacy is obtained not only the body becomes healthy by its properties, but a high level of intellectual power, imagination, concentration, thinking ability is achieved . Human becomes self-disciplined.

Pranayam, due to its proper control, due to the improved method of breathing, it gives respiratory stability to the respiratory system. So the mind becomes calm, stable, as quiet as the breath, slow and long breath will help the nerves to calm down. The more stable the nerve, the brain will be stable. The tissue of the brain when responds to any shock, the nerves become awakened by shock and responds positively to become a part of acceptance system of brain. In this way, if the distinction between the body and the mind is destroyed to make them identical, then the true personality of human being begins to appear and the person starts to experience the beginning of development.

Once a person's mind is on the track, it is less likely to get lost. Asana and pranayama are being performed every day so that the difference in the attitude does not last much longer than the reasonable. There is a ring around him that he can not violate easily. Naturally, the attention of the external becomes less intrusive.

The best, especially if the children of 7-8 years old starts yoga, it is beneficial to get rid of it early. The child-born sanskars usually do not escape. Again, during the age of growth and developement, it helps to increase full growth of muscles, joints and internal organs, and there is also the possibility of having a strong interest in Yogasadhana. But if there is no opportunity for such a child, then no age is considered ineligible for body ascetics. On the contrary, the efficiency of the body is increased during the growth and developement. When they fully reached the maturity, they are considered to have the pleasures of every step of life. Yoga is more effective when it is developed according to intelligence.

Yoga, pranayam can reduce the illness. It can also be used for serious illness. If it is due to a new illness, then it is appropriate to do yoga again. So it is not necessary to stop yoga. It decreases weight at the same time without the feel of weakness. It heals illness rapidly.

Yoga is a perfect system of action. As human needs and ambitions are changing, social and economic needs are changing over the course of time, some needs are irrevocable even from time immemorial. Whatever may be the kind of culture or caste, needs are irreversible. It is a psychological truth that desires when there is a need. Needs can be objective, but desires are self-centered.

Any kind of social or economic prosperity whether at the level of civilization or in any situation in the society, the physical needs of the society, the need for awareness and spiritual well-being, remain the same. For the wellbeing of physical and mental strength, different sciences came forward and put efforts to their fullest strength to improve mental health.In addition to the knowledge-related needs, the human struggle is in full

swing. Aspiring to be omniscient, man has created a network of branches of knowledge around us.

Freedom of thought is definitely axiomatic claim of man. Every person thinks in accordance with the manner in which they behave according to their nature and in accordance with their conduct and ethics. But the first impression arises on the tendency to think about the external world. External subjects inspire us to think and internal senses awaken thoughts. Whatever may be the prevalence of good thoughts and ideas, even though the precepts of learning, it is not easy to understand the subject matter and the good thoughts of external world.

Though thinking that if it is an intellectual act, keeping the systematic thinking in mind, it is up to the person to work on the idea of thinking, then the individual's personality needs to be developed by Yoga only. Yoga is to inspire thoughts, to think, to dignify and find out the thoughts, to quell the thoughts, to refine the thoughts and to confirm the correct ideas.

Asanas is what makes people sensitive. This sensitivity takes place at different levels. Increase in the burden of any part of the body or give it stresses keeps it stable and strong. It is possible through the asana to keep the life in force as high as you want. Diversity of Asanas and methods of doing it in a variety of ways is not just a type of entertainment but it shows the way to cross-interiors, and this diversity is expected to be catchy, welcoming and adequate for everyone according to age, and to be followed by everyone's well-being and health.

To maintain the health of the body and mind, the practice of moral and mental attitudes through practice of Karma Shudhi, cleansing of Panchamahabhutta and Tanmatra by Asan, pranayama through PranaShudhi and pratyahara to IndriyaShudhi and Dharana, Dhyanis to make ChittaShuddhi, when there is a soul of soul and energy in mind, Whatradusanala be paryavaranasuddhi add curb? The answer to this question is only found in Yoga. Yoga is coincidence, Yoga means

Samyak, Yoga means Samadhi. Ashtang-Yoga practitioner wishes to unite the body with mind.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

Studies on Crafts and Gears used for Marine Fishing Operations on Devgad Coast, Sindhudurg

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Abstract
Fishing is the main occupation of approximately more than fifty percent population in Devgad tehsil. From ancient periods, fishing has been carried out in sea as well as in estuaries. Fishing operation is usually done in open sea and estuaries throughout the year except the ban period. In Maharashtra, ban period is from 1st June to 31st July. Along Devgad coast it extends upto *Naralipournima.* Fishing operation is carried out with and without gears. Two types of crafts are used mainly as traditional and mechanized. Selection of craft and gear depends upon the type of substratum, depth of water column for the targeted species, nature of the sea shore, type of fish etc. Six gears and four crafts are used for fishing in Devgad region. Some gears are operated by single person whereas some require organized group of fishermen. Depending upon the economic condition of the fishermen, selection of craft and gear is done.
Keywords: Devgad, Marine fishery, craft, gear

Introduction
Fishing industry is the main source of food and income for large group of population residing in Devgad. To cope up with demands of growing population, though mechanization is essential, some fishermen are totally dependent on traditional fishery throughout the year. Lower economic group of fisher flock generally use non- mechanized devices. Crafts and gears used on the east and west coast of India are different. They depend on the nature of the sea shore and speed of water drain by the rivers. As compared to eastern coast, western coast is calm and less affected by cyclonic storms. Crafts are the devices that provide platform for fishing and to carry gears and crew to the fishing grounds. Gears are the equipments used to capture fish. Fishing is carried out either with gear and

without gear, similarly with crafts and without crafts. Selection of craft and gear is done according the nature of sea shore, types of fish to be caught, season and fishing season. Various types of mechanized and non-mechanized gears as well as crafts are used for fishing along Devgad coast. Devgad tehsil is situated on the western coast of Konkan region of Maharashtra. Here, the sea shores are steep and deep. Beaches of Devgad are of three types namely sandy, muddy and rocky. At some places, mixture of two or all three types is observed.

Objectives

1] To visit the various fishing centers as well as landing centers frequently as per the time availability throughout the study period

2] To obtain the necessary information from the fishermen flock, business agents and other related community involved in the fishing business through a well-set questionnaire as well as oral interviews.

Material and Methods:

a) Study area:

Sindhudurg district is situated in South Konkan on west coast of Maharashtra. Out of eight tehsils of Sindhudurg, three (Devgad, Malvan and Vengurle) are gifted by sea shores. Area covered by Devgad tehsil 5219 sq. km. and is endowed by sea coast of approximately 32 km. Fishing is exclusively carried out in the creeks and the open sea. Specific area selected for the present study includes Wadatar-Malai creek, Devgad port, Anandwadi, Taramumbari, Mithmumbari, Kunkeshwar, Vijaydurg, Tambaldeg, and Morve.

b) Methodology:

Most of the area of the Devgad tehsil represents more or less similar use of crafts and gears. The data for the proposed study was collected from different fishing areas of Devgad tehsil using well set questionnaire. Informal discussions were done with fisher flock to gain relevant information by visiting the landing centers. Data was gathered through frequent visits to area under study.

Result and Discussion

Fishery and related businesses are the major income and employment generating resources in Devgad tehsil of Sindhudurg district. The actual act of fishing is carried out on the coastal lines of Arabian Sea in the tehsil and related estuaries since ancient periods. Estuarine fishing is done significantly during rains; but yet it is not a major commercial source in all fishing centers in tehsil as compared to deep sea fishing. In addition to that, in most places, estuarine fishing is restricted mainly to molluscan harvesting rather than actual fish catch. (Jambale 2018). About 75% molluscan fishery comprises of bivalve collection without using any craft and gear mainly by low economic fisher flock. Those having their own vessel use it for collection of bivalves at greater depths. Fishermen community, expert in swimming of all age groups above the age of 8 years, are involved in hand picking of bivalves of different species such as *Katelysia opima, Meretrix meretrix, Paphia ala-papilions* by touching and sensing bivalves beneath muddy substratum with their toes. They are expert in this collection, after sensation of bivalve shell they just bent down in water to collect it in bag tied to their waist or in a non mechanized fishing vessel such as Pagar. Besides these, other common molluscan species harvested in this area are green mussels (*Perna viridis*), and oysters *Soletellina violacea* without using craft and gears. Main oyster species collected in this region are rock oysters (*Saxostrea cuculata*) is collected by opening shell with the help of sickle and *Crassostrea madranensis* is directly handpicked from deeper waters.

In Devgad, fishing boat or craft used for operation are basically of two types. One is non-mechanized and other is mechanized. Different types of boats used on the coast are as follows...

1. **Pagar (Dugout canoe):**Most commonly used and affordable fishing craft in this region is Dug-out canoe locally known as Pagar. The length of this boat ranges between 28 – 32 feet. This type of boat is prepared by scooping out wooden material from wooden logs of large Ain tree. But so as to reduce the weight of vessels now a days mango tree logs are used. Fishing crafts used in the estuarine region are mainly non-mechanized.

2. **Rampani boat (Plank built boat):** Rampani is long plank-built boat, measuring about 15x3 m. Mostly used for operating Rampani net. In this area such as Kunkeshwar, Mithmumbari, Katvan, Tambaldeg, Padavane and Munge. Previously boat was built by stitching wooden planks. In this region, rampani boat is used with an outrigger so as to balance weight of the main boat. The outrigger is a frame work projecting from main boat sides. This type of vessels requires more space in the port. Therefore their number is gradually reduced in this region. At present rampani boats are modified with fiber material, as they are easy for maintenance and balance. The cost of the modified fiber rampani boat is reduce with the benefit of durability. Being non-mechanized the boat is rowed. This type of boat is used to operate shore seines, boat seines, drag nets and gill nets.
3. **Fiber boat:** Fiber boat is a manually operated and economical boat used in this region. The size of the boat ranges between 55-60m and is fitted with 2-4 cylinders sometimes. It requires one year duration to build and the life span of the boat is about 10 years. Two factories are situated in this region for manufacturing of these vessels. These types of fiber materials are supported internally by wooded bars. Such 200 vessels are employed in gill net operation in Devgad port. Few fishermen used pocket GPS device during fishing operation.

4. **Trawler:** Trawler is a mechanized type of fishing vessels used particularly to operate trawl net. Length of the new trawlers is about 50-60 feet, whereas old one was 30-45 feet. These vessels are fully mechanized and well equipped. Most of them are with vessels tracking system (VTS) and with GPS, fish finder and having government help through DAT (Distressed alert transmitter). This device is used to obtain help from coast guard during emergency. This type of craft is mainly used to operate trawl and purse seine nets and nearly 120

5. trawler are involved in fishing in Devgad port.

Gears used for fishing on Devgad coast varies according to fish to be caught. Various types of indigenous and special nets are used by fishermen. The nets used on Devgad coast mainly include.

1. **Cast net:** It is operated from pagar and small fiber boats or sometimes directly standing in shallow water near sea shore. Most often cast nets are used in Taramumbari, Kunkeshwar and Mithmumbari. These types of nets are used to catch shoals of small size fish where substratum is muddy or sandy. These nets are circular in shape and operated by holding cord and throwing the net after citing fish shoal. The net is operated by a single person. The net sinks down to the bottom due to iron or lead sinker attach to lower margin.
2. **Gill net:** Gill nets are operated by fiber glass vessels. Gill net is rectangular piece of net made up of various mesh sizes. This rectangular piece of gill net possess head rope with floats and foot rope is present at the bottom. To the foot rope sinkers are attached, sometimes stones are used. The fish get entangled in net in the gill region and dorsal fin in hole of the gill net. The catch consists of sear fish and cartilaginous fishes etc.
3. **Hooks and lines:** Hooks and lines are used for capturing individual fishes having commercial high value or during monsoon. It is also practiced as hobby or home consumption. A long line is made up of one major line with several small branched lines. The long line is made up of smaller units known as baskets. To each basket, 3-5 small branch lines are attached.The length of each basket is decided by type of fish to be caught. At the end of each branch snood wire is connected to a hook. Each unit of long line (basket) is denoted separately by attaching float and a flag at the top.
4. **Trawl nets:**Trawl net is used in inshore and offshore fishing activities. Trawl net is fully mechanized net operated from trawler. The shape of the trawl net is like a half open umbrella tapering towards the end. The mesh size at the mouth region is more whereas, smaller at the tail region. The tail region where targeted species are caught in the net is known as cod end. The mesh size at the cod end by rule is 40mm, but the rule is not followed practically. The mesh size at cod end region is lowered to 20mm, that results in death of immature catch. Towards the mouth region chances for escaping fish are more due to large mesh

size. But as the mesh size gradually decreases towards the cod end. The mouth region is kept open by otter boards attached to both ends made up of glass fiber material. The foot rope is attached with metallic chain of lead balls, whereas the head rope possesses floats made of fiber material. Depending upon targeted species trawlers are of three types, namely pelagic, midwater and demersal trawls. Mainly used for prawn, sole fish, dhoma, etc.

5. **Dol net:** Dol net is fixed type of trap net used in water with less wave action in estuarine region. It is basically conical bag like structure without wings. The mesh size gradually goes on decreasing from mouth end towards the cod end.The large bag like net is fixed in the sandy bottom of the sea with the help of stout bamboo poles or with the help of thick ropes attached to heavy anchors. The net is kept open in horizontal position facing towards the tidal flow. When change in the tidal flow occurs the catch is emptied by hauling operation. The length of the net is about 56m. The width near mouth region is approximately 30m and height nearly 18m. Bamboo pole is about 32m long out of which 8m remain buried under the substratum. The mesh size at the mouth region is 200mm and which is gradually reduce to about 10mm at the tail region.

6. **Seine nets:** Seine nets are the large size nets with wings and towing warps. The mode of operation is by encircling a particular area and towing the gear with both ends fixed to a point either on the shore or craft. Usually these nets are used for bulk fishery and requires more man power for its operation. The seine nets used in this region are of two types, purse seine net and shore seine (rampani).

a. **Purse seine:** It is large bag like net basically used for pelagic fishery. The fishes are captured by encircling them, both horizontally and vertically. The length of the net measures about 450m and 40-45m depth. And the weight varies depending upon mini or large purse seine. The maximum range is about 1-1.5 tones. The mesh size of the net is uniform throughout the main body and it is the largest part of the net. It lies between wings and bunt. Bunt is end portion of the net from which fishes are collected. A single operation yield catch of Rs. 80,000 to 1,00,000. Small and large size all fish varities are caught with the help of purse seine. This leads to indiscriminate fishing of all fish varities resulting in overexploitation of fish resources.

b. **Shore seine:** Shore seine requires large man power up to 80-100 men. Locally used shore seine in Devgad is known as rampani. This type of net is used to catch all variety of fishes ranging from small to large size. The net is without bag portion. It is made up of 100 to several 100 rectangular pieces joined together. The size of the mesh is smaller at the central part then at the both sides. In the central region it is 12mm and at the side 30mm. the fiber floats are attached to head rope and stones are as sinker at the foot rope.

Conclusion

The types of crafts and gears used in study area are changed from time to time with the mechanization. Mechanized vessels such as trawlers and nets such as purse seine are used to increase fish crop but immature catch result in over exploitation. This greediness of human being may leads to extinction of several species of marine life beyond recovery. Non mechanized crafts and gears are replaced by the mechanized ones so as to

meet the growing demands of the large population. Restricted number of vessels in a particular estuary and Devgad port is essential for sustainable fishery. Over exploitation of fishery resources have marginalized the traditional fishermen. Studies of crafts and gears gives present scenario and impact of modern techniques and mechanization. Previous traditional fishery is gradually replaced by mechanized fishery. In all four crafts and six gears are used in and around Devgad tehsil.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

Green Audit in Academic Institutes

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Abstract
The environment where we live within is of utmost concern since it is directly related to the survival. Keeping it healthy is the responsibility of each and every individual. After Earth Summit Rio 1992, the concept of environmental audit was accepted by many countries. In Indian scenario, very few industries were inspired. The reasons are listed in the present study. The present study focuses on the process of environmental audit in academic institutes of India. The study also mentions some of the practices to be continued as a part of environmental management. Some of the practices like renewable energy, composting, use of CFL are followed by 60%, 50% and 30% of the institutes respectively. Sewage treatment plants are opted by only 20% institutes. It is found that there is meagre data is available regarding the environmental practices undertaken by the academic institutes. Such data may help in deciding the simple policies to be adapted by the institutes towards a sustainable environment.

Keywords: ***stages of audit, energy management, water management, plantation, biogas plants***

Introduction
Earth is the only planet in the universe to sustain life because of its environment. No life can exist without suitable environment and so no human being.

Increasing population, civilization, industrialization and urbanization on the earth have brought this environment under the great pressure.
Revolution in the field of science and technology to make the life more comfortable has made the environmental degradation as transboundary problem which has degraded air, water, soil and ecosystem as whole. Polluted environment leads to the adverse effects on the health of animals, plants and human being. Booming technological fight in the past decade has affected environment very adversely. Environmental issues have now become a world-wide concern and the focus of discussion in a variety of forums both at national and international levels.

India is a developing country and adapting science and technology for its progression. There is improvement in the life style but on the other side it is creating exploitation of the environment. Luxurious life style is becoming environmental risk which may render it unsuitable for future generation.

All the issues related to environment are rooted in economic and social policies of the country and therefore they occur at all levels from local, national to global. Most of the foreign countries are working on these issues sincerely and systematically. They have framed very stringent policies for environment protection and executed them successfully. Even the country like Maldives called attention of the world by convening its meeting of cabinet under the sea. However, besides having tradition of worshipping environment, we, Indian are overlooking the challenging and burning issues of environmental protection. Environmental issues remained just part of the debate and discussion but rarely any action is taken in systematic way. It is assumed by the society that the responsibility of protection of environment lies with government and its concern agencies. Even majority of industries in India are focusing on their production and marketing policies but not on the control of environment hazards that they are being responsible.

Generally, every constituents of our society is responsible for environment crises and it is the duty of each of us to strive hard for its conservation. If we start with ourselves, it will definitely create a positive benchmark of

the success in the journey of environment protection. Green audit is the prime solution of this scenario.

Green audit is the tool of management system used methodologically for protection and conservation of the environment. It is also used for the sustenance of the environment. The audit suggests different standard parameters, methods and projects for environmental protection. It can be adopted by any industry, organization, institute and even by housing complex. The green audit is useful to detect and monitor sources of environment pollution and it emphasizes on management of all types of wastes, monitoring of energy consumption, monitoring of quality and quantity of water, monitoring of hazards, safety of stakeholders and even the management of disasters.

Background

The green audit was first implemented in the United States in the early 1970s by some companies in commensuration with Clean Air and Clean Water Act. The process of this audit initiated from response of commercial policies of US to natural requirement and not from the local authorities. Afterwards, these policies resulted into an act for the companies who are responsible for environmental loss that they were causing. The US has adopted the act to compensate the environmental loss. In order to avoid this liability companies took initiatives with regards to act by conducting 'Performance Review' and 'Compliance Audit'.

In UK, a few major companies mainly the British Petroleum introduced guidelines of environmental auditing for the first time in 1975. It was then made applicable to local authority sections in this country when 'Environmental Charter for Local Government of the Friends of the Earth' came in light in the year 1989. By 1992, more or less half of the local authorities of UK stood for the audit completely or partially.

The United Nations Conference on Environment and Development (UNCED), also known as Earth Summit Rio-1992 held at Rio de Janeiro, Portuguese from 3rd to 14th June 1992 inspired the countries on the globe to review their environmental stand to act effectively to save the earth with sustainable approach. It is the best

achievement of the Earth Summit Rio-1992 that most of the countries have accepted their national strategy for sustainable development which includes the policy and programmes aimed to promote geo-biodiversity and protect environment. This Rio spirit shows significant progress in most of the countries and they have changed and upgraded the environmental situation to the possible extent. Some of the Asian countries were also motivated from the summit and played same role within their limits.

India is the first country in the world to make environmental audit compulsory (Arora 2017). According to gazette notification [No. GSR 329 (E)] of March 13, 1992, all Industries were communicated to submit the reports of the environmental audit to their concerned State Pollution Board, giving details of water, raw materials and energy resources used and products and waste generated by them in their operations from 1992 (National Environmental Policy 2006).

The environmental audit could not make much headway even after two years. Out of the lakhs of industries that existed in India, only 2995 audit reports were submitted by December 1993 (Aparajita 1995). The possible reasons would be

1. Hurriedly implementation without any infrastructure or experts.
2. Higher cost for environmental auditing.
3. Longer period of completion.
4. No follow up plans.
5. No evaluation of the reports by concerned PCBs and no feedback provided.
6. Fear among industries about disclosure of modus operandi to the public who they feel are not mature enough to follow the importance of such data.
7. Fear among industrialist that the data they are revealing might lead to legal arguments and litigation by PCBs.
8. There was also fear among the industrialists that the data regarding raw materials used which was supposed to be mentioned by industries might reveal their trade secret.

This has led to distortion of environmental audit and the revised notification No. GSR 386 (E) was announced in April 22, 1993. It has replaced 'Environmental Audit' by 'Environmental Statement'. The Government of India has announced the policy statement: 'Industrial concerns and local bodies should feel that they have a responsibility for abatement of pollution.' The industries were now supposed to fill a form and submit it to the concerned Pollution Control Boards (PCBs). The environmental statement was not actual based on actual reports and was stating that the concerned industry has taken requisite steps in compliance with existing pollution control regulations. It defeated the purpose of environmental audit regulation.

Environmental Audit in Academic Institutes

In 2006, Government of India has declared the National Environment Policy 2006 and made green audit mandatory to each industry. According to the policy it is a response to India's national commitment to a clean environment, mandated in the Constitution in Articles 48 A and 51 A (g), (DPSP) strengthened by judicial interpretation of Article 21 (National Environmental Policy 2006). It is recognized that the maintenance of the healthy environment is not the responsibility of the state alone. It is the responsibility of every citizen and thus a spirit of partnership is to be realized through the environment management of the country. The process of environmental audit was formalised by Supreme Audit Institution (SAI) according to the guidelines given in Manual of Standard Orders (MSO) issued by Authority of the Controller and Auditor General of India 2002. . The Supreme Audit Institution of India is the highest national Institution of auditing in the country.

By realizing the need of responsibility towards environment, NAAC, an autonomous body under UGC has added the concept of environmental audit in accreditation methodologies of universities and colleges.

Aims and objectives of Environmental Audit in Academic Institutes

To nurture environmental friendly management in academic institutions following aims and objectives were formulated

- To recognize the initiative taken by organization towards environment.
- To secure the environment and cut down the threats posed to human health.

- To provide baseline information to enable organization to evaluate and manage environmental change, threat and risk.
- To recognize, diagnose and resolve the environmental problems.
- To recognize the effects of an organization on the environment and vice versa.
- To identify and control the impact of activities of organizations on environment.
- To suggest the best protocols for sustainable development organization and environment.
- To assess environmental performance and the effectiveness of the measures to achieve the defined objectives and targets.
- To identify the different pressures on organizations to improve their environmental
  performance.
- To ensure that the natural resources are utilized properly as per national policy of environment.
- To establish the parameters for maintaining health and welfare of the community of the organization.
- To set the procedure for disposal of all types of harmful wastes.

- To reduce energy consumption.
- To give preference to the most energy efficient and environmentally sound appliances.
- To minimize the consumption of water and monitor its quality.
- To identify the risks of hazards and implement the policies for safety of stakeholders.
- To facilitate the stakeholders with different aspects of disaster management.
- To train all stakeholders of the organization and empower them to contribute and participate in the environmental protection.
- To make sure that rules and regulations are taken care to avoid the interruptions in environment.

To achieve the mentioned objectives following stages are implemented. It includes three stages viz. pre-audit stage, audit stage and post-audit stage. Each of these stages comprises a number of clearly defined objectives, with each objective to be achieved through specific actions and these actions yielding results in the form of outputs at the end of each stage.

Keeping the importance of environmental audit in view, the present study focuses on reviewing the process of environment audit and the major to be taken by academic institutes to contribute towards environment.

Research Methodology

For the current study, the secondary data is used. It is obtained from the environmental audit reports of colleges across India. The primary data regarding some of the environmental related practices was also generated through secondary sources. Institutions related to higher education are only considered during the presnt study.

Pre-audit Stage

- **Establishment of Environmental Management System**

  The first and very important phase of green audit is establishment of an Environmental Management System (EMS) by an organization. The Environmental Management System is the backbone of the auditing process and its role is broad and wide. Every aspect of

green audit is monitored by this system. The organization should establish the Environmental Management System. The governance structure of the Environmental Management System is shown in following chart.

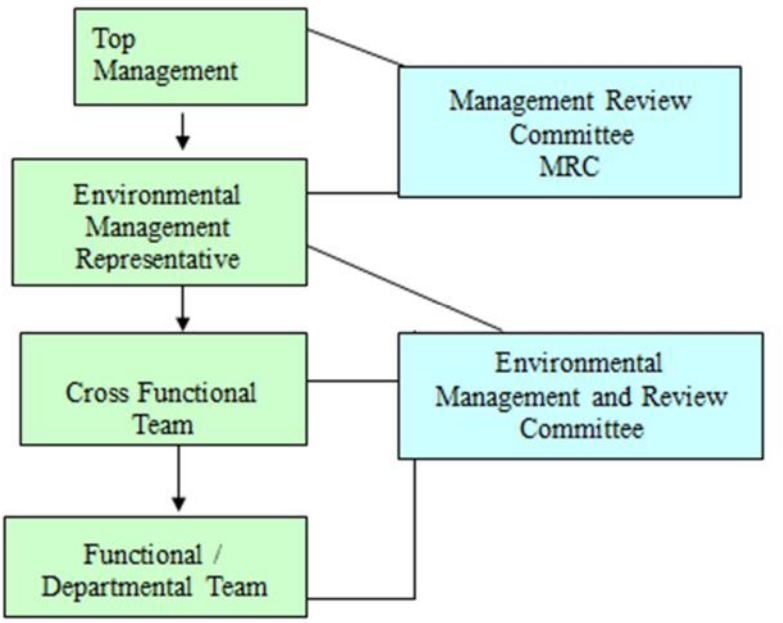

Fig. 1 Governance of Environmental Management

Environment Management System includes all stakeholders of an organization comprising top management to the functional team. Each of them has given a specific task of compliance within stipulated period.

- **Declaration of Environmental Policy**

  The Environment Management System should declare 'Environment Policy of an Organization' and communicate it to all the concerns stakeholders. The policy is the reflection of goals, objectives, scope and priorities of the organization related to environment sustenance.

- **Planning of Programmes or Activities**

  As per the declared environmental policy, the Environment Management System should plan and execute their programmes and activities in comprehensive and systematic manner.

All environmental aspects related to the organization and their legal requirements should be studied before the planning of such activities.

- **Implementation and Operations**

  During implementation and operation processes the EMS requires to define roles, responsibilities and authorities of key personnel, commit to staff training, maintain effective communication channels, adopt effective documentation and operational controls and maintain sufficient awareness on emergency preparedness among the staff.

  The EMS should evaluate all implemented programmes and processes and modify it as per the environment policy.

Audit Stage

- **Actual Auditing**

  The Environment Management System plans and executes the actual visit of an auditor of concerned agency.

- **Checking of Documents and Evaluation**

  The auditor evaluates the documents rigorously and suggests necessary recommendations.

- **Review of Environment Policy**

  The auditor takes the review of the Environment Policy by evaluation of documents as well as personal interviews of representatives of stakeholders.

- **Review of Programmes or Activities**

  The auditor also takes the review of all the planned and implemented programmes or activities by evaluation of documents as well as personal interviews of representatives of stakeholders.

Post-audit Stage

The post-audit stage is the role of an auditor. The auditor considers all the facts and observations of the audit together in concern with the Environment Management System.

- **Evaluation of Findings**

  The auditor evaluates the findings as per the standard procedure.

- **Reporting with Recommendations**

  The auditor prepares a brief report of the audit along with recommendations in consultation with the EMS and sends it to the auditing agency.

- **Preparation of an Action Plan**

  According to the recommendations given by an auditor the EMS should chalk out the action plan and accomplish it effectively.

- **Follow-up**

  The auditor takes the follow-up of the programmes or activities periodically.

Certification

After successful completion of audit, an organization will be honoured with the certificate and the certificate is valid for three years.

Continuous Process Assessment

As mentioned earlier the green audit is continuous process. The Environment Management System of an organization should adhere to this continuous process of green auditing as per the environment policy and recommendations and go for the auditing process again after three years.

Initiatives by academic institutes for Green Campus

As green auditing aims at improving the environmental status, following measures can be taken by academic institutes to contribute toward sustainable environment.

Generating carbon foot print data

Carbon foot print is the total amount of Green House Gases (GHGs) emitted in terms of carbon dioxide by a person, institute, company, state or country. For calculation of carbon foot print the basic data regarding direct and indirect sources of emission of Green House Gases is needed. The GHG emissions are generally calculated through the application of documented emission factors. The documented emission factors are ratios relating GHG emission to proxy measures of activities (GHGP Ref) like use of electricity, use of diesel generators for electricity generation or any other purpose, LPG consumption, food wasted and vehicular emission. The software like ChevronTexaco are available to calculate the GHG.

Reduction of GHGs can be achieved by plantation. It is a widely accepted solution for reduction of carbon foot print on campus. The plants selected must be suitable to the soil and climatic conditions. Indigenous plants which help in building soil fertility and coppicing ability are suitable for the academic campus. Tree sensus should be conducted periodically. Measures for biodiversity conservation also highlight the efforts towards environment. Even though plantation is regular activity in the academic institutions, 50% institutes take sincere efforts towards it while 50% of the institutes do not have sincere concern about it. Following ‘No vehicle’ day, use of bicycles, public transport are many options. However, readiness towards its acceptance is needed.

Energy management

Consumption of energy helps in understanding the success towards green environment. Lesser the consumption of energy more contribution the environment is. Electricity can be used efficiently by replacing CFL bulbs and tube lights with LED lamps and fluroscent tubes wherever possible and use of LED screens in place of CRT. Star rated Air conditioners should be placed in place of old air conditioners. Efficiency of air conditioners should be increased by minimizing the leakage using through open doors and cupboards of the room. Infrastructural changes that allows maximum natural light but minimizes heat in-grace help in reducing the use of electricity. Simple practices like cleaning skylights and lamps will increase the luminosity. There should not be any idle energy consumption. Screen savers on computers increase energy consumption than in sleep mode. Use of 15" monitor @1024*768 resolution consume 6 watt less energy than 17"-19" monitor with higher resolution (Gowri and Harikrishna 2014). Considering there are 500 computers in the institute, it is possible to reduce 3000 watt per day. Use of laptops over the desktops also help reducing energy consumption. Energy consumed by laptop is less than that of desktop (NRDC). Use of renewable source of energy is widely accepted option now a days. The survey showed that 60% of academic institutions in India opt for solar panels although not rely completely on to it. 20% of the institutions do not harness solar energy while 20% are not take need of solar energy seriously.

Solid Waste Management

Managing our own waste is the responsibility of every individual. The solid waste produced in academic institutes mainly consists of papers and garden waste. Other than that glassware and old instruments form the bulk. Paper waste can be reduced by maximizing e-communication and e-learning. Use of one side papers is one of the best solution for reducing paper waste. The papers after use can be turned into handmade papers. Some papers which do not have confidential data can be given into the scrap for recycling. Other recyclable materials like cardboards, broken glassware, and metal should be given to the vendors. Use of paper cups can be minimized by replacing them with ceramic cups. Single used

plastic bottles can be replaced with refillable vessels. Plastic waste can be collected separately and given to the agencies which are specialized in recycling plastic waste. Tetrapacks also can be collected separately and given for the agencies reuse and recycle them. Disposal of sanitary waste should not be neglected. At educational institute good quality incinerators is the best option which reduces the sterile ash. Garden waste can be for composting. Many efficient and effortless processes are existing for the same. Many academic institutions follow most of these practices. Composting is one of the easiest ways to manage biodegradable waste. During current study it was found that only 50% colleges do composting, 20% do not do and 30% are not serious about it.

Silvennoinen *et al.* (2015) divide food waste between originally edible and originally inedible, the latter referring to, for example, vegetable peelings, bones and coffee grounds. The food waste of both the categories can be managed efficiently by having biogas plants and anaerobic digesters. The sludge can be further processed into compost. Study by California energy commission estimated that codigestion food processing waste and waste water at waste water treatment plant could increase biogas potential (Kulkarni 2009). However, the pre-processing of food waste before co-digestion is needed (Kuo and Dow 2015). The biogas, thus generated can be used to replace LPG in biogas and chemistry laboratories. Any academic institute hardly indulge into biogas and sewage treatment plant in their institution.

Water management

Water is a very valuable resource and everybody is gaining the awareness about the value of water. Many known technologies can work efficiently. Rain water harvesting, sewage treatment and its use for horticulture and garden, no leakage from the tap, use of push button taps, use of lowflow faucets, automatic faucets, and/or faucet aerators, use of condensed water of AC for gardening, use of sprinklers for watering lawn, use of RO water, Recycling of RO waste water are few of them. Rain water harvesting is choice for water management in 70% of academic institutes of India according to the present study. The study also says that only 20% have sewage treatment plant.

Hazardous waste Management

Green Chemistry approach helps in reducing the excess use of chemicals and also provides approach towards reducing hazardous waste products. Broken glassware, plastic needles, syringes, razor blades, slides, scalpels, pipettes, broken plastic or glassware, micropipettes and pipette tips ware creates a potential hazard. Triple rinse with copious amounts of water help in reducing the pathogens and neutralizing harmful chemicals on to it. Collect the first rinse as chemical/harmful waste. Rinse two and three can go down the sanitary sewer. The empty/triple rinsed containers can then be placed in a glass only box, recycling container or directly into the dumpster. Use of sterilized agar waste for composting is one of the ways of waste management. Purchase of minimal chemicals as per the requirement avoids wastage of chemicals.

E-waste management

Management of E-waste is more challenging problem rising along with development in technologies. Kitila (2015) found in his study in educational institutions of Ethiopia that desk top computers generate majority of E-waste since most of the staff and students rely on them for their work and lifespan of computers is very short. The main reason for voluminous E-waste is lack of awareness about the potential hazard to living being and to environment, absence of legislations, shortage of recyclers and refurbishing shops etc. There is very scarce data regarding e-waste generation and its management in Indian Academic Institutions. The survey conducted during the study showed that 50% institutions handover the e-waste to the agency for further disposal whereas 50% of them have not responded.

Conclusion

Green audit, also referred as environmental audit should be implemented by higher education institutes. One should understand the process of environmental auditing. It is a continuous process. Once learnt about the short fall about the efforts towards environmental conservation, one can plan about some of the initiatives mentioned above. Though academic institutes take part in restoring the environment, still there is scope for the further action.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

Ergonomic Evaluation of the Residence (Private Areas) of the Elderly

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Abstract

Population aging is a global phenomenon. Living with an elderly person at home is a delicate phase in any family's life because majority of the elderly need assistance to accomplish Activities of Daily Living. Consequently, it is at home, especially the kitchens and bathrooms, where most falls/accidents occur. In order to increase the quality of life of the elderly - safety, comfort, physical and social health, the physical environment must be free of hazards. Home modifications must take into consideration the capabilities and limitations of the elderly. It is strongly believed that most accidents can be avoided with inexpensive measures.

The objectives of the study is to: (i) determine the incidence of falls and accidents among the home living elderly, (ii) ergonomically evaluate the private areas (Bedrooms and Bathrooms) in the existing residences of the home living elderly to identify potential safety hazards that lead to falls /accidents (iii) suggest economical & affordable changes/modifications in the homes so that they can adapt in their familiar surroundings.

Data was collected from 90 participants (aged 60 years and above). Convenient (willingness to participate) and purposive sampling method was employed. The participant's background information was obtained through a self-constructed questionnaire. In addition, a survey of their residential space was conducted to observe the design modifications and suitability of interior (bathrooms, toilets and bedrooms) and exterior (corridors, ramps, handrails) facilities. The checklist HSSAT V.4.0, was used to assess the residential spaces ergonomically.

Results indicate that 31% had a fall/slip due to the physical environment in the last one year. Bathroom was identified as the most unsafe area in

the home. 95.5% of the elderly could identify the unsafe areas/corners in their homes but were confident that their homes were accident free. Most common hazards are poor illumination, level changes in flooring and slippery flooring.

Keywords: Elderly, Home Modifications, Safety, Ergonomics

"Respect is one of the greatest expressions of Love."
— Miguel Ruiz, Author

Population ageing is one of the most important global trends of the 21st century and the issue has started receiving much attention from the public, media and policy makers. The phenomenon of population ageing is becoming a major concern for policy makers too, during last two decades. The increase in life expectancy has resulted in a major shift in the age group of 80 years and over, known as the 'oldest old'.
According to the report titled "Situation Analysis of the Elderly in India" (2011) by The Central Statistics Office, Government of India, both the share and size of elderly population is increasing over time. From 5.6% in 1961, it is projected to rise to 12.4% of the population by the year 2026. For a developing country like India, this may pose mounting pressures on various socio-economic fronts including pension outlays, health care expenditures, fiscal discipline, savings level etc.

In India if we divide the total population into three major age-groups, i.e. age in years 0 - 14; 15 – 59 and 60 and above, it is a clear picture that during the last few decades the number of children (age 0 -14) is decreasing from 37.6% in 1991 and is projected to be about 25% by 2021. On the other hand, the proportion of population in the working age-group (15 – 59 years) and the aged/elderly (60 years and above) both are rapidly increasing. The improvement in life expectancy and decline in age-specific death rate among the elderly are chiefly due to the improvements in public health and medical advances in the prevention of many fatal infectious diseases.

Traditionally, older adults are taken care of by their families. A caregiving crisis is predicted owing to changing gender roles, employment of women,

erosion of traditional family values, and an increasing trend for nuclear families. The number of older adults living alone is increasing. With decreased family support and informal caregivers, older adults in India care for themselves (http://ajgg.org/AJGG/V9N1/2013-164-RA.pdf accessed on 14.02.18). The WHO (World Health Organization) proposes 'active ageing', which aims to extend healthy life expectancy and quality of life for all people as they age, including those who are frail, disabled, and in need of care. It emphasizes on promoting an active lifestyle, which saves substantial health care–related expenditure. (According to the WHO Global report on Falls Prevention in Older Age http://www.who.int/ageing/Publications/Falls_prevention7March.pdf accessed on 25.12.18).

The traditional Indian society and the age-old joint family system have been instrumental in safeguarding the social and economic security of the elderly people. However, with rapid changes in society and the emergence of nuclear families in India in recent years, the elderly is likely to be exposed to emotional, physical and financial insecurity in the years to come.

A few problems faced by the Indian elderly are:

- Economic Insecurity: Less than 11% of older Indians have a pension of any sort, according to national surveys (World Bank 2001; Uppal and Sarma 2007). Saving is difficult or impossible for a majority of Indians because earnings are low.
- Isolation and Neglect: Isolation, or a deep sense of loneliness, is a common complaint among many elderly. They often feel neglected because the young family members may be busy with their life, demanding jobs, distractions such as Television, Social Media etc. The elderly, especially those who are weak and/or dependent, require physical, mental and emotional care and support. When this is not provided, they suffer from neglect. Isolation is a terrible feeling that, if not addressed, leads to tragic deterioration of the quality of life
- Lack of Preparedness for Old Age: A large number of people enter 'old age' with little, or no, awareness of what this entails. While demographically, it is accepted that a person is considered to be old

when they attain the age of 60 years but there is no clear indicator available to the individual. For each person, there is a turning point after which they feel physiologically or functionally 'old'. This event can take place at any age before or after the age of 60 years. Unfortunately, in India, there is almost no formal awareness program for people to prepare for old age (http://www.helpageindiaprogramme.org/Elderly%20Issues/problems_of_the_elderly/index.html accessed on 17.02.19).

- Living Arrangement and Social Security: More than four in five older Indians live in multigenerational households with their children. But surveys find that the share of older Indians living with only a spouse or alone doubled between the early 1990s and the mid-2000s (http://www.prb.org/Publications/Articles/2012/india-older-population.aspx accessed on 26.10.18). A number of trends may explain these changes in living arrangements, including declining fertility leaving fewer children available to care for older parents, rural-to-urban migration for employment that separates families, and changing social expectations regarding intra-family obligations. Security at night a particular issue for many elderly, especially for those living alone.
- Failing Health: As people get older, two major challenges impact on their ability to engage in everyday tasks. The first is a gradual decline in hearing, vision, and mobility (which includes walking, and movement of the arms and body). The second challenge is a high probability, which increases with age, of having one or more chronic diseases, such as arthritis, cataracts, or heart disease. These chronic diseases often lead to additional impairment. (http://www.helpageindiaprogramme.org/Elderly%20Issues/problems_of_the_elderly/index.html accessed on 02.10. 17).

Falls/Accidents among the Elderly: Falls is a major cause of injuries associated with old age. In a Multi-centric Community Study, evaluating Health Problems in the Elderly (2003), in 10 states across India, covering

a total population of 10,200 elderly with equal rural and urban distribution, the incidence of falls (History of a single fall in the last 6 months) was found to be 14% (http://www.who.int/ageing/projects/SEARO.pdf accessed on 10.09.18). History of fall and fall frequency was seen to be significantly associated with disability and psychological distress. Higher disability and consequent increasing distress was noted among those with a prior history of fall after 60 years of age and those with a history of three or more falls. Falls and fall related injuries are among the most serious and common medical problems experienced by older adults. Nearly one-third of older persons fall each year, and half of them fall more than once. (http://www.who.int/ageing/publications/Falls_prevention7March.pdf accessed on 23.01.19). Falls occur as a result of a complex interaction of risk factors. The main risk factors reflect the multitude of health determinants that directly or indirectly affect well-being. These risk factors are categorized into four dimensions: Biological, Behavioural, Socioeconomic and Environmental factors.

Ergonomics: Ergonomics is the science and practice of designing the workplace, equipment, machines and environments keeping in mind the capabilities and limitations of the human users. The goal is to design jobs and tasks to remove incompatibilities between the work and the worker that hinder safe work performance. This allows person to prevent injuries,

illnesses, and mistakes *and* improve overall worker health and business performance. The inclusion of ergonomics dedicated to safety may seem unusual, but there are a variety of issues that can crop up if seniors are living in a place that is not as accommodating to their particular condition. For instance, if an elderly resident has to overexert his or herself for simple tasks like reaching for dishes or doing laundry, it could lead to falls, pulled muscles or torn ligaments. According to the NSC (National Safety Council), overexertion is the third-leading cause of unintentional injuries in the India.

Home Modifications: Home modifications are changes made to adapt living spaces to meet the needs of people with physical limitations so that they can continue to live independently and safely. These modifications may include adding assistive devices/technology or making structural changes to a home so that the elderly can independently perform ADL (Activities of Daily Living). Modifications can range from something as simple as replacing cabinet doorknobs with pull handles to full-scale construction projects that require installing wheelchair ramps and widening doorways. The main benefit of making home modifications is that they promote independence and prevent accidents. Most Indians want to age in their homes (Aging-in-place), but most homes are not designed to accommodate the needs of people over age 65 years. Most of them live in homes that are more than 20 years old. As these buildings get older along with their residents, they may become harder to live in or maintain. A house that was perfectly suitable for a senior at age 55, for example, may have too many stairs or slippery surfaces for a person who is 70 or 80 years.

A good home modification plan should improve the following features of a home:

- ✓ **Accessibility:** Making doorways wider, clearing spaces to make sure a wheelchair (if need be) can pass through, lowering countertop heights for sinks and kitchen cabinets, installing grab bars, and placing light switches and electrical outlets at heights that can be reached easily.
- ✓ **Adaptability:** Changes that can be made quickly to accommodate the

needs of seniors or disabled individuals without having to completely redesign the home or use different materials for essential fixtures. Examples include installing grab bars in bathroom walls and movable cabinets under the sink so that someone in a wheelchair can use the space.

- ✓ **Universal Design:** Universal design features include appliances, fixtures, and floor plans that are easy for all people to use, flexible enough so that they can be adapted for special needs, sturdy and reliable, and functional with a minimum of effort and understanding of the mechanisms involved.

Assistive Technology: Assistive Technology is, any service or tool that helps the elderly or disabled do the activities they have always done but must now do differently. These tools are also sometimes called "Adaptive Devices."

Justification for the study: Although India will be the youngest country in the world by 2020 with an average age of 29 years, the number of elderly people is likely to increase significantly. According to the 2014 "State of Elderly in India" report released by a non-profit organization, there will be 143 million elderly in our country by 2021. Presently, the elderly in divided into three categories: the young old (60 – 70 years), the middle-aged old (70 – 80 years) and the oldest old (80 plus years). While the overall population of India will grow by 40% between 2006 and 2050, the population of those aged 60 and above will increase by 270%. Out of this, the oldest old segment, which is the most vulnerable on account of suffering from disabilities, diseases, terminal illness and dementia, is also the largest growing segment of the elderly population, at a rate of 500%. (http://www.livemint.com/Politics/z6BacVOwf5SvmpD9P1BcaK/20-of-population-to-be-elderly-by-2050-HelpAge-India-repor.html accessed on 04.10.18).

It is our responsibility to create a society where people are not worried about getting old. In order to increase the quality of old people lives, safety, comfort and physical and social health, must be taken care of. It is thus important that the home they live in has a safe, comfortable and

healthy living environment as long as possible. This study was conducted to provide practical solutions to help the home-living elderly live well at home and safeguard their health and independence.

Aims and Objectives

The overall aim of this study is to assess the home safety measures and practices adopted by individual families in Mumbai city and its suburbs and to plan/create/design a safe, accident free home environment for the elderly. The specific objectives are to:

1. Determine the incidence of falls and accidents among the home living elderly
2. Ergonomically evaluate the private areas (Bedrooms and Bathrooms) in the existing residences of the home living elderly to identify potential safety hazards that lead to falls /accidents.
3. Suggest economical & affordable changes/modifications in the homes so that the elderly family members can adapt themselves in spite of their failing strengths.

Methodology

A descriptive study was conducted to assess the residences of the home-living elderly aged 65 years and above. The study was conducted on ninety residences of the home-living elderly in Mumbai city and its suburbs to understand the current condition of the elderly due to improper design at home.

The checklist HSSAT V.4.0 i.e. Home Safety Self-Assessment Tool was used to assess the residential spaces ergonomically. Data was collected by structured and open-ended interviews during home visits without affecting the self-esteem or emotional status of the elderly. Observation was also used as a tool to identify accident-prone areas in their residences. Certain questions were asked to the elderly in order to know the areas that the elderly perceived are the most dangerous in the house and what preventive measures could be taken.

Based on the knowledge of the population and the purpose of the study, purposive (willingness to participate) and convenient sampling technique

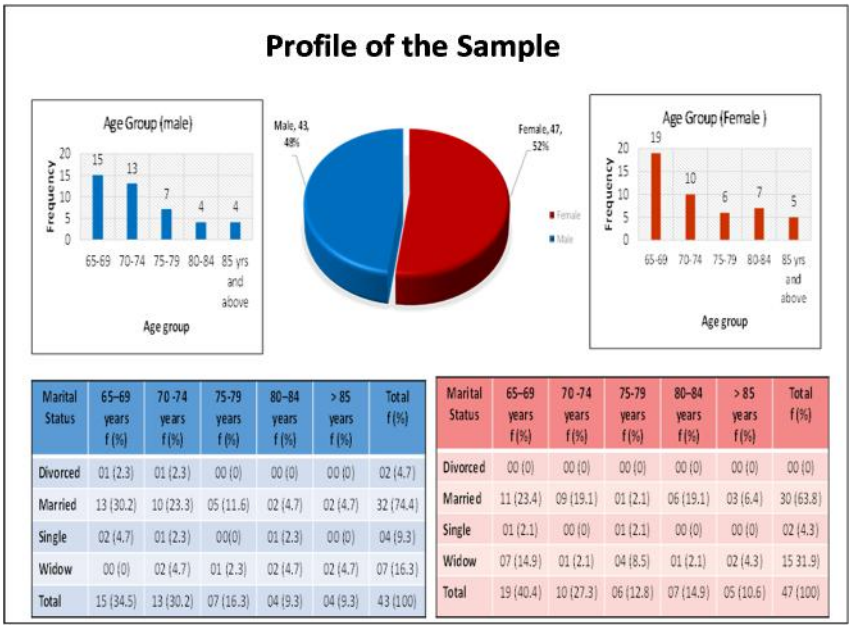
was employed. Descriptive Statistics of Mean, Standard Deviation, Percentages and Frequencies were calculated for all variables using MS Excel.

Results and Discussions

Of the ninety elderly participants, 43 (48%) were males and 47 (52%) females. Extreme care was taken to not hurt their sentiments or bring back painful memories if any. 57 (63.3%) were the Young – Old in the age group of 65 to 74 years; 24 (26.6%) were the Old in the age bracket of 75 to 84 years and 9 (10%) respondents were the Oldest – Old. The average age of the sample is 73.43 years.

The percentage of elderly women married [30 (63.8%)] was lower than the percentage of men married [32 (74.4%)] and 15 (31.9%) women were widowed as against [7 (16.3%)] men who lost their spouses. This may be due to the prevalent practice of men getting married to women of relatively much lower age-groups, especially in the good old days. 45 (50%) of elderly live with either their children or with their children and grandchildren, this shows that the family structure is still strong in these households. 26 (28.9%) of elderly live with their spouse. The depressing fact is that 17 (18.9%) live alone. Of these 2 (2.2%) were very frail and feared that no one would notice them if they died, coz they had practically no visitors.

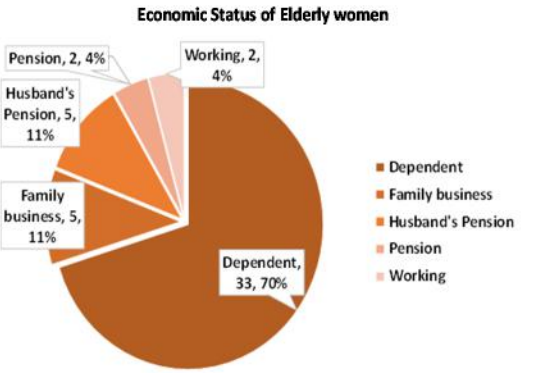
About 25% [(11 (25.6%)] of the elderly men and about 30% [14, (29.7%)] of the women live with their children. More than 35% of the elderly men live with their spouse as compared to 25% of elderly women, which again reflect the differences in their marital status.



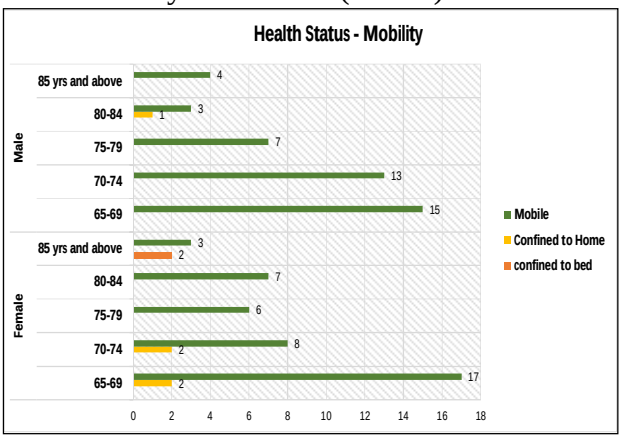
Marital Status	65–69 years f (%)	70 -74 years f (%)	75-79 years f (%)	80–84 years f (%)	> 85 years f (%)	Total f (%)
Divorced	01 (2.3)	01 (2.3)	00 (0)	00 (0)	00 (0)	02 (4.7)
Married	13 (30.2)	10 (23.3)	05 (11.6)	02 (4.7)	02 (4.7)	32 (74.4)
Single	02 (4.7)	01 (2.3)	00(0)	01 (2.3)	00 (0)	04 (9.3)
Widow	00 (0)	02 (4.7)	01 (2.3)	02 (4.7)	02 (4.7)	07 (16.3)
Total	15 (34.5)	13 (30.2)	07 (16.3)	04 (9.3)	04 (9.3)	43 (100)

Marital Status	65–69 years f (%)	70 -74 years f (%)	75-79 years f (%)	80–84 years f (%)	> 85 years f (%)	Total f (%)
Divorced	00 (0)	00 (0)	00 (0)	00 (0)	00 (0)	00 (0)
Married	11 (23.4)	09 (19.1)	01 (2.1)	06 (19.1)	03 (6.4)	30 (63.8)
Single	01 (2.1)	00 (0)	01 (2.1)	00 (0)	00 (0)	02 (4.3)
Widow	07 (14.9)	01 (2.1)	04 (8.5)	01 (2.1)	02 (4.3)	15 31.9)
Total	19 (40.4)	10 (27.3)	06 (12.8)	07 (14.9)	05 (10.6)	47 (100)

The economic independence reveals the problem of day-to-day maintenance of livelihood of the elderly. The distressing fact here is the high proportion of elderly females and males were totally dependent on their family members About 43 (47.8%) of the elderly had to depend on others for their day-to-day maintenance. Less than 30% [14 (29.8%)] elderly women but majority [33 (76.7%)] of elderly men were economically independent.



As a large proportion of the elderly women 25 (53.2%) were found to be economically dependent on their children/family members. 2 (4%) women continued their job despite difficulty faced in travelling to and from workplace because they had no other option. 5 (11%) said they barely managed to survive and buy the basics with their husband's pension amount. Among the economically dependent elderly men, 2 (4%) were supported by their spouses, who were still in the working people bracket.



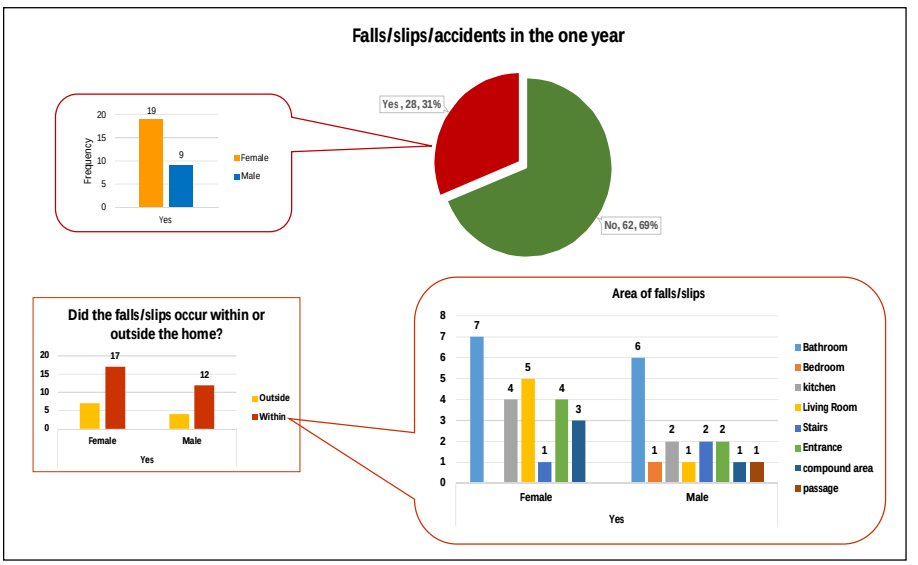
While assessing a person's health condition is important to take into consideration the perception of the individual about his/herhealth. A person may be considered to be in good health is he/she feels so.

The study sought information on the state of physical health of the elderly as to whether they are mobile or confined to home or confined to bed only.

92.2% of the (sample population) elderly were mobile and enjoyed evening walks and a chat with building/colony friends. More than 50% [46 (51.1%)] of the respondents self-rated their health as being fair and 31 (33.8%) rated themselves as having excellent or very good health. 15 (16.7%) had no medical concerns, whereas the remaining respondents mentioned about taking medication for either or and BP (high/low), diabetes, problem of joints, fatigue/tiredness, breathlessness, respiratory problems or arthritis.

28 (31%) respondents had a fall/near fall, slips or trips in the last one year. When asked the reason for the accident, they stated negligence of their part, poor lighting etc.

The bathroom was identified by the elderly as the most unsafe room, with multiple hazards. The elderly women felt that the living room because of the furniture and clutter was the next unsafe room in their residences. All respondents were aware that falls, slips, trips are the most common accidents in old age. 39 (43.3%) stated that the incident occurred due to slippery flooring, 17 (18.9%) said that if there was something to catch or hold on to (such as a grab bar) the incident wouldn't have occurred. The elderly respondents were able to identify instantly at least one modification they could make to prevent such accidents. Although many of the elderly recognized what could be done to prevent falls/slips/trips in general terms, they had not made these recommended changes to make their homes safer. It was often indicated that they would plan eliminating the hazards in the future when they needed to make them. 86 (95.5%) of the older people in this study did not think their homes were unsafe. They rated their homes as being very safe, fairly safe and safe, although they were found to quite hazardous during the home visits and observation.



Safety hazards that lead to falls /accidents among the home living elderly

The safety check for accident prone areas in the homes of the elderly was conducted through home visits. Ergonomic Assessment of environment/physical hazards in each room or area of older people's

homes (including outside areas) was conducted using the modified checklist (adapted from the HSSAT V 4.0.)

The checklist focused on identifying physical hazards in the home environment in common areas, furniture arrangement or incidents associated with falls (or the prevention of falls) in older people. The checklist consists of potential hazards which may increase the risk of falling, slipping or tripping (e.g. scatter rugs on slippery surfaces, inadequate lighting) and the absence of safety devices which may prevent such incidents (e.g. grab rails in the bathroom and toilet, and night lights). Criteria and instructions for deciding if the article/layout/arrangement was hazardous was predetermined for each item being assessed.
A thorough inspection of each part of the elder person's house was completed. A decision was made about each item and a 'hazard' scored if a potential hazard was present or safety device absent. If a hazard item area was not there to be assessed (e.g. no stairs outside, no dining room) then the hazard items were scored as 'not applicable.

Private Areas

A bedroom should be a place in which one feels relaxed, comfortable and safe. The ambience is as important as the functionality of the room. As people age, home modifications are more directed towards safety. Elderly homes should include modifications to keep the seniors living on their own sufficient, mobile, safe, secure and comfortable. Without certain modifications, seniors could wake up in the middle of the night to use the bathroom or get a drink and accidentally fall. These falls could be extremely dangerous.

The essential features of a suitable bedroom are

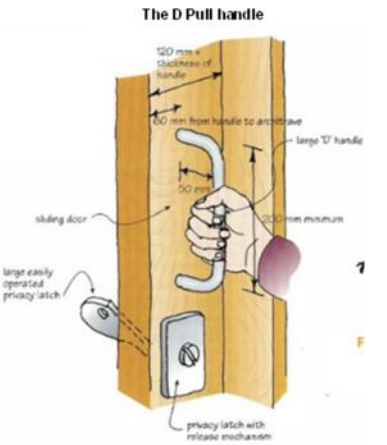
- sufficient space to move around
- close proximity to bathroom
- good natural lighting and ventilation
- well considered clothes storage, furniture and other fittings

Observations made were as follows:

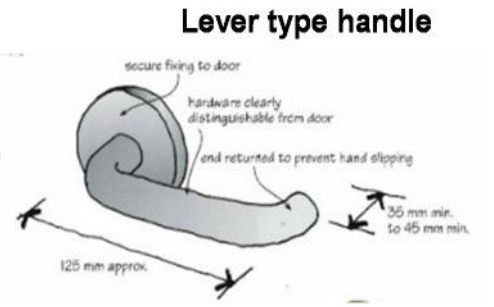
Home Safety Audit (Private Areas)							
	Details	Female (n = 47)		Male (n = 43)		Total (n = 90)	
		Yes	No	Yes	No	Yes	No
1.	Easy to find way to bedroom	1 (2.1%)	46 (87.9%)	7 (16.8%)	36	8 (8.9%)	82 (91.1%)
2.	Privacy maintained	4 (8.5%)	42 (89.5%)	4 (9.3%)	39 (90.7%)	8 (8.9%)	82 (91.1%)
3.	Door can be locked from inside and unlocked from outside when needed.	22 (46.9%)	25 (53.1%)	20 (46.5%)	23 (53.3%)	42 (46.7%)	48 (53.3%)
4.	Door handles/knobs ease to operate	7 (14.9%)	40(85.1%)	6 (14%)	37 (86%)	13 (14.4%)	77 (85.6%)
5.	Wide doors	9 (19.1%)	38 (80.9%)	5 (11.6%)	38 (88.3%)	14 (15.6%)	76 (84.4%)
6.	Windows are easy to operate	4 (8.5%)	43 (91.5%)	3 (7%)	40 (93%)	7 (7.8%)	83 (92.2%)
7.	Flooring is in good condition (even, matt finish, non-slip and clutter free)	3 (6.4%)	44 (93.6%)	3 (7%)	40 (93%)	6 (6.7%)	84 (93.3%)
8.	Lighting in all areas is consistent so the elderly are not moving from darker to lighter areas	2 (4.3%)	45 (95.6%)	5 (11.6%)	38 (88.3%)	7 (7.8%)	83 (92.2%)
9.	Glare and excess light avoided	13 (27.7%)	34 (72.3%)	9 (21%)	34 (79%)	22 (24.4%)	68 (75.6%)
10.	All switches are easy to operate	23 (49%)	24 (51%)	18 (41.9%)	25 (58.1%)	31 (34.4%)	59 (65.6%)
11.	Access to emergency bell/phone	40 (85.1%)	7 (14.9%)	36 (83.7%)	7 (16.3%)	76 (84.4%)	14 (15.6%)
12.	Furniture is secure to support the elderly if they try to balance with help of it.	5 (10.6%)	42 (89.4%)	7 (16.3%)	36 (83.7%)	12 (13.3%)	78 (86.7%)
13.	Height of the bed is appropriate	12 (25.5%)	35 (74.5%)	5 (11.6%)	38 (88.4%)	17 (18.9%)	73 (81.1%)

Door and door handles: 48 (53.3%) homes did not have door that can be unlocked from outside. It is always recommended for the elderly to use door that can be locked from inside but unlocked from outside if required. Some older adults were not even aware of such type of doors.

- Most [77(85.6%)] find it difficult to operate door handles/knobs because of smooth rounded knobs. They did not have adequate grip strength to twist and turn the knobs with force for it to open. They thus preferred the simple traditional latch and door handles, which did not match to the décor of their houses. A few door handles had sharp edges which are which are unsafe and not recommended for elders due to tender sensitive skin.



It is recommended that door handles must be easy to grip and operate with one hand. Handles should be placed at a height (preferable at 105mm from floor level) that is reasonable for walking adults, people in wheelchairs and, where appropriate children.

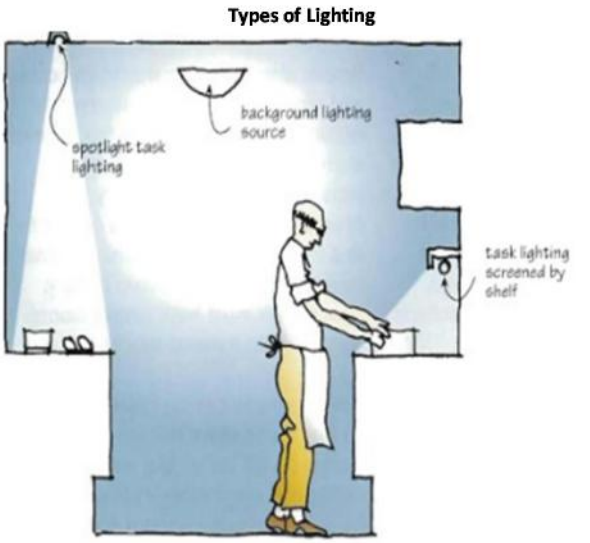


The D pull handle is ideal for use by the elderly. The door knobs that are traditionally used are difficult to grip and rotate. Lever handles as seen in

fig 6. Is easier to use. The preferred shape has a long lever with a turned-in end. Lever handles enable a person to open a door with as little effort as leaning on the handle with their handle or elbow.

Windows: Windows and glazing must enable occupants a view but must also cut out the heat gain in the house. It should compromise on the security and even dangerous in the event of breakage.

- Excessive brightness can produce glare. Glare maybe irritating and, in some cases, disable vision. Glare causes discomfort to the eye and also causes irritation. Many elderly [68 (75.6%)] could not avoid glare in their residences. It was reported that many of them faced problems due to glare at their residences.
  - They specifically stated that they feel giddy or dizziness and a sudden black-out which was very dangerous.
  - It was suggested that lightweight curtains, adjustable blinds, tinted glass, sunscreen films can help reduce the glare without affecting the illumination levels inside.



Lighting: Artificial lighting can define the ambience in the house and is very important for clarity in vision. Adequate lighting becomes increasingly important as a person grows older. They will require about 2 to 3 times more illumination than a younger person.

- General or background lighting is usually provided in most homes through fluorescent tube lights. These do not produce shadows and resembles daylight making it the ideal option for the elderly.
- Task lighting provides focused illumination for specific activities in set locations. It improves visual clarity and offsets tiredness. Reading and work areas in bedroom requires task lighting.
- Decorative or aesthetic lighting accents certain features or draws attention to the picture, fittings etc.

Light switches must be placed near the entrance to the room and at the same side of the door handle. They must be installed at a comfortable height between 600 - 1200 mm from floor level. Switches must be easy to use. Large rocker-type switches are ideal especially for people with arthritis. Illuminated switches help people find them in the dark. Too many switches on one plate can create confusion and two or three switches on a single plate is the maximum number recommended. The wall switches should be in contrast colour so that it is easy to recognize and locate.

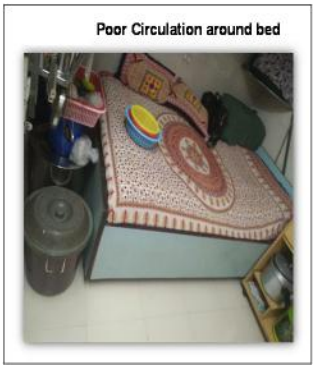
- 59 (65.6%) stated that the switches were difficult to operate especially due to its placement and colour. The switch boards merged with the wall colour to make it obscure.
- In many homes the switches were difficult to reach because they were hidden behind sofa sets or wall units/cupboards etc.
- They also reported facing problems of locating switches in the dark. None of the homes had light switches near the door and on the side of the door handle.
- It was also found that elderly faced problems in locating the switches in darkness.
- 39 (43.3%) of the older adults had problems in locating switches at night or in darkness.

Communications: Modern communications are almost essential for everybody but can be a lifeline for the elderly. Cordless and mobile telephones make it possible for people to telephone from anywhere in the house. The position of eh main telephone point is not so important. For those who have difficulty holding a phone in one hand and dialing with the other, a fixed keypad should be installed in a suitable location in house. Computers with internet facilities allow people to communicate across the world, gather information and work from home. To provide for internet and email access, at least one power outlet and a telephone jack or cable connection will be required in the bedroom. An intercom system, telephone or an alarm is required in case of an emergency.

- None of the elder people had such communication system within an arm's reach. The telephone was located in the living room and eh phone charging points away from the bed.

Furniture

All furniture should be easy to get in and out of. For that reason, chairs and sofas should be chosen according to the size of the person using them. While taller people require generally deeper seating, a smaller person needs shallower seats. Narrower or shallow seats are also better for someone with bad knees or for people who have difficulty rising out of a seated position. Recliners can be useful for seniors. They are often used for sleeping at night because of



medical conditions that cause breathing difficulties, or when legs need to be elevated for better circulation. Easy to clean Choose upholstery that can be cleaned easily.

Round tables or tables with rounded edges should be used to prevent or minimize injuries that can happen from bumping into sharp corners. Glass-tops must be avoided so also tables and furniture with wheels.

Arrange furniture so that it is easy to move around the space. That is especially important if a wheelchair is being used. It should be easy to maneuver. Avoid overcrowding, and never place furniture near entry/exits.

It was observed that in many residences:

- Centre tables have castor wheels which is considered as a hazard, mainly because they are very unstable when used as a support while standing from a seated position.
- 78 (86.7%) had a near miss or a fall due to furniture or furniture arrangement (Fig 6.33) The height of the bed was inappropriate for 17 (18.9%) respondents and 73 (81.1%) faced problems while getting in and out of the bed.
- Sometimes, the older adult used a low stool to climb up the bed. The stool did not have a rubber bushes for a good grip.
- Some bed had sharp edges too.
- Only 7 (7.8%) beds had guard rails. It was also observed that some beds were shaky when the older adult would sit on it.

Bath and Toilet Area

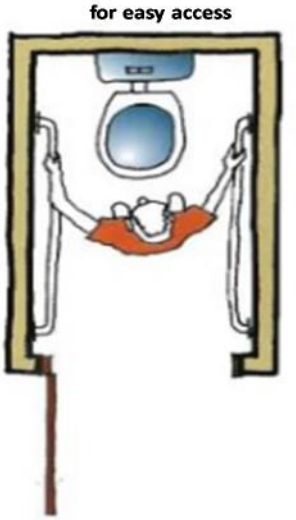
Bathroom designs, whether traditional or modern, are suited for the young and the healthy. It is challenging, to design a bathroom with careful consideration to accommodate the needs of the elderly. Bathrooms was the observed as being the most hazardous place in homes of the elderly. The functional value of the house gets reduced if the occupants cannot use the bathroom comfortably.

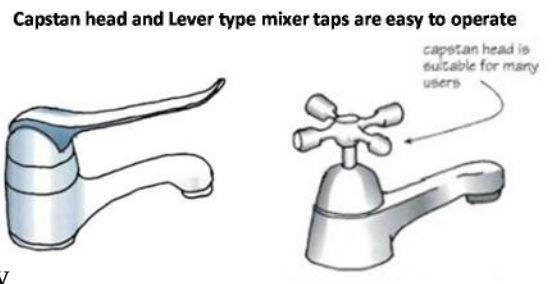
Home Safety Audit (Bath and Toilet)							
Details		Female (n = 47)		Male (n = 43)		Total (n = 90)	
		Yes	No	Yes	No	Yes	No
1.	Tub/shower have rubber, non-skid mats or strips	17 (36.2%)	30 (63.8%)	12 (27.9%)	31 (72.1%)	29 (32.2%)	61 (67.8%)
2.	Grab bars near the shower, tub and toilet.	7 (14.9%)	40(85.1%)	5 (11.6%)	38 (88.4%)	12 (13.3%)	78 (86.7%)
3.	Safe non-skid flooring	25 (53.1%)	22 (46.9%)	26 (60.5%)	17 (39.5%)	51 (56.7%)	39 (43.3%)
4.	Hot water regulation/mixer prevents burns	13 (27.7%)	34 (72.3%)	12 (27.9%)	31 (72.1%)	25	65
5.	Hand held shower/jet spray easy to handle/use	6 (12.7%)	41 (87.2%%)	6 (14%)	37 (88%)	12 (13.3%)	78 (86.7%)
6.	Phone/emergency bell installed in the bath/Toilet	5 (10.6%)	42 (89.4%)	2 (4.7%)	41 (95.3%)	7 (7.8%)	83 (92.2%)
7.	Mirror length is extended to basin and is easy to view/use	22 (46.9%)	25 (53.1%)	13 (30.2%)	30 (67.8%)	35 (38.9%)	38 (42.1%)
8.	Clothing hooks and towel rail are easily accessed	5 (10.6%)	42 (89.4%)	5 (11.6%)	38 (88.3%)	10 (11.1%)	80 (88.9%)
9.	Doors can be locked from inside but can be opened from outside if need be	5 (10.6%)	42 (89.4%)	6 (14%)	37 (88%)	11 (12.2%)	79 (87.8%)
10.	Toilet flush button is easy to recognize, access and operate	4 (8.5%)	43 (91.5%)	4 (9.3%)	39 (90.7%)	8 (8.9%)	82 (91.1%)

Size is an important factor in the usability of a bathroom. The bigger the bathroom the better it is. The bathroom needs to be accessible from other parts of the house. It is most convenient is to have access to the bathroom from within the bedroom.

The standard measurement for a toilet is 900 mm X 900 mm which is way too small to provide access to the elderly with functional limitations. The elderly who can walk may be able to use a standard toilet with grab rails easily. Hinging the door to open outwards gives more space for easy access.

Toilet with outward swinging door and grab rails on both sides for easy access





It is essential that taps are easy to use. Many elders have weak grip and hence find it difficult to use standard taps. Four-pronged capstan head/wheel-type tap is easy to use but many elderly participants of this study preferred lever handle mixer taps.

The elderly members cannot stand under the shower for too long. Some sitting arrangements or fixture can be very helpful for self-help.
Observations made in this area include rubber, non-skid mats or strips in the tubs/shower in the bathrooms were not used commonly in the homes. 61 (67.8%) reported that they did not have non-skid mats or strips in the bathrooms

- According to the study conducted it was found that 12 (13.3%) of the elderly had grab bars in their bathroom and toilet areas, whereas 78 (86.7%) did not have grab bars. In one of the homes, the grab bar was used to dry cleaning cloths by the maid servant.

- Some elders grabbed the taps and other such fixtures to sit and stand up due to the absence of strong grab bars in the toilet areas.
- The grab rails in 2 homes (Fig 6.37) were not placed at appropriate height, hence was seldom used by the elder residents.
- A few homes did not have towel rails/racks, hence the towel was placed near or on the instant water geyser, which is a potential electric shock hazard.
- The bathroom door was unsafe for the elderly because of the lack of a bidirectional door, inadequate door width (less than 750 mm) and presence of threshold.

- The bathroom space was also used for laundry, making the already small bathroom size shrink further. Washing machine was installed inside the common bathroom area which was used by most elders living with families.

Poor illumination, floor level difference and absence/inappropriate placement of grab bars in bathrooms of the elderly

- Uneven flooring and change in floor levels (Fig 6.41 and Fig 6.42) posed a high risk.
- Many elderly couples living alone used zero watt bulbs (Fig 6.38) for the bathroom area to save on electricity.

- According to the results, 39 (43.3%) experienced minor burns/scalds in the bathroom due to accidently testing hot water.
  - Some 20 (22.2%) elder respondents did not have hot water regulator/mixer at their residences so they use to boil/heat the water in the kitchen in a container and then take it to the bathroom. This is a high risk habit. There have been incidences of the heavy utensil slipping from their hands leading to burns/scalds.
  - In one of the homes, the instant geyser had a loose wire hanging which was again a potential hazard.
- 82 (91.1%) elders found it difficult to operate the flush buttons. 28 (31.1%) said the flush rope was too high and still others claimed the flush button was hard to push. A few (6.7%) said the colour of the flush button same as that of the cistern and therefore, it was difficult for them to locate.

Suggestions for modifications in the homes

Problems observed in the homes of the elderly	Suggestions for improvement
Lighting	– Brighter staircase lighting – Large rocker light switches that turn on/off with a push – General lighting from a steady source – Placement of task lighting in appropriate work areas
Clear walkways	– Accessible path of travel to the home – Walkways must be in good repair for safe walking – Doorbell in accessible location – Surface to place packages on when opening door
Stairs	– Should be well lit at all times.

	– Should have a landing at the top as the bottom for the user to steady themselves before changing directions – Handrails on both sides of staircases and outside steps. – Increased visibility by adding contrast strip on top and bottom stairs, colour contrast between treads and risers on stairs and use of lighting – Should no doors that obstruct the top or bottom landings
Grab bars	– Bracing in walls around tub, shower, shower seat, and toilet for installation of grab bars to support 90 – 100 kgs – Grab bars should have graspable size and must be slip resistant

Problems observed in the homes of the elderly	Suggestions for improvement
Doorways and Doors	– House number should be clearly visible from far Doorbell in accessible location – Surface to place packages on when opening door – All exterior doors must have secure, easy-to-use locks, bolts and knobs. – Door should open into the house (inward opening) to avoid accidents. – A fish-eye lens viewer/peephole should be installed at an appropriate height. – Door closers can be convenient if installed in an appropriate location. – The 'D – pull' handle is the most appropriate. Door knobs are difficult to grip and turn.
Handles (cupboard and cabinets)	– Should be easy to open and close. – The 'D – pull' handle is the most appropriate. – The closing mechanism should be soft roller catches, magnetic catches or self-closing hinges.
Floor and Flooring	– Arrange furniture so that there – Arrange furniture so that there is a clear pathway between rooms (is plenty of space to move around). – Remove items (boxes, old articles, old furniture etc.) from stairs, hallways, and pathways. – Keep low-rise side tables, magazine racks, footstools, plants etc. out of the path of traffic. – No steps between rooms/areas on the same level – No changes in surface levels as far as possible

	– Non-slip flooring in foyer, entrance – Smooth, non-glare, slip-resistant flooring in bathroom and shower – Colour/texture contrast to indicate change in areas – Do not store boxes near doorways or in passage. – Remove newspapers and all clutter from pathways.
Windows	– Plenty of windows for natural light – Low windows or taller windows with low sill height – Window curtains/blinds/shades/cords are easy to reach and open/close
Electrical, Safety and Security	– Security light at main entrance door – Rocker or touch light switches – Light switches must be located near entrance to every room/area. – Keep electric, appliance and telephone cords out of walkways, but do not put cords under a rug. – Do not use extension cords across pathways; rearrange furniture, if needed. – Electrical cords/wires should be out of the flow of traffic – Security alarm, emergency alert system and/or video-monitoring system.
Access to private areas (bedroom, bath, toilet)	– Place a lamp, telephone, or flashlight/torch near the bed. – Replace satiny sheets with cotton sheets. – Arrange clothes in the closet so that they are easy to reach. – Provide a nightlight along the route between the

	bedroom and the bathroom. – Keep clutter off the bedroom floor.

Conclusion: For an elderly person, falling can result in devastating consequences, and falls are too common. Most falls among the elderly occur in known spaces rather than in unknown areas. The results of this study prove strongly that falls among the elderly can be prevented. A fall often results from multiple factors, one of the main factors being hazards in the home.

Homes can be modified for the elderly taking into consideration their physical and cognitive strengths, capabilities and limitations and their body dimensions (anthropometric measurements).

Aging increases postural instability, thus a simple economic solution is to consider installation of support bars or grab rails. Ensuring that circulation routes/paths are free of clutter and furniture is another simple modification that can be made immediately. Another contribution is to place the most used objects in areas where old people can see and reach easily.

After identifying the potential risks, an ergonomic approach was used to suggest simple changes in the existing layout/arrangement in the homes so that the elderly people could better adapt to their environment. Many a times, the older adults themselves had practical solutions to the problem being discussed. Involving them in making the modifications helps understand their capabilities and limitations. Guidelines for age-friendly home design and construction are recommended. Improving awareness of older adults, caregivers and family members is also important to their safety.

Designers and Architects working in the housing industry must deliver creative and innovative solutions to meet the everyday needs on the ageing population. Smart homes are homes equipped with technology that promotes independence, ensures safety, security and increases the quality of life. Smart homes are equipped with automated systems for different

tasks such as lighting, kitchen safety, door switches, movement sensors, individual tracking badges, reminder systems etc. Installation of smart home technology might be a stigma to some elderly leading them to think themselves as older and frailer than other adults, but if accepted well, it can be a enormous boon to their comfort and safety.

One limitation of the study was the convenient sampling method adopted. Participants were urban elderly predominantly from the modern Indian population and culture. The study findings cannot be generalized to rural elderly with a common facilities shared among several houses, or other regions and cultures of India. Although the HSSAT Checklist has potential for clinical application, further research is needed to establish and improve its psychometric properties for clinical use. The effectiveness of the assessment and modifications in reducing injury in older adults also needs to be investigated.

Way Forward: The results of the present study reflect the circumstances and consequences of falls among the home living elderly. The morbidity due to falls include bruises, sprains, cuts as well as serious injuries and fractures, restricted mobility and loss of independence leading to functional decline, psychological fear of falling (post fall syndrome) and permanent disability in a few cases. To avoid such incidence, more emphasis needs to be given to the circumstances like the falls observed in houses with inadequate lighting, level changes in the house, uneven floor of the house and slippery floor of the house.

Designers, architects, town planners and builders must aim at creating accessible built environments. The built environment should take into consideration the physical and mental capabilities of the people using them. The 'design for all' concept is the design for human diversity, social inclusion and equality.

The Government should take more interest in ensuring quality constructions and safe environments are created. According to the WHO global report on falls prevention in older age, public health policies and strong legislation can effectively decrease falls in older adults (WHO

global report on falls prevention in older age http://www.who.int/ageing/publications/Falls_prevention7March.pdf accessed on 5.03.17). Nonetheless, the actual translation of these policies is a problem, especially in health promotion sector in India. Fall prevention must be emphasized in public health policies and health programs for elderly people. Falls are an emerging public health problem and a barrier to active ageing in India. There is an urgent need for coordinated and collaborative efforts of health professionals, researchers, policy makers, and health care delivery systems to prevent falls and promote active ageing.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

Shaping New Dimensions: India's relations with Israel and Russia

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Abstract

India's engagement with the 'Heartland', has put India as one of the stakeholders in the region that corresponds to Halford J Mackinder's World Island. And Owen Lattimore described Eurasia as the world's new centre of gravity …… a whirlpool in which meet, political currents flowing from China, India and the Arab world….. it encloses more different kinds of frontiers than could be found …. in any area of the world. The theme of the paper, is to analyse the role of India in Asia, after the dissolution of the Soviet Union. It created a new international environment. There was a triumphant mood in Washington, as it proved universal victory of Western liberal democratic institutions. The US had been considered as the leading country in the world, and it emerged as the only great power of the unipolar international system.

This article provides an insight from an Indian perspective of Indo-Israel relations along with its closer friend Russia. The new contour of geopolitics in the 21st century will be technology driven, making less affluent nations dependent on influential nations. The five members of UN Security Council lead, and Israel is the second tier of arm-sellers. Brazil and India, will vie to occupy a geopolitical space in the already divided world. Thus it has thrown a challenge to the US, preventing a single nation to monopolize power.

India and Russia now look for convergence of interests, anchored within hard reality. India became the largest buyer of Israel military equipment, while Israel became the second largest defence supplier to India after

Russia, surpassing the USA. The 21st century witnessed the onset of a different political scenario, as the Indian democracy under the NDA government has made national self-interest the driving force.

The paper is an attempt to understand India's ties with Israel and Russia, where Russian window is useful for global cross ventilation for Israel also, as discussed in various newspapers and foreign policy. The nations understand the globalizing logic of coming closer to one another with 'multiple strategic partners.' It is a signal to the West that likewise India's foreign policy postulates are also based on the assumption of a multi-polar world.

Keywords: gravity, whirlpool, Eurasia, multi-polarity, technological-driven, Convergence.

In several recent developments in the upcoming international scenario, important changes in India's policy structure are seen. Under the leadership of Modi, India's foreign policy manifests as a major pragmatic interest-oriented foreign policy, with a view to making India a self-sustaining economic power with socio-political stability and with potentially sound security structure. Although it has prompted India to pursue pro-American stance on all international issues, in the recent past, yet this shift has not materialised into US fulfilling India's long pending demand to force Pakistan to stop exporting cross-border terrorism into the country, restraining China's anti Indian activities (like formation of Beijing-Islamabad unholy axis against New Delhi), besides securing a permanent seat for India in the UN Security Council.

Morton Kapalan's six models of international system, might have been based on the assumption - from a 'Balance of Power', it is a 'loose bi-polar system' and now it appears to have been leading to a kind of 'Unit Veto-System', where no State would venture to attack another as the States then will have equal potentialities to destroy each other. In other words, we call it a multi-polar world.

Situating India in a global order thus, it has emerged as a power successful in securing defence collaboration with the West and purchases

weapons from US, Israel and France, and conducts joint military exercises with ASEAN countries. The NDA regime under the leadership of Prime Minister Modi has been successful in carving a space and place for India so far as diplomacy is concerned. India has befriended Israel, Saudi Arabia and UAE, but also continues to have ties with Iran. There is a trade imbalance though, in favour of Russia, in as much as, areas like defence, energy and nuclear facilities dominate the trade basket.

The article touches upon the issues of striking a beneficiary balance between India vis-a-vis Russian-Israel ties. Despite mounting pressure from US there is 'no plan to scrap India's Russia deal' inked for five squadrons of the advanced S-400 Triumf, Surface-to-Air Missile system (SAM). Simultaneously, Israel and Indian ties are strategically developed to handle myriad security problems the country faces, as the recent Pulwama attack. Israel is a country that has a successful history in dealing with such security issues and has a massive arms industry. Israel has therefore become quite central in the consciousness of the Indian strategy. In order to attract investors world over, it also requires introducing adequate economic reforms. The paper deals with the short evolution of relations with the two countries and also dwells on the new contexts of present international order marked by 'multi-polarity' and several other challenges, like mounting threat of economic recession, ISIS terrorism and regional tensions in Asia-Pacific, particularly around South Asia, South Sea China and West Asia.

New Contexts and Consequent adjustments

The political world order is fast changing ever since the past few decades, after Russia started losing its domination, and the vacuum thus created, was being filled up by United States and other developed countries. The developed countries formed their regional groups, and some like NATO and EU, that had direct support of the US became strong. The developing countries which were technologically and economically growing fast, like China and India to certain extent, also pushed forward to fill the gap. From the Western-centric, it has entered into a different phase, having new political and economic manifestations in the new economic and political structures.

Though US is mounting pressure on India to also consider its Terminal High Altitude Area Defence (THAAD) and Patriot Advanced Capacity (PAC-3) missiles system, there is no plan to scrap the $5.43billion deal inked with Russia for five squadrons of the advanced S-400 Triumph surface-to-air missiles. Despite New Delhi's closer relations with US and other major western powers, India inked the deal with Russia in 2018 after four years of extensive negotiations resulting in an inter-government Agreement. This, despite the threat of sanctions under the US law called CAATSA (Countering America's Adversaries through Sanctions Act). While the quick-reaction NASAMS is being specifically acquired for the missile shield over Delhi, the S-400 systems scheduled for delivery in October 2020-April 2023 time frame-work, are meant for the strategic deterrence against China and Pakistan along the borders as well.

The most dramatic turn took place at the political -diplomatic level, with Prime Minister Narendra Modi coming to power in 2014. His unique stance towards Israel proves that leaders make difference in relations between countries. Indeed the flourishing relations between the two is unprecedented among nations, considering the fact that Israel is such a small country while its counter-part, India is a giant. The Key to the growing India-Israel ties is in the realm of security and defence. The paper reflects upon stances where India-Israel cooperation has increased dramatically with Modi government since 2014. India abstained from voting at the UDHRC that approved their Gaza Commission of Inquiry Report in July 2015. Forty-one countries voted in favour of adopting the findings of the biased report, yet India was one of only five others who abstained. This marked for the first time that India had ever voted against Palestinian interests at the UNHRC, signalling a potentially significant shift in India-Israel relations.

It was predicted that it will lead to *'New American Universe'*, except that America's edge would be based on military and economic (as opposed to technological) preponderance. But the new multi-polar world order is seeing the emergence of regional blocks, with reduced trade barriers as well as capital mobility for members. Conventional conflict between

States is reducing but cyberwarfare, terrorism and espionage are new threats in the multi-polar order. Thus in this non-unipolar world, no single power including India, will be rule maker by itself. Even the US-Russian rivalries will continue, Modi faces an exigent challenge to revitalise a flagging partnership with Russia while safeguarding India's regional security and its $3 billion development aid to Afghanistan since 2002. This challenge is compounded by the fact that a robust relationship with Moscow is vital to a balanced India Foreign policy.

Methodology

The article studies the challenges faced by the Indo-Russia relations in after the collapse of the Communist regime and attempts to decipher the enigmatic Indo-Israel strategic ties in today's context. The *objective* is to understand emerging Delhi-Israe strategic alliance, along with sustaining relations with an old ally Russia. The making India more powerful to play a significant role in the Asian Region.

On its basis, the *Hypothesis* advanced is - Amid turbulent socio-political and military developments in the Arab region, should India continue with policy of strengthening ties with Israel or be a balancer between military Imperialism of US-Israel-North Korea axis and the BRICS led alternative economic and military order?

Justification for the article

India's diplomatic approach towards Israel has always been under scanner of estrangement. The changes in the global politics because of liberalisation has been a major factor for a policy shift - India coming closer to Israel, without losing ties with the Arab world. The enormity of the defence cooperation between the two, can be determined from the mere fact that in a very short span of two decades, Israel has turned out to be the largest arms supplier to India, outshining the Russians with whom India had defence cooperation since independence.

Even in today's scenario where national interest has been placed first by the countries and friendship later, the unique concept of looking for permanent friends in the Arab World and Israel, which are very different from each other, will prove to be a major challenge for India's foreign

policy in the future. India's desire to participate in the peace initiatives in West Asia changed India's outlook towards Israel after Madrid Peace (1991) conference. The dispute, over annoying friendly Arab and Muslims, became inappropriate when the Palestine Liberation Organisation (PLO) themselves were settling peace with Israel. With this new development India was encouraged to break ice with Israel. The Jewish State was no more a 'pariah' as before.

The trade transactions between the countries is not significantly high and Putin was frank enough in stating in 2016 that trade turnover between India and Russia is too small and does not correspond to the potential. Hence there has been a stark realisation on the parts of leaders and efforts are needed to increase trade ties, making it "Geo-political and Geo-economics" in nature. Since then the countries are coming closer and has signed pacts of various nature-leading to better trade and economic cooperation.

The *scope* of the paper is restricted to:

- *comprehensive relations between the two nations in various fields (especially defence, agriculture, medicines and security)*
- *concerns of the Pakistan and the Arab-world and various challenges (to combat Islamic terrorism),*
- *And attempts to further enhancement of Indo-Israel-Russia alliances standing together to overcome threats from non-political factors.*
- *lastly India's standing in Multiples International Political order today.*

The maximum of the *information* for the study has been collected from the books, articles and information available on internet on the subject. The bibliography of the same is mentioned at the end.

Background

Since the collapse of Communist regime, the political world order has been changing ever since, where traces of the Soviet-Afghan War, which lasted for nine years (December 1979 - February 1989), saw the emergence of insurgent groups known collectively as the mujahedeen, as

well as smaller Maoist groups. They fought a guerrilla war against Soviet Union and the Democratic Republic of Afghanistan government. It was backed primarily by US, Saudi Arabia and Pakistan making it a Cold War - a proxy war - Pakistan received tons of arms from US to be handed over to these mujahedeen (from whom the Taliban evolved). Large number of these weapons, Pakistan diverted to Pakistan occupied Kashmir (POK) too, to be later, further handed over to the militant groups, who were then sent to Kashmir in India to create disturbance in Kashmir. The US also increased diplomatic, economic and military pressures on the Soviet Union, at the time when the latter state was already suffering from economic stagnation. This led to the collapse of former USSR in 1991 and disintegration. Russia is re-emerging now, under the leadership of President Putin, but the country no longer has the capability, and its influence is being challenged by China and the West.

Still Russia has established considerably good relations in *multi-dimensional aspects*. Russia's policy makers have transitioned to a multipolar world which has created the possibility of developing constructive strategic relations immediately with some influential partners. It has sought to achieve three main goals in West Asian region:

i. *to demonstrate renewed power and influence;*
ii. *increase trade with the nations of the region for economic boosting, specially its energy sector,and*
iii. *to minimise Arab, Turkish and Iranian support for the Chechen rebellion against Russian control, which the rebels are carrying out in the name of "Islam".*

In the world politics, the Middle East remains the region with the most serious security challenges. Among the factors shaping the region, Israel's foreign policy is traditionally of paramount importance, and *Israel-Russian relations are a significant element.*

Russia established relations with Israel and increased trade ties. However Israel perceives Iran as a threat to its national security because of Iran's perpetual support to Hezbollah and controversial Nuclear programme, while Russia's strategic consideration towards Iran links with the (its) economic security in terms of hard currency.

Provision of security is at the core of such interests, as both have the same enemy - *the Islamic terrorism, without any 'ifs and buts.'* Substantial progress has been made in fighting *radical Sunni Islamic terrorism led by ISIS and Al-Qaeda* and Russia has made great contribution to this result. The security partnership is part of a border network that links the two, including bilateral trade and tourism. Most important, there are millions of Russian-speaking Israelis and Russians are the second largest group of tourists to Israel, second only to the US. The relation can improve a bit more but there is little room for any dramatic increase.

GEOGRAPHICAL DISTRIBUTION OF THE ISRAELI FOREIGN TRADE IN 2017

	Imports			Exports			Total trade		
	Partner	Value Mio €	% World	Partner	Value Mio €	% World	Partner	Value Mio €	% World
	World	61,159	100.0	World	53,127	100.0	World	114,285	100.0
1	EU 28	25,187	41.2	EU 28	15,772	29.7	EU 28	40,959	35.8
2	USA	7,161	11.7	USA	15,295	28.8	USA	22,456	19.6
3	China	5,778	9.4	Hong Kong	3,715	7.0	China	8,662	7.6
4	Switzerland	4,893	8.0	China	2,883	5.4	Switzerland	6,182	5.4
5	Turkey	2,563	4.2	India	1,705	3.2	Hong Kong	5,408	4.7
6	Japan	1,842	3.0	Switzerland	1,288	2.4	Turkey	3,781	3.3
7	Hong Kong	1,692	2.8	Turkey	1,218	2.3	India	3,344	2.9
8	India	1,639	2.7	South Korea	784	1.5	Japan	2,611	2.3
9	Singapore	1,357	2.2	Japan	768	1.4	South Korea	1,797	1.6
10	Russia	1,089	1.8	Brazil	760	1.4	Singapore	1,768	1.5

Russia covered 1.8% of the Israeli imports & around 1% of the exports in 2017. In turn Israel represented just 0.5% of the Russian exports & 0.4% of its imports in 2017. Thus Israel and Russia should not be regarded as strategic trade partners.

Despite these ties, the foreign policy differences between the two are significant - disagreements being on the view of Iran and the Middle East peace process. The most recent Syrian-related tension between the two countries pertaining to Israeli attack on Iranian targets in the T-4 airfield, on April 9th, 2018, brought sharp public exchange. Putin called the Israeli strike as 'a dangerous development' and asked Israel 'to refrain from activities that would destabilise Syria, and to respect Syria's sovereignty.' Israel is counting on Putin to keep confrontations with Iran and Syria from spiralling into war, reasoning that the Trump administration is simply watching from the side-lines. Oren explained 'America did not enter in Syria, it's not in the game.' The warming up of relations between Russia and Israel is taking place against the background of the on-going anti-Russian sanctions. So for Moscow, contact with Tel-Aviv serves as a kind of window, perhaps even a 'vent', and fundamentally important one.

Re-emergence of Russia

These confronting interests put Moscow in a unique spot, forcing it to adopt an approach in a new perspective. Putin announced his plans to return to the Presidency, and he called for a stronger **"Eurasian Union"**, to include Belarus, Ukraine and Commonwealth of Independent States.

Russia is, thus, again trying to fortify its commercial position in the neighbourhood, with Eurasian Economic Community (EurAsEC), a project long championed by Kazakhstan's former President Nazarbaev. This is to expand to a 'common economic space', with free passage for goods and services on the model of European Union. The broader group would negotiate with the European Union, and the small European Free Trade Association, for free trade area across Eurasian continent to Vladivostok. In the year 2016, President Putin specially mentioned at the inauguration of St. Petersburg International Economic Forum (SPIEF), the scope for India in enhancing economic ties with the EEU. Initiated by Russia it has enormous market potential. To boost bilateral Russia-India - new stage partnership - their high officials projected thrust areas to boost trade and encourage private sector participation. The Working Group on Modernization and Industrial Cooperation have been set for joint ventures in the fields identified for joint ventures in areas of mineral fertilizers, power equipment, CRGO steel, pharmaceutical etc.

Henry Kissinger taught us that in foreign affairs the crucial variables are -capability and will. A more credible ambition is for India to be '***rule shaper***' - one of a small number of powers with the ability to play a major role in shaping the evolution of rule of the road. Indeed this is in evidence - in India's approach to climatic, energy and maritime security. India has adopted a principled approach based on equity and differentiated responsibility around which it was able to mobilize broad and supportive coalition (IBSA, SCO). It is a matter of great significance that in June 2016, India became the 35th country to be admitted to the Missile Technology Control Regime (MTCR), a major international anti-proliferation group of which Russia is a key member. This would enable easier space and missile collaboration for India with Russia, which could not supply cryogenic engines and other dual use technology missiles to India, because it was bound by MTCR.

This article, potentially attempts to draw upon new ties among the three nations, where Russia and Israel has come closer to each other in recent years - with the defeat of ISIS, emergence of Russia as the patron of Assad regime, and President Trump's announcement of the withdrawal of

the US forces from Syria, have affected the policies and alliances of Israel, Iran, the US, and Russia with respect to that country, leading to a wide-scale conflagration. To reduce the risk of war, Israel needs to consolidate its security understanding with Russia over southern Syria. There are major areas of disagreement between Russia and Israel regarding the situation in Syria, chief among them is Israel's concern about Russia's operational reliance on Hezbollah and Iranian backed Shia militia as 'foot soldiers.' Israel fears that the involvement of these groups will lead them to play a significant role in Syria's future.

India's place in the new world order

Today there is more recognition of fact that the more India engages with the global economy, the more its power and security will grow. It may be because of an increasing share in world trade. Also because the only sure path to peace is to create powerful constituencies in other countries that have a vested interest in supporting a nations cause. Trade and investments create the lobbies that transform relations among States. *Even more remarkably, a new way of thinking is emerging in some quarters of India that links foreign policy with pluralism and a new kind of multilateralism.*

Privileged Interests:

The *'trajectory of development'* of relations, between the three nations, may lead to a unique geographical and political complementarity within the Eurasian zone. While, the two countries, India in South Asia, and Israel in West Asia, occupy place of importance, on the other hand Russia's leadership, on a recent occasion, has expressed its '***privileged interest***' in the ex-Soviet Republics (its near abroad), based on 'civilizational unity.' The proposed Eurasian Union serves as an effective tool.

India has a wild nuclear card. It is one of the nine countries suspected to be having nuclear weapons. This nuclear option has given India the teeth of a major actor in global politics. It possesses second largest army in the world having 1.4 million active military personnel. India's fire power, military aircrafts and battle tanks are no less in comparison with other major powers. Being a major power in South Asia, it can cooperate with China to streamline the Asian economy and pave way for stability and peace. India's ICT sector and entertainment sector, have won worldwide approbation. India's space program has caught the attention of the world too. India's mission to Mars was appreciated by the BBC as "Thrilling" while calling it as one of the cheapest interplanetary missions ever undertaken.

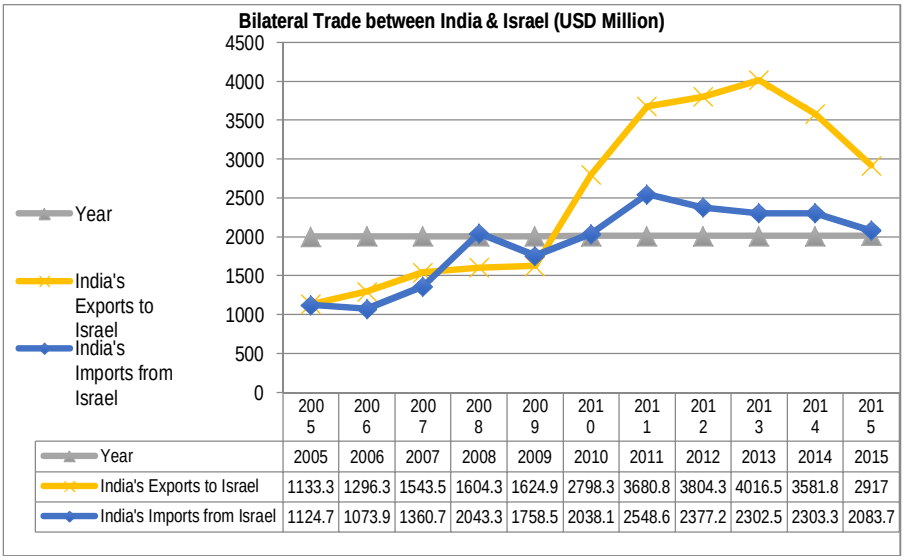
The landslide victory of Modi government signals to the world that relationships made on any bilateral and multilateral issues with India will not end abruptly. In this regard, Ashley. J.Tellis, expressed the view that India under Modi is aspiring to be a leading power, rather than just a balancing force globally. The Indian diaspora is also expected to contribute to and support significantly for the development of India, so that it will play a more vital role in the coming century. India has its strategic partnership with global power and rising power and its participation in existing institutions as well as alternative institutions, such as Asian Infrastructure Investment Bank, SCO, inking a Joint Strategic Vision for the Asia-Pacific and Indian Ocean region with US etc. It has also made defence cooperation with France and Russia and other Middle East countries and is also building relations with Israel and Japan to

improve security and equip oneself. The new challenges seen with the decline of US led hegemonic order has given rise to non-western powers, who are faced by new challenges - broadly divided into - security, economy and issues of global common interest (climatic change, human trafficking, refugee crisis, hunger and poverty). A brief reflection of India's partnership with Russia and Israel is to enhance the fact that multilateral cooperation is indispensable where regions have different political orientation, and are also experiencing different stages of development – works to bring them still closer.

Indo-Russia relations are intensifying but Challenges persist:

India shared strong ties with the former USSR, as it was India's biggest defence and trade partner, although both have failed to find a sustainable economic logic to their ties, still continue to have 'geopolitical' convergence' with minor differences. Efforts are being made to intensify multi-dimensional ties in the areas of:

- Nuclear Energy-where the Kudankulam Nuclear plant is the primer and Russia is the first country for drafting a road-map for supporting production of components for nuclear fuel reactors of Russian design in the years to come,
- Defence Sector- -special and privileged relation, where BrahMos missiles are already operational that has strengthened India's defence capacity,
- Make in India- Russian experts has mentioned the production f India's own regional plane by 2020,making India the third largest aircraft market,



	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
India's Exports to Israel	1133.3	1296.3	1543.5	1604.3	1624.9	2798.3	3680.8	3804.3	4016.5	3581.8	2917
India's Imports from Israel	1124.7	1073.9	1360.7	2043.3	1758.5	2038.1	2548.6	2377.2	2302.5	2303.3	2083.7

Both are now experiencing a period of hopes and great anxieties. Under the US pressure India did not yield and refuse military-technical cooperation with Russia. It has confirmed the strength of "all power friendship" between New Delhi and Moscow.

India-Israel Strategic Partnership:

From the early 1990's, there has been a gradual shift in India's stand on the Palestine issue. From being a vocal supporter of Palestine and a critic of Israel, now we have become one of the major partners of Israel. India's anti- Israel attitude was also part of larger diplomatic strategy of countering Pakistan's influence in the Arab world and that of safeguarding its oil and gas supplies from the Arab countries. The same also ensured the security to the jobs for thousands of Indian's in the gulf and thereby helping India to keep its foreign exchange reserves afloat. The perception of protecting Indian national interests by a negative foreign policy towards Israel was so strong among the Indian leadership, that despite Arabs failing to reciprocate positively. Yet all the efforts of the Indian government could neither ensure continued electoral support from the

Muslims nor win the good will of the Arab states.

But over the years trust among the two has increased and Israel is one of the major defence partner. We also enjoy relations in agriculture, biotechnology space etc. Israel's knowledge and technology related to ports, desalination plants, and irrigation can be helpful to India. Israel has mastered water conservation technique and India can learn from it .Another area of potential cooperation is cleaning polluted under the Indo-Israel Agricultural Project. Israel pledged to set up 28 centres of excellence. The two nations have signed an agreement to foster cooperation on urban water systems and later Israel announced that it would help India to raise yield of its fruit and vegetable crops under the Indo-Israel Agricultural Project, by offering its advanced technology. Israel has pledged to open 28 centres of excellence across India focused on providing training to Indian farmers on vertical farming, drip irrigation and soil solarization.

Israel has one of the best intelligence system in the world, and sharing of it may lead to safe India. A new partnership between Indian security firm Punj Lloyd and Israel Weapons Industries, known as PLR, to produce in India small manufacturer equipment's for local and export use. Indian military deployed an Israeli-developed comprehensive integrated border management system (CIBMS) along its border with Pakistan. India participated in the Israel Blue Flag military exercise for the first time in November 2017. Multiple collaborative agreements were signed between Israel Space agency and the Indian Space Research Organisation to foster partnership in the development of electric propulsion systems for small satellites, and creating systems to accurately measure the extreme conditions in the outer space. Even the Indian Red Cross Society and Israeli National Emergency Medical Services held a training for Indians to handle natural disasters, accidents and life-saving skills.

The year 2017 saw an increase of Indian tourists to Israel, increasing the number of direct fights between Delhi and Tel-Aviv. Even grants from India-Israel R&D and Technological fund was announced in 2018 ,including companies working for better the lives of people through

efficient use of water ,solar use and life -changing surgeries. The fund aims to help Israeli entrepreneurs enter the Indian market.

Thus the friendship need to expand and we have to do away with the normative posturing of relationships which may endanger India's international ties and also its domestic situation.

Conclusion

The Russian foreign policy is about protecting national interests in interaction with the other states and their interests. Its relation with Israel are arguably the best example**.** The current world has already taken a tectonic shift in the form of US and China-centric multi-polar world order. India is a freedom loving country and it is the largest democracy. Therefore, it is expected to find allies in all democratic countries in the world.

The paper has taken account of US running away from its commitment due to contraction in its economy, but China is taking lead on Climate Change and digital economy. New areas where growth has been projected:

35% from 2017-2019 will come from China, 18% from the US, 9% from India, and 8% from Europe. By 2050 the three economies - China, India and Indonesia - will be among the largest, commanding global economies from Asia, and none from Europe.

In conclusion, the paper highlights the significance of strategic relations between the three countries India-Russia-Israel. India's national interest is better served by building multiple alliances and leverages than proclaiming Israel as its 'natural ally.' It may go beyond the current transaction relationship, but remain relevant in geopolitical terms and "India's Act West" foreign policy. Russia has been a long-standing and time-tested partner for India. This emerging new order needs to restructure the whole frame-work of global financial institutions, with more transparent and inclusive nature.

In the projected Asian Century, despite the rise of the People's Republic of China (PRC), India has found friends in Israel and Russia, which is

shaped due to situation that was growing in Middle East and Asian region. Russia was against the relations with Israel because of the US connection. Today the ability to compartmentalize foreign policy issues, is one of the hallmark of Israel-Russia diplomacy. Now, with the Russian stance in the Middle-East, strengthened as a result of Russian military cooperation and diplomacy towards Syria, Israel can also secure its regional position by advancing in cooperation with Russia. *The relation is characterised by adichotomy of friendly relations coupled with serious disagreements on many regional issues.* Russia hopes to present itself as a more acceptable alternative to US, in Israel-Palestinian mediation.

Realising India's potential, India has been offered trade deals and lower trade tariffs by many countries. The membership of NATO was offered to India. In the Post-India's membership in SCO, there is ample room for India and Russia to work together in Eurasia, to ensure balance of power. The American companies see a fantastic opportunity in India for their business prospects. With the Modi government, the grants from Israel Industrial R&D and Technological Innovation Fund (14f) were announced in 2018, including for companies working to better the lives of people through efficient water use, improving communications, infrastructure, solar energy use, and life-saving surgeries. The fund aims to help Israeli entrepreneurs to enter the Indian market. *Thus Israel has been assiduously lining itself up alongside India's nationalist BJP government in an unspoken-and politically dangerous –'anti Islamist' coalition, an unacknowledged alliance, while India itself has now become the largest weapons market for Israeli arms trade.* in the coming years and beyond. India and Russia should also try to align their respective Look East and Look West policies and encourage respective private sector companies to work with each other, in Central Asia, in untapped sectors like IT and renewable energy.

While defence, military and nuclear energy could be sectors of cooperation between India-Israel-Russia, it makes sense to increase trade amongst themselves, to edge against disruptive forces. Much of such trade and energy flow is likely via Indian Ocean, where India is an established

maritime player. India has to find critical interests in just about every major multilateral regime and vital interests in several emerging regimes.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

Study of Cashless Economy of India

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Abstract
In modern era of digitalization Indian government is trying to develop cash less economy at the place of existing physical currency custom of India. The biggest challenge for Going for cash less economy is to maintain balance between ease of financial transactions and curbing malpractices. To deals with problems of black money, Hawala, money laundering Indian Government has embarked on the cashless economy. Digital money started a new era in Indian economy. The purpose of this paper is to find out the challenges which the stakeholders would face in implementing the cashless economy and the possible measures to overcome them. This paper focuses on the understanding of the cashless system in India and will draw attention to the significant hindrances faced by the cashless economy and electronic payment systems. The exploratory study was conducted to calculate the cost of transaction borne by the customers and banks on the way towards a cashless society.

Keywords: cashless economy, digital payments, digitalization

Introduction

Cashless economy refers to all the financial transactions in economy will take place through Plastic money, online payment, payment gateways or any other electronic form. The primary object behind cashless economy is to cover present non-registered transactions. The Indian government trying to achieve objective of cash less economy through various means, which includes Credit and Debit cards, Unified Payment Interface (UPI), Unstructured Supplementary Service Data (USSD), Aadhaar Enabled Payment System (AEPS), Mobile Wallets, Banks Pre-Paid Cards, Point of Sale, Internet Banking, Mobile Banking, and Micro ATM's etc. Even

though India adopted digital payment system in its economy, still it has a long way to go. Countries like Denmark, Sweden, Canada, South Korea, etc have very much high percentage of cashless transactions—as about 85-90%. Norway has stopped issuing cheques. For this countries task of cash economy is easy than India because these countries are much smaller than India, large educated population, higher penetration of organized retail and higher awareness about digital transactions than India.

Prerequisites for a Cashless Society

To convert age-old dependence on physical cash transactions into cashless society is a just a dream without proper preparation in this regard. There are few prerequisites like technical infrastructure, awareness, social acceptance and comprehensive legal measures in place for a successful transition to cashless economy.

Objectives

- To understand the concept of Cashless Transaction in economy.
- To measure and explain the impact and importance of Cashless Transaction System.
- To find difficulties and challenges faced by Indian population for adoption of cashless economy.
- Suggestions to face challenges to improve cashless transaction system in India economy.

Research Methodology

For this study qualitative and quantitative both research methods are used. Data for study was collected from primary as well secondary sources.

Primary Data

Primary data for research is collected through structured questionnaire and direct personal interviews.

Population size

This Study is related to all the Banks and the Consumers across Mumbai.
Sample Size

Customers - 50 different customers residing in city of Mumbai.

Banks - In this research sample researcher have considered 12 banks of Mumbai,

The reason for selecting Mumbai region as my sample is that Mumbai is the financial city of the country. Bank managers and officers responses had been reported through interviews.

Following are the banks under study:

Sr.No	Private	Public	Co-Operative Bank
1	ICICI Bank	Union Bank of India	Abhuydaya Co-operative Bank
2	RBL Bank	Bank of Maharashtra	Apna Sahakari Bank
3	HDFC Bank	Bank of Baroda	Greater Co-operative Bank
4	HSBC Bank	Vijaya Bank	Bharat Co-operative Bank

Secondary Data

Secondary data was gathered from various sources viz: books, reports, journals, published papers.

Limitations of the study

Despite of all efforts and dedication towards this study there are some limitations to this research which are as follows:

Sample size: The sample size considered for this study is very small to represent country like India.

Method of primary data collection

Primary date obtained through questionnaire and personal interviews, there is possibility of personal bias or due to any other reason respondent not provided true data.

Review of Literature

Meaning of Cashless economy is not the complete absence of cash in economy, it is a system in which goods and services are bought and paid for through electronic media.

1. According to Alvares, Cliford (2009) in their reports ―The problem regarding fake currency in India. It is said that the country's battle

against fake currency is not getting easier and many fakes go undetected. It is also stated that counterfeiters hitherto had restricted printing facilities which made it easier to discover fakes.

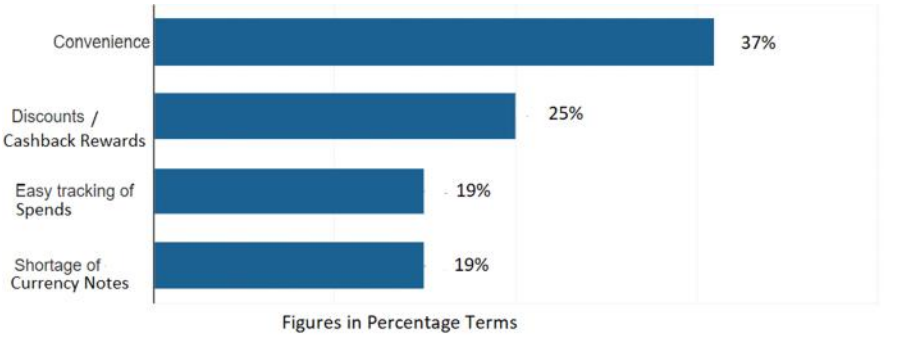
2. Jain, P.M (2006) in the article ―An Analysis of Growth Pattern of Cashless Transaction System. Available funds can be optimally used if fullest advantage of technology, quick payments and remittances is ensured. This will largely benefit banks, financial institutions, business houses and common citizen of India. He also pointed out the need for e-payments and modes of e-payments and communication networks.
3. Srinivas, N. (2006) in his study ―An analysis of the defaults in credit card payments, has tried to analyze the socio-economic profile of the defaulters of credit cards, to identify the set of factors which contributed to such defaults and suggest relevant measures to minimize the default cases. Analysis of reasons indicated that economic hardship is the major reason identified by majority of the sample units follows by rigid payment structure and loss of job/business. The main suggestion is that the banks concerned should redesign the payment structure of credit card defaulters in a flexible and affordable installment.

Data Analysis and Interpretation

- **Responses from consumers**
- **Reasons for consumers to adopt cashless transactions:**

Not only financial inclusion is a reason to shift from a cash-based system to electronic payments, but there are other reasons as well.

Diagram 1:



SOURCE- DATA COLLECTED THROUGH PRIMARY RESEARCH

The above Diagram 1 indicates that cashless payment system is not adopted by customers only because it's convenient for them. There are other reasons like discounts/cashback rewards attracts customers to adopt cashless payment system. As per the study, most of the digital payments preferred for food/beverages, travelling, entertainment, utility bills, shopping, and government services is via card, followed by cash, cheque, bank transfers and mobile payments.

- **Familiarity of electronic payment systems among consumers:**

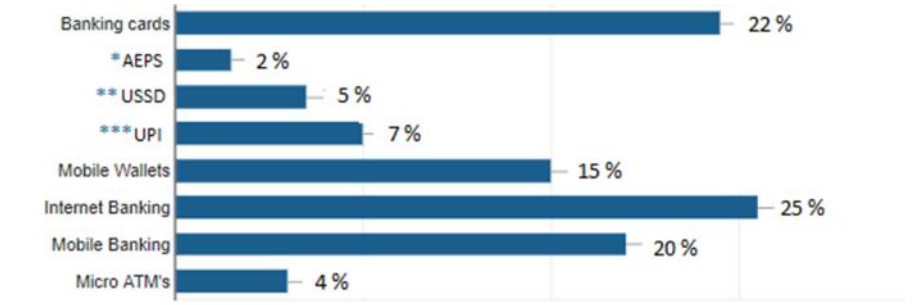
The Digital India program is a flagship program of Indian Government with a vision to transform India into a digitally empowered society and knowledge economy. As part of promoting cashless transactions and converting India into less-cash society, various options of digital payments are available.

[*Aadhaar Enabled Payment System **Unstructured Supplementary Service Data ***Unified Payment Interface]

With the advent of Aadhaar System in the Indian Economy much concerns have been raised for the AEPS. The above Diagram 2 is a clear revelation that AEPS being an emerging electronic payments system is rather

relatively unfamiliar mode.

Diagram 2:



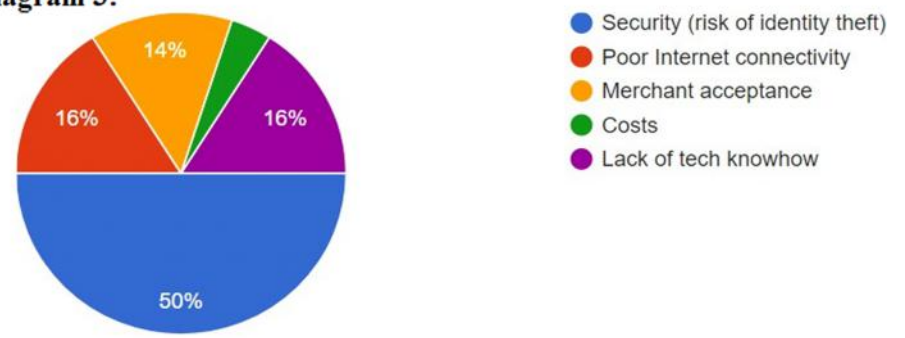
Figures in Percentage Terms

SOURCE- DATA COLLECTED THROUGH PRIMARY RESEARCH

- Consumers' biggest concern around cashless payments

Consumers would move from being a cash ridden society to a cashless society, but due to the security issue, poor internet connectivity, merchant acceptance, cost of transactions and lack of tech knowhow they still resist cashless transactions.

Diagram 3:



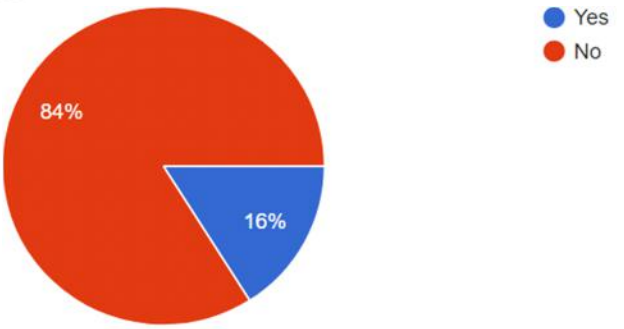
SOURCE- DATA COLLECTED THROUGH PRIMARY RESEARCH

According to the data collected it shows that major concern among sample of consumers under study to be the security aspect of such electronic

payments. Also, the lack of technical knowledge and poor internet connectivity adds to be major hindrances for India to become cashless.

- Consumers opinion on the cost of transaction charged to them

Diagram 4:



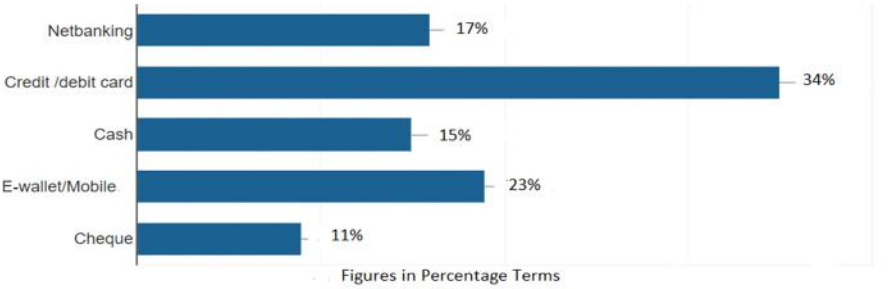
SOURCE- DATA COLLECTED THROUGH PRIMARY RESEARCH

Bank charges transaction fees and service charges like SMS service charges, card fees, Internet banking fee, access fee on electronic payments. Currently,citizens feel squeezed because the cost of cashless has not reduced the cost of cash. They feel the cost of cashless and digital transactions will have to be significantly brought down from the current levels. Until then, the cost of digital transactions must not be increased beyond the current levels.

- Consumers preferred mode of payment post demonetization
- When Demonetization struck, people had to turn to mode of payment other than cash, most of the people resorted to pay through

Diagram 5:

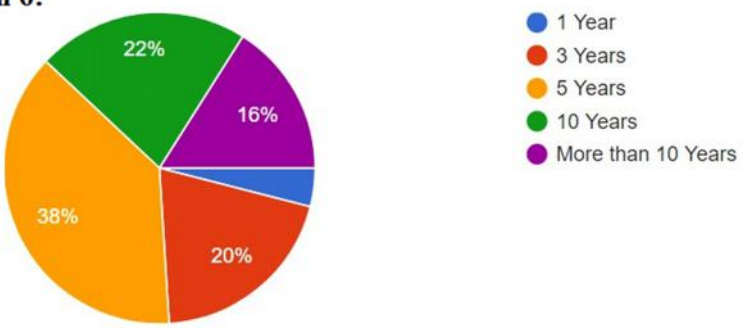
banking cards. Also, the use of E-wallets increased. The fact that the country was starved of paper currency for a significant period while the new notes were being printed it pushed many end-consumers into adopting e-wallets like PayTM to transact, closing the merchant-customer loop. Even if there was a hype in the digital transactions post demonetization, when the circulation of notes became regular it was observed that, the majority switched back to traditional mode of payment.



SOURCE- DATA COLLECTED THROUGH PRIMARY RESEARCH

- **Probable time for India to become a cashless economy by the consumers**

Diagram 6:



SOURCE- DATA COLLECTED THROUGH PRIMARY RESEARCH

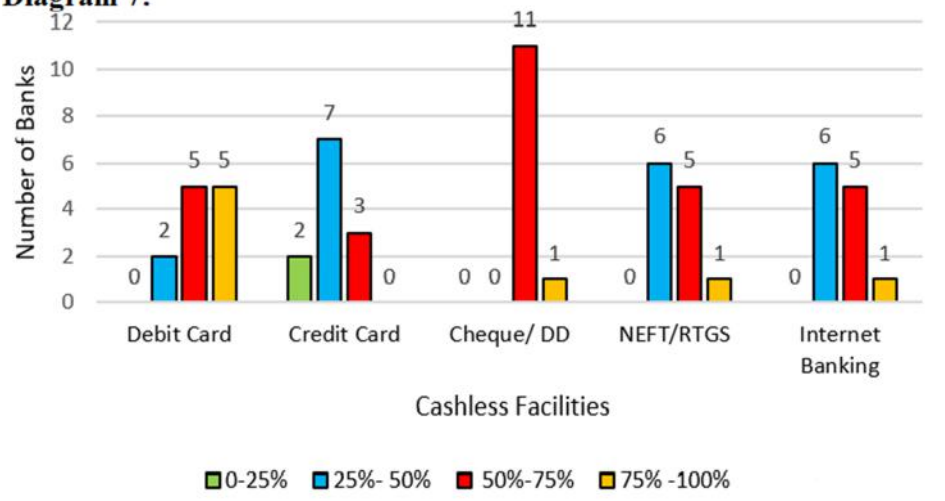
Only 24% of respondents feel that India can become cashless in next 3 years. Whereas, 60% of respondents feel that India can become cashless in next 5- 10 years. 16% of respondents feel that India will take more than 10 years to become a cashless economy. The process of making digital payments in India is relatively tedious and time consuming.

Digital payments aren't a single standard like cash money. In few cases it can be said that digital payment platforms are not interoperable.

Responses from banking professionals

- **Various banking cashless facilities used by the consumers**

Diagram 7:

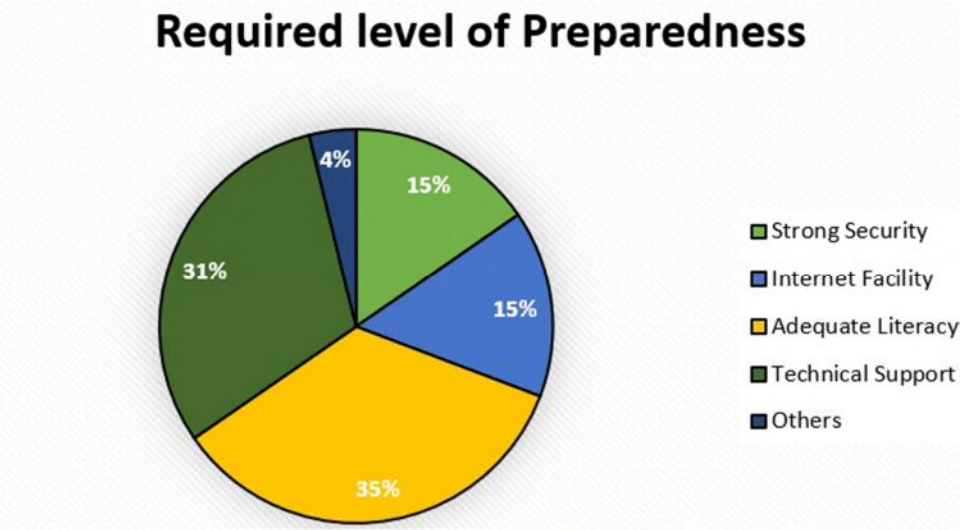


SOURCES- DATA COLLECTED THROUGH PRIMARY

It can be see that debit cards, credit cards and cheque/DD are most commonly used cashless transaction. According to banking professionals, there has been a significant increment in the usage of internet banking and RTGS/ NEFT post demonetisation.

- **Level of Preparedness required to become cashless economy**

Even as people adapt to newer digital modes of payment, questions remain over the platform's operational aspects. As a nation, we are clearly behind on the preparedness to deal with this large scale move towards digital payments. It is observed that adequate literacy of the public and an efficient technical support, followed by strong 24x7 security and internet facility for increasing the reliability on the cashless India movement.

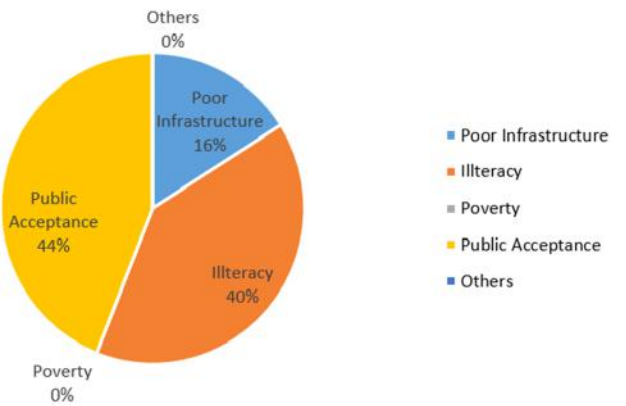


SOURCE - DATA COLLECTED THROUGH PRIMARY

- **Hurdles affront of Cashless India**

It was found that, public acceptance stays supreme for effective change in the overall structure. of payments and to reduce illiteracy and improve the infrastructure required to become a digital economy.

Diagram 9:



SOURCE - DATA COLLECTED THROUGH PRIMARY RESEARCH

Findings

Consumers are not familiar with all the electronic payment facilities available. Even if they knew, the usage of digital transactions boosted only

after demonetization. They realize that the cost of going digital is high and hence expects incentives and discounts for using such electronic payment systems. Consumers and bankers believe security and tech knowhow to be made efficient for effective usage of digital transactions

According to the sample survey, it is revealed that India is not completely ready for cashless economy. The preparedness required to become a cashless economy are adequate literacy, strong security, internet facility and effective technical support. The hurdles in the path of India are illiteracy, public acceptance and poor infrastructure.

The interviews conducted with bank officials and managers reveal that, India is not fully ready to become a cashless economy, strong aversion from customer to accept fund through banking channels. A secured structure to be made for clients with good user interface which should reduce security risks.

The bankers feel that, awareness for digital payments should be increased. Free service should be provided to help incompetent public for usage of the electronic transactions. And there should be incentives like discounts/cashbacks which will motivate digital transactions among consumers and businessman. Technical infrastructure should be improved to facilitate digital transactions. Educating the lower section of India to increase the smooth performance. Also, the bankers suggested that tight firewall is required for the safety of customers, which concerns customers the most as we found the by the survey conducted.

Recommendations and Conclusion

If we look at the overall scenario of establishing the cashless economy, it is beneficial in the present system. It can be said that cashless economy is the need of the hour. It has become not only important but necessary for the country to go cashless for the systematic development in the economy. Parity between cash and digital money is probably impossible to achieve, but there are means of getting closer to it by creating an incentive structure for that switch, and that involves making cash more expensive than cashless, and better enforcement of digital economy.

It will be better to say that India at this point of time has to go for less cash economy rather than cashless economy. The continuous march towards less cash economy will lead to cashless economy in the country in near future.

Suggestions

- Equitable improvement of infrastructure for bringing in effective changes and thus decreasing the disparity in the development of rural and urban regions.
- Mere launching of schemes and campaigns regarding cashless doesn't seems to be worthwhile. To make these schemes more impactful, some sort of marketing tools like Bank Mitra or exhibition and camps in rural areas should be set-up to make these schemes fruitful.
- Online transactions should be made as cheap as possible, eliminating all sort of extra charges. so that more and more peoples switch from cash based to cashless economy.
- Adequate security mechanisms should be put in place to safeguard the interest of consumers against dubious and fraudulent practices of fraudsters.
- Giving an indirect tax rebate for using cashless methods of payment, which brings parity between cash and cashless. Even online, merchants can be incentivised to charge less for digital payments, and more for cash on delivery.

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

Problems of Tourism Development in Sindhudurg District

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Introduction

Tourism has become the key factor and the valuable attributes to the economic prosperity of the most of the developing nations. In recent days tourism has been a rising industry and proving itself as the pivot of vehicle for economic development in a number of countries. Economic development of the nations runs parallel to the development of tourism. Recently, a major portion of the world trade is constituted by tourism industry. Growth rate of tourism is faster than any other trade or good or services in the world economy. It has taken the strong shape of highly organized service sector and industry. Visionary political leaders and business tycoons have been exploiting maximum potentialities of the tourism industry for the development of their economy for the years. Various developing countries are designing their economic planning to exploit the opportunities of tourism. The economy of many countries is depending on tourism. It has become the most reliable economic source for prosperity. Availability of communication means and fast transportation added a kind of splendour to the tourist industry.

Sindhudurg district is known as the second paradise in the nation. It is always compared with divine beauty of Kashmir. It has diverse aspects of tourism i.e. temples, caves, forests, forts, rivers and mountain ranges, creeks, lagoons, orchards of coconut, betel nut, mango, cashew, paddy, wild fruits like blackberry, jamun etc. The district has contributes a lot to the Maratha history and national history. The coastal line of the district is embellished with various historical places including forts. The district covers a number of well known temples and religious sacred monuments. Rich cultural heritage is preserved in the families. The best vocal artists, writers, poets, musicians belong to the lands of Sindhudurg. It is land of Alphanso Mango; well-known international brand in fruit market. But yet the overall development of the district is lagging behind.

Definition

According to L. J. Lickorish "Tourism embraces all movement of people outside their community for all purpose except migration or regular daily work. The most frequent reason for movement on sporadic or in infrequent business purposes". Bukart and Medik provide the following conceptual definition – Tourism denotes the temporary and short-term movement of people to destinations outside the places where they normally live and work and their activities at those destinations.

Objectives

1. To review to rural development through tourism development in Sindhudurg district.
2. To study the employment opportunities and future potential through tourism in the district.
3. To study the selected destinations of tourism and types of tourism.
4. To understand tourism industry in the district.
5. To study the contribution of tourism in rural development.
6. To study the overall development of the Sindhudurg district.

Present Situation of Tourism in Sindhudurg District :

In 1997, it is declared as First Tourism District in India. But Sindhudurga district suffers of a number of problems such as social indiscrimination, unemployment, undeveloped agricultural sector, lack of marketing for agro products, unemployment and so on. It is recorded as the Lowest Population Density district in the state. Unemployment drives the poor people to the metropolitan cities for livelihood. Migration of the people to the cities has almost vacated the small villages. Inadequate infrastructure is the common problem for the district. Lack of connecting roads, narrow roads, transportation facilities, lack of medical facilities, sand sanitation problems are so common in the district. Government administration tries its best to provide solutions to these diverse hurdles and problems. Development of tourism is closely associated with eradication of problems of the district.

There is favourable atmosphere for the development of tourism in the district. District needs tourism for its own development.

Sindhudurg at a Glance

1) Devgad Taluka:

Devgad is the tahasil place which situated 40 km. away from Mumbai-Goa National Highway. The world famous 'Devgad Alphanso' mangoes are available here during the season. Devgad is famous for its temples, forts, clean beaches, fisheries etc.

2) Malvan Taluka:

Malvan is a compact town situated on the coast of Western India. The Faomus Sindhudurg sea-fort which lends it's name to this District, constructed by Chatrapati Shivaji Maharaj - a place of pride, is located in Malvan. There are several tourist attractions such as Sarjekot, Padmadurg, Moryacha Dhonda, Tarkarli, Kolamb creek, Dhamapur, Ojhar, Kasartaka, Tondawali, Anganewadi, Malvan rock garden and Jai Ganesh temple. The typical malvani dialect spoken all over Sindhudurg district, known for it's special crispness and creek in tongue quotes has carried the name of Malvan even abroad. The surrounding sea has rich biodiversity and recently the Maharashtra Tourism Development Corporation has provided the snorkeling facility which can be availed by anyone and get a first hand experience of the under sea world. Malvan is also famous for its special slightly spicy tangy cuisine and has several eateries around the cater sea food.

3) Vengurla Taluka:

It is really a love at the first sight experience for any tourist coming to Vengurle for the first time. Located towards the south of Sindhudurg district, Vengurle with its silver sands, sparkling blue sea and bountiful nature is a poet's dreams come true. The very name of Vengurle conjures up the beautiful Public Works Department (PWD) rest house situated on a hilltop on the beach and picturesque lighthouse located behind it. Mansishwar temple, Narayan lake, the beautiful beach of Sagreshwar are some of the sights worth seeing in Vengurle. There are several eateries catering typical Malvani spicy cuisine.

The view of Vengurle town however, differs from the places from one sees from different direction, for instance, if viewed from the Dabholi Ghats one sees the half-moon shaped sea beach from Sagareshwar to the

port with the prominent rest house and the lighthouse behind it. It almost appears that mighty sea has embraced this beautiful town in its arms.

There are several other tourist locations close by such as Mochemad beach Shiroda, Vetoba of Aravali, Redi, Terekohl, Vaingani beach, Bhogawe, Nivati fort, etc. Which can be easily accessed from Vengurle. The nearest railway station is Sawantwadi or Kudal and the place is easily accessible by road as well. The 'Balasaheb Sawant Agricultural University' fruit research center in Vengurle camp area is also worth visiting.

4) Sawantwadi Taluka:

Once recognized by the name Sunderwadi as a tribute to its scenic beauty, the small township has developed into a taluka place known a Sawantwadi. The city is well known for its colorfull wood craft. Sawantwadi was under the rule of Khem Sawant family. The city is blessed with the presence of beautiful lake known as the Moti Lake around which the township has developed. A tour of Sawantwadi would be incomplete without visiting the palace, Jagannath Bhosale Garden, the Shilpgram and the adjacent hill station Amboli.

Moti Lake is a well maintained tourist attraction. A tour of the Lake is a must, giving the tourist a prime view of the surrounding city. The city corporation has renovated the lake with spacious pathways, attractive luminaries and its surroundings. Tourist can avail of the boating, water scooters, paddle boats or the Kashmir type Shikara's at very affordable cost. One should not miss a rambling walk on the pathways around the Lake to enjoy the scenic beauty.

5) Kudal Taluka :

Kudal was chosen as the capital place of Sindhudurg district at the time of its inception in 1981. However due to administrative convenience the District office to the newly formed Sindhunagari in 1994. Located strategically on the Mumbai Goa highway, Kudal is a historic place. The Raul Maharaj Math at Pingoli, the beautiful Mansantoshgad at Shivapur, Datta temple and Yakshini temple at Mangaon, the penanace site of Saint Tembhe Swami, Ranganaged, historic Ghodebav of Kudal, Devdongar on the banks of Bhansali river, Rameshwar temple of Akeri, Rawalnath temple of Oros are some of the place of tourists attraction, Kudal is also a station for the konkan Railway.

6) Kankavli Taluka :

Kankavali town, an important business center and a taluka place, is located centrally in Sindhudurg district, on the Mumbai-Goa highway. The place is also connected through Konkan Railway. The town is on the cultural literary, social and religious forefront. The Gopuri Ashram of 'Konkan Gandhi' Appasaheb Patwardhan, Bhalchandra Maharaj Ashram, Rainy season waterfall of Savdav, historic Kharepatan town, Mhadkadevi Temple of Kasardé and Gangeshwar temple of Talere are some of the tourist attractions in this taluka.

7) Vaibhavwadi Taluka :

Vaibhavwadi Taluka is located in the realm of Karul Ghat which joins the Sindhudurg district and Kolhapur district. This is slightly isolated taluka and is very quiet and a place away from crowds. The Napane Waterfall which is flowing all over the year. The beautiful Karul Ghat, the Gagangiri Maharaj Muth on the historic Gagangad and the recently discovered Inari caves are major tourist attractions.

8) Dodamarg Taluka :

Dodamarg is the southern end of Sindhudurg District. Located on the boundry of Karnataka and Goa, this taluka was formed by the bifurcation of the Sawantwadi Taluka. The combined Maharashtra - Goa Govt.'s Tilari dam project is housed in this taluka. Tha backwaters of Tilari dam and the flowing Tilari river has contributed to the lush greenery, and at

times one finds wild elephants in groups coming here from the adjacent Karnataka state for food. Unneyi dam - a part of the Tilari project with it's developed garden, Hanumantgad, Pargad and Kasainath are the major tourist attractions. One can experienced the typical rural life amidst the evergreen jungles. The Kasainath mountain is located near the Dodamarg town.

Future Scope for Tourism in Sindhudurg District :

The concept of "Quality Tourism" becomes indispensible for the planning for Sustainable Tourism Development. It is connected with attracting the tourists, facilities and services offering "good value for money", protecting tourism resources and protecting high esteem of the local environment and society.

Sindhudurg has enough potentialities for tourist attractions; Dense forests, adventure sports, excellent waterfalls, caves, ancient pilgrim places, historical monuments, Archaeological sites, cultural and religious festivals, and many others. The concept involves the maximum exploitations of these potentials for development of tourism, observations of the gaps and limitations at the local sites, recommendations for overcoming of the limitations as well as interactions with the local people. The basic idea is to enhance the visitor's experience to the place.

Broad Classification of the scope based on Theme of Tourism: Nature – Eco Tourism, Ethnic Cultural and Heritage Tourism, Leisure Tourism, Corporate Tourism, Health Tourism, Religious Tourism, Agro Tourism, Special Interest Tourism, Mega Projects and Development of Gateway.

Problems of Tourism in Sindhudurg District :

a) Lack of star and international facilities of accommodations and lack of continental foods.
b) Narrow and bad conditions of roads.
c) Non-availability of currency exchange facility.
d) There is no Airport in Sindhudurg district.
e) Non-availability of Guide Service.

f) Lack of tourism literature.
g) Non availability of Direction Boards indicating Tourist Spots.

Conclusions

1) The Sindhudurg district has 120 kms. Sea shore of Arabian Sea with white and clean sand. There are many forts, many old Hindu temples in the districts. The district is beautiful with natural scenes.
2) Maharashtra Tourism Development Corporation has developed basic infrastructure and resorts of important tourism centers like Ganapatipule, Tarkarli, Amboli, Vijaydurg and Kunkeshwar.
3) The Konkan railway has started in the year 1998. This was big push to tourism industry of the Sindhudurg district. The domestic and foreign tourists attracted to the tourism of Sindhudurg.
4) The unique food culture of the Sindhudurg district is also attracting the tourists in the district. It is based on sea food and processed fruits like Mango, Cashew and Jackfruit. The unique local cold drinks like Kokum Sarbat, Solkadhi, various fry fishes and unique dry fruit like cashew nut is playing an important role in the tourism development.
5) The water sports like scuba diving snorkeling, sea paragliding, Dolphin suffer, boating has started by local entrepreneurs. This movement has also attracted the tourists to the Sindhudurg district.

Suggestions

1) Prohibition on use of Plastic
2) Protection of Wild Life
3) Prohibition on Deforestation
4) Protection of old Hindu Temple Heritage
5) Conservation of Fort Heritage
6) Conservation of Local Food Culture & Cultural Heritage
7) Conservation of Coral and Sea World
8) Ban on excess and unseasonal fishing
9) Conservation and Development of Horticultural Products
10) Development of Sea-coast and Creeks Tourism

11) Adventure Tourism in Rainy Season
12) Direction Boards indicating Tourist Spots
13) Prohibition on Mining
14) Hospitability Trainings
15) Organisation Tourist Festivals
16) Publicity of unique tourist features of the District
17) Positive Political Approach

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INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY EDUCATIONAL RESEARCH
ISSN: 2277-7881; IMPACT FACTOR – 6.014; IC VALUE:5.16; ISI VALUE:2.286
VOLUME 8, ISSUE 8(6), AUGUST 2019

Phytochemical and Medicinal Investigation of Weeds *Eclipta prostrata* and *Pendalium murex*

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Abstract

Weeds are unwanted and undesirable plants which interfere with the utilization of land and water resources. This green vegetation is also flourished in Aquatic systems, forestry, Industrial sites, Roadside, Railway lines, landscapes water tanks and waterways. Information about medical aspects of these weeds are been gathered from local people, Vendor and experts from Ayurvedic field. Basically, Medicinal importance of plants is due to the presence of some specific substances like Primary metabolites which enhance growth and metabolism within plants and secondary metabolites are produced from primary metabolites they play an important role in different metabolic activities of living organisms such as attracting pollinators and chemical defense against micro-organisms, insects and higher predators. Many such natural products have been used in Industrial products, agricultural chemicals, Pharmaceuticals and as food additives. Some of the secondary metabolites are potentials drugs, essential oils, alkaloids, antibiotics, cardiac glycosides, coumarone, lignin's, resins, sterols, Sapogenins, Tannins, Volatile oils and Insecticides.

Two such weeds *Eclipta prostrate* and *Pendalium murex* were studied to detect and identify which secondary metabolites are present in these plants so Flavonoids and sterols are some of the secondary metabolites which are found in these plants which are further Identified, extracted, Isolated through the Thin layer chromatography, then Quantitatively estimated followed by comparative study of these two species that which part of the plant yield more metabolites as compared to the other species. It is being

observed that Flavonoids are maximum (6.30mg/g of d.w) in the leaves of *Eclipta prostrata* and minimum (3.30mg/g d.ws) in the fruit of *Pendalium murex* and the sterol content is maximum in fruits of *Eclipta prostrata* (3.04mg/g d.w)and minimum in the roots of *Pendalium murex* (1.73mg/g d.w).

Keywords: weeds, Ayurved, medicinal aspect, Flavonoid, Quercetin, Kaempferol, Sterol β-Sitosterol, Stigmasterol, Phytosterol

Introduction

Weeds of arid area are a good source of phytochemically important compounds. The plants for study were collected from Haryana. The region of the Northwest part of Indian in the states of Rajasthan and Haryana is the area between the Indus river in the west and the Aravalli mountain in the east are described as desert soil the local inhabitants as well as in an indigenous system of medicine utilizes the medicinal plants of the region.

In the last few decades, there is a growing demand of medicinal plants by pharmaceutical companies. This increasing demand if properly utilize can help in village economy as well as will open new avenues of employment. The per hectare income generated from growing medicinal plants is much more than any other crops. On the other hand, the land which is not suitable for crop cultivation can be utilized for the cultivation of medicinal plants, which is suitable for that habitat.

India has a vast and inexhaustible resource of drugs of plant origin. Several important medicinal and Aromatic plants prescribed by Vaidya and Hakim have carefully investigated from every point of view.

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Ethnobotanical aspect

Weeds are an important source of medicines. These are used by human beings for the treatment of many diseases from ancient times. The traditional Medicinal plants throughout the world played an important role in the development of a new Herbal drug. India is known for some of the medicinal plants which are in great demand all over the world. Almost 540 species are utilized by Pharmaceutical formulations (Kapoor and

Mitra 1979).Medicinal importance of plants are due to the presence of specific substances like primary metabolites and secondary metabolites (Luckiner., November 1977).

UNESCO (1960) has published a survey report with details of the world medicinal Plant growing in different arid zone belonging to different families which are most adapted to dry condition for their growth and production of secondary metabolites in plants under water supply. They occur in higher plants but are uncommon in cryptogams. They impart colour to flowers and fruits. Correlation between flower colour and attraction of insects for pollination is well known, however, their occurrence is not restricted to flowers but include all parts of the plant.

Phytochemical aspect

Some secondary metabolites are Flavonoids and Steroids

Flavonoids: They are polyphenolic compounds possessing 15 carbon atoms, 2 benzene ring joined by linear three carbon atom. Some Flavonoids are of Pathological significance whereas others are physiologically important to animals. They show therapeutic hemorrhagic condition (Pon Velayutham., Anandh Babu and Dongmin Lui, 2009). They also show protection against a nuclear hazard (YahyapourR,Shabeeb D *et.al* 2018).

Steroids: Theyare the most important group of secondary metabolites. Steroids occur abundantly in the vegetable world than in animals and therefore plant steroids are considered as a precursor for hormone synthesis. The sapogenins, diosgenin which is abundantly available, is of particular importance for the production of sex hormones. The phytosterols are ubiquitous in higher plants and probably also in plant tissue culture. Indeed it is probably that they are essential components of many cellular membranes.

The steroids attached with sugar are very common in plants one class of these substances are known as saponins. The steroidal part of these saponins called sapogenins.

Sapogenins are widely used in the field of medicines, as they are the main precursor of many medicinally useful steroids hormones. Chemically Steroid represents a non-saponifiable fraction of lipids extracted in fat solvents.They bear cyclopentano-perhydro-phenanthrene nucleus in their molecular structure. The steroid consists of 4 rings A, B, C, D. A, B and

C rings are six-membered and D is 5 membered rings. If the compound has one hydroxyl group and no carboxyl group it is a sterol. If it has one or more carbonyl group or carboxyl group then it is a steroid. And we know that steroid is the precursor of hormone synthesis.

Research and Methodology

Some of the weeds, are used by local people for Medication. A research was conducted by interviewing the Hakim's, Vaidhya's and Ayurvedic expert of that area. And the dosage and the

Mixture was studied and how it is helpful to mankind and curing the ailment, though natural with no side effects.This investigation had thus inspired me to find out which are the natural substances present in the weeds, so this research was conducted.

Collection of plants: Plants were collected from Rohtak District State Haryana, which is above 220 metres above sea level. Two weed species *Eclipta prostrata* and *Pendalium murex* were taken for study.

Eclipta prostrata

Family: Asteraceae

Local Name: Bhringaraaja, Bhringa.

Habitat: Throughout India up to 2000 m on the hill.

Characteristics: The plant found the whole of the year and measures about 50 cm in length. The branches are green, shiny, with some blackish shade. The branches have small white hairs. Leaves are 2-6 cm in length and 2-3 cm in breadth. On crushing the leaves a blackish green fluid squeeze out, which turn out black after some time.

Flowering and Fruiting: Almost throughout the year.

***Pendalium murex*:**

Family: Pedaliaceae

Local Name: Ghokhru.

Habitat: North-Western India.

Characteristics: The plant grows in the rainy season and obtains a height of 50 cm. Its branches remain bent towards the ground. The flowers are small-sized and yellow. Its fruit has four spines.

Flowering and Fruiting: October and November

Preparation of plant Material

Leaves of *Eclipta and Pendalium* were collected from the study area, thoroughly washed with tap water wiped air-dried cut into small pieces. Further dried at 100 % for 15 min to inactivate enzyme then further dried at 60ºC till constant weight is achieved, then powdered.

Extraction

Flavonoids

The dried samples were separated soxhlet extracted(Subramanium and Nagrajan,1969) in 80 % Ethanol (100ml/gm dry weight) on a water bath for 24 hrs. Each of the extracts was concentrated and the concentrate wasre-extracted into petroleum ether (40-600C: fraction 1) ethyl ester (fraction 2) ethyl acetate (fraction 3) in succession. Each of the steps was repeated 3 times to ensure complete extraction in each case.Fraction 1: was rejected due to its being rich in fatty substances; Fraction 2: was analysed for free flavonoids; Fraction 3: was analysed for bound flavonoids

Fraction 3 of each test sample was hydrolysed with 7 % sulphuric acid (mg/gm residue) for two hours.This mixture was filtered extracted with ethyl acetate in separating funnel. The ethyl acetate layer (upper) was washed with distilled water to neutrality. With the help of thin layer chromatography fraction 2 & 3 were assessed for flavonoids.

Chromatography

Thin-layer chromatography for flavonoids

Ethyl ether and ethyl acetate fraction from each of the following test sample were uploaded standard reference compound(Apigenin, Kaempferol, Luteolin, Quercetin and Vitexin) using solvent mixture of n-butanol, acetic acid and water(4:1:5; upper layer).

Several other solvent mixtures such as ethyl acetate saturated with water, acetic acid (6:4) forestall system(acetic acid, conc.HCL and water; 10:3:30) were also tried. The solvent mixture of n-butanol, acetic acid, water(4:1:5) gave the best result in all the cases examined. The developed plates were air-dried and visualized under UV light which showed two fluorescent spots in both the fractions 2 and 3 in all the instances co-including with those of the standard sample of Quercetin (blue Rf 0.82)

and Kaempferol (bright yellowish blue, Rf 0.93). The plates were placed in a chamber Saturated with ammonia vapours to observe the colour of the spots (Quercetin, Deep yellow; Kaempferol, light yellow). On spraying the developed [plates with 5% ethanolic $FeCl_3$ solution which also showed only one spot(in both the fraction 2 and 3) in which fraction was considered with that of the reference of Quercetin (bluish-grey) and fraction 3 with Kaempferol brownish). The Rf values were calculated on an average of the 5 replicate.

Preparative thin-layer chromatography(PLC)

The extract of both the fraction (2and3) was applied on separate plates and the developed plates were air-dried and visualized under UV light. Each of the fluorescent spot coinciding with those of standard reference compounds of Quercetin and Kaempferol were marked. The marked spot was scrapped and collected separately along with the silica gel and eluted with ethanol. Each of the elute was crystallized with chloroform.

The compound thus isolated, were subjected to colourimetric (quantitative estimation)m.pt,(Melting point apparatus, Toshniwal, India), UV maxima on a spectrophotometer on infrared spectral studies.

Quantitative estimation

Quantitative estimation flavonoids were carried out colourimetrically following the method of Kariyone et al. (1953) and Naghhski et al. (1975) in case of quercetin; and Mebry et al. (1970) in case of Kaempferol. Stock solution (25micro gm/ml) of quercetin and Kempferol were separately prepared by dissolving the authentic sample in methanol. Six conc.,(25 micro gm/ml-150 micro gm/ml) of each of the standard samples were spotted on silica gel coated and activated plates. Separate plates of each of the conc. Of quercetin and Kempferol were used and these chromatograms were developed in the same solvent system as used for the quantitative method (n-butanol; acetic acid; water,4:1:5, upper layer). Such developed chromatograms were air-dried and visualized under UVlight. The fluorescent is marked and collected along with the adsorbent in separate test tubes the mixture shaken vigorously, centrifuged and supernatants collected separately. The volume of the replicates was made up to 10 ml by adding spectroscopic methanol. To each of these sample 3ml of 0.1mole $AlCl_3$ was added, stoppered tightly and the mixture was shaken

vigorously. Such tubes were kept at room for 20min. Five such replicates were prepared in each case and optical density is measured using spectronoic -20 colourimeter set at 440 nm for quercetin and 423 nm for kaempferol against a blank (10ml spectroscopic methanol+3ml 0.1 mole $AlCl_3$.

Table 1.Flavonoid contents of *Eclipta prostrata and Pendalium murex*

Plants	**Plants parts**	**Quercetin**	**Kaempferol**	**Total**
Eclipta prostrata	Leaves	1.10mg/gm.d.w	5.20mg/gm.d.w	6.30mg/gm.d.w
Pendalium murex	Fruits	0.10mg/gm.d.w	3.20mg/gm.d.w	3.30mg/gm.d.w

Sterols

Dried plant parts in powdered form were taken and used for extraction of sterols. Each dried sample was hydrolyzed with 30 % HCl 4 hours on a Water Bath. The hydrolyzed test samples were filtered and washed with

D/W till the filtrate attain PH 7.0. Test samples so obtained were dried at 60°C for 8 hours and soxhlet extracted in Benzene (200 ml) 24 hours separately. Each of the Benzene extracts of the various test samples was dried in Vacuo and taken up in chloroform for further analysis. With the help of thin layer chromatography two sterols ß Sitosterol (Rf0.52) and stigmasterol (Rf 0.49) were observed in the plant samples.

Thin-layer chromatography

Each of the crude extracts applied separately on the silica gel G coated and activated thin glass plate along with a standard reference sample of sterols (β-Sitosterol, Campesterol, cholesterol, Lanosterol, and Stigmasterol). The plates were developed in an organic solvent which is a mixture of benzene and ethyl acetate (85:15), air-dried sprayed with50% H2SO4 and subsequently heated at. Two colours were matched with the standard samples of β-Sitosterol (Rf.0.52) and Stigmasterols was (Rf. 0.49) were observed in the plant samples. A few other solvent systems (hexane: acetone, 80: 20; benzene: ethyl acetate, 3:1) were also tried but benzene and ethyl acetate (85:15) gave an excellent result in the present investigations.

Preparative thin layer chromatography (PLC)

Each of the extract along with standard reference sterols was applied separately on thickly silica gel (0.3mm-0.4mm) G coated and activated glass plates. The plates were developed in an organic solvent mixture of benzene and ethyl acetate (85:15).

The developed plates were air dried and visualized under UV light. The two fluorescent spots(Rf. 0.49) and (Rf. 0.52) corresponding with β-Sitosterol Stigmasterol in roots, shoots and fruits of selected plant species and collected along with silica gel from unsprayed plates. Each of the mixtures was eluted with chloroform. The elute were dried in the vacuum crystallize separately with acetone and methanol.

Quantitative estimation

Quantitative estimation of β-sitosterol and stigmasterol in each of the test sample was carried out using the method of Das and Banerjee (1980). A stock solution of β-sitosterol and stigmasterol in chloroform (500 micro gm/ml) was separately prepared, from this 6 conc. (0.1, 0.2, 0.3, 0.4, 0.5 and 0.6) were prepared and spotted on silica gel G coated on an activated glass plate. The plates were developed in the solvent system of benzene and ethyl acetate (85:15). Such developed chromatographs were air-dried and exposed to iodine vapours. Iodine spots were marked and heated to evaporate excess of iodine. The spots were scrapped along with silica gel and each was eluted with 5ml of chloroform in test tubes. Each of the tubes was centrifuged, supernatants were taken, solution evaporated to dryness and processed further. To each of the dried samples, 3ml of glacial acetic acid was added and shaken on a vertex mixture at room temperature for 1min and then immersed in crushed ice. To this frozen sample, 2ml freshly prepared chromogenic reagents(0.5ml of 0.5% anhydrous ferric chloride in glacial acetic acid and 100ml of conc. Sulphuric acid; Klyne, 1965) was added drop wise at 0ºC and mixed thoroughly. Each of the reaction mixtures was incubi ted at 40 ºC for 30 min. The optical density of each of the test sample was taken in a spectronic -20colorimeters set at 540nm against a blank (3ml glacial acetic acid and 2mlof chromogenic reagent). Five such replicates run for each of conc.to minimize the standard deviation and average optical density was plotted against their respected conc. To complete a regression curve, which follows bear law.

Each of the extracts was spotted along with β-sitosterol and stigmasterol on the silica gel G activated glass plate and developed in benzene and ethyl acetate (85:15). The two spots coincided with those of the authentic of β-sitosterol and stigmasterol were marked in all samples of selected plant species. Each of the elute was dried, taken up in 5ml of chloroform and r as described above, conc. of β-sitosterol and stigmasterol were calculated (mg/g d.w.) by comparing the optical density of standard β-sitosterol and stigmasterol separately. Five such replicates were examined in each case and the mean values calculated.

Table. 2.Sterol content in *Eclipta prostrata* and *Pendalium murex*

Name of Sterol	***Eclipta prostrata***	***Pendalium murex***
	Fruits	**Roots**
β-Sitosterol	2.12mg/g d.w	1.04mg/g d.w
	Fruits	**Roots**
Stigmasterol	0.92mg/g d.w	0.69mg/g d.w
Total sterol content	3.04mg/g d.w	1.73mg/g d.w

Result and discussion

Medicinal Aspect of *Eclipta prostrata*:

Bhringaraja powder one part, black sesame seeds half part and Aamalaka (*Emblica officinale)* half part was prescribed as an age sustaining tonic. It is used as a detoxifying antiseptic herb in animal for Liver enlargements Hyperacidity and Dysentery the juice of Bhringaraja is used to wash the wounds. The oil extract of leaves is used for hair growth and gives natural colour to grey hairs. Its seeds are used in sex debility and as a tonic. Its juice followed by milk retards old age and reduce old age problems.

Medicinal Aspect of *Pendalium murex*:

A simple decoction of Gokhru seeds mixed with honey or a paste of Gokhru with coconut water is prescribed for dysuria. Gokhru is recommended for painful micturition, suppression of urine. It's decoction in milk with Amla, Shatavari and Sesame seeds work as a sex tonic. A decoction of Ghokru and Shunthi is prescribed for rheumatism. Gokhru is an ingredient for Dashmularistha due to its diuretic property. Dashmularistha is a restorative tonic for women suffering from urinogenital diseases.

Flavonoids: Presence of Two Flavonoids Quercetin (Rf 0.82 bluish yellow) and Kaempferol (Rf 0.93 bright yellowish blue) was confirmed in samples 2 and 3 the presence of Quercetin and Kaempferol was confirmed.

Quercetin is maximum (1.10 mg/g d.w.) in the leaves of *Eclipta prostrata* and minimum (0.10mg/g d.w.) in the leaves of *Pendalium murex*. Similarly, Kaempferol is maximum (5.20 mg/g d.w) in the leaves of *Eclipta prostrata* and minimum (3.20 mg/g d.w.) in the fruits of *Pendalium murex* as shown in Table.1.

Sterols: β – sitosterol and stigmasterol were confirmed by Co- TLC.(Rf βsitosterol 0.52 and stigmasterol, 0.49)M.pt (Beta-sitosterol, 139-140 °C stigmasterol 132-133 °C) and superimposable IR spectra of isolated and the authentic samples of sterol. Maximum sterols content was observed in fruits of *Eclipta prostrata* (3.04mg /g d.w.) when compared with other plant parts of *Pendalium murex*, where as it is minimum in the roots of *Pendalium murex* (1.73mg/g d.w.) as seen in Table. 2

β– Sitosterol contents is maximum (2.14 mg/g d.w.) in the fruits of *Eclipta prostrata* and minimum (1.04 mg/g d.w.) in the roots of *Pendalium murex*. Stigmasterol contents are maximum (0.92mg/g d.w.) in the fruits of *Eclipta prostrata* and minimum (0.69mg/g d.w.) in the roots of *Pendalium murex* as seen in Tasble.2

This work of *Eclipta Prostrata* was compared with phytochemical analysis obtained by Gas chromatography coupled with mass spectrometry in other species *Eclipta alba*. It is observed that eight possible bioactive compounds were found such as Tridecanol, 2-ethyl-2methyl, 1-Hepta triacotanol, c-sitosterol, oleic acid, eicosyl ester etc.,These phytochemical compounds contains anti-inflamatory, cancer preventive dermatitigenic, Hypocholestrolemic and anaemiagicinsectifuge. Similarly, *Eclipta prostrata* contains chemical constituent namely oleanone-type glycosides Eclaibasaponin I and Eclaibasaponin II which is used in manufacturing drugs for treatments of many diseases.(John wyson., M.Devithiran., Saravanan Periswamy., Devireddy Anand., Jan.,2016).

This work of *Pendalium murex* was matched with phytochemical analysis of *Pendalium murex* by M.Sermakkani and V.Thangapandian ,They carried out the analysis according to standard method(M.Sermakkani., V.Thangapandian.,2010). The analysis showed that the leaves and fruit extracts of *Pendalium* contains Flavonoids, alkaloids,glycosides,

sterols,phenols,saponins,terpenoids glycosides etc. Flavonoids and Tannins are phenolic compounds they act as antioxidants and free radical scavengers(Polterait,1997),Plants derived natural products such as Flavonoids,terpenoids and steroid have received considerable attention in recent years due to their diverse pharmacological properties and can be used as a source of potential drugs.

This investigation indicates that sterol can be isolated from intact part of medicinal plant species growing at Kalanaur area of Rohtak district. The medicinal plant of this zone has sufficient amount of sterol content which can be a good source of Phytosterol.

Conclusion

The Result shows that *Eclipta prostrata* is rich in Flavonoid and Sterol contents as compared to *Pendalium murex.*

Sufficient amount of sterol shows that these weeds are a good source of Phytosterol, and are of good medicinal value and Nature-based formulations for Pharmaceutical Industries.

Farming of these plants can fetch business to Farmers and generate Revenue to the Nation.

Acknowledgement

I would like to thank my family Mr.Alok Kumar Roy for his inspiration, expert advice and esteemed support and Mrs.Vrushali Gaikwad and Dr.Kunal Khobragade for motivation and encouragement. Miss Samiksha Garse for her versatile approach and encouragement.

I am truly grateful and my exclusively special thanks to Dr. Minakshi Gurav my "Friend philosopher and guide "for her valuable guidance and support without her this would not be possible.

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