

Volume V Issue II
July 2018

BHARATA MATA JOURNAL of Multidisciplinary Studies

Peer Reviewed National
Research Journal



Bharata Mata College

Thrikkakara, Kochi-21
Kerala, India

EDITORIAL BOARD

Rev. Fr. Jacob G. Palackappilly
Managing Director, Bharata Mata College

Chairman

Dr. Shiny Palaty
Principal, Bharata Mata College

Chief Editor

Associate Editors

Dr. Priyalakshmi G

Dr. Pearly P. John

Dr. Sr. Tessy Thomas

Dr. Mini Abraham

Dr. Litty Sebastian

Dr. Shibi B

Editorial Advisory Board

Rev. Dr. Varghese Kalapparampath Former Manager, Bharata Mata College

Dr. Babu Joseph Former Vice Chancellor, CUSAT, Kochi

Dr. P. M. Chacko Former HOD, Department of English, U C College, Aluva

Dr. Joseph Injody Principal, Rajagiri College of Social Sciences, Kalamassery

Dr. Sivan Nair Indian Institute of Technology, Guwahati

Dr. Litty Allen Varghese National Institute of Technology, Calicut

Dr. Anoop Anand DRDO, Ministry of Defence, Govt. of India, Pune

Dr. Honey John Professor, CUSAT, Department of PS & RT

Dr. S. Bijoy Nandan Professor & Head, Department of Marine Biology,
Microbiology and Biochemistry, CUSAT

Dr. Mathew J. Manimala Professor and Chairperson OBHRM, IIM, Bangalore

Printed and published by Dr. Shiny Palaty, Principal Bharata Mata College. Thrikkakara

ISSN 2348 - 3571

Contents

Management

- **Cyber Bullying: A Perspective Study among Higher Secondary Students in Kerala** 01
Sheena Rajan Philip & Nigith Ramchandran
- **Bound by Blue: An Exploration into Consumption and Psychosocial Impact of Pornographic Materials from Internet among Youths in Kochi City** 12
Reny Rajan & Namitha Mary Thomas

Science

- **Synthesis, characterization and visible light photo catalytic studies of nitrogen doped TiO₂ nano particles** 21
Anu K John & Shiny Palaty
- **Isolation and Molecular Identification of Bioplastic (Polyhydroxybutyrate) Producing Bacteria from Soil** 39
Anagha A Kurup, Anjusha Mohan & Rishad K. S.
- **Vitamin C and its synergistic effects in preventing diabetes** 47
Nimitha R. Chandran and Soja Louis
- **A study on diversity and abundance of Butterfly species in Cheriya Kadamakkudy** 59
Rahana, Sherin Antony & Sugathan

Humanities

- **Protean Visions of the Emerging Malayalee: Reading Food in Cinema** 77
Sneha Suresh

Commerce

- **Ananganmala Eco-Tourism Project – a SWOT analysis** 85
Rathi K N & Rekha P T
- **Demographic Dividend and Productivity: Role of DDU-GKY** 95
Tessy Thomas

CYBER BULLYING: A PERSPECTIVE STUDY AMONG HIGHER SECONDARY STUDENTS IN KERALA

Sheena Rajan Philip
School of Social Work
Bharata Mata College
Thrikkakara, Kochi

Nigith Ramchandran
School of Social Work
Bharata Mata College
Thrikkakara, Kochi

Abstract

Technology continues to develop rapidly and is therefore changing our ways of functioning in society. Internet, cell phones and other communication technologies provide us with conveniences and our students exposed to interactions that put their safety and emotional well-being at risk. This study explores higher secondary students perspectives associated with cyber bullying. Specifically, it examines this new phenomenon from the following four perspectives: (a) To understand the occurrence of cyber bullying among students (b) To obtain knowledge about students experience of cyber bullying (c) To check the students awareness towards legislations pertaining to cyber bullying. The data was collected from 40 samples from 3 higher secondary schools

In this, finding is that majority respondents would consult with their parents and teachers if they were cyber bullied, and only few respondents would do nothing. Majority 80 percent of respondents were not aware about the meaning of bullying. Majority 60 percent of the respondents believe that bullying is a notable crime Majority opined government should enact strict law which cover all the aspects of cyber bullying. Sixty percent of respondents pointed out that excessive online streaming were the increase in the cyber bullying case.



Introduction

Cyber bullying is bullying that takes place using electronic technology. Cyber bullying has been defined by The National Crime Prevention Council: "When the Internet, cell phones or other devices are used to send or post text or images intended to hurt or embarrass another person." A cyber bully may or may not know their target. A recent study in 2006 by International market research, survey and business consultancy (IMRB) and Parent Circle has revealed that every third child is bullied in a school. Bullying still appears to be a big hindrance to one's emotional growth. Hence it also affected the victims physically. Children are considered as the gift of god and also the future of tomorrow. Therefore ensuring their future is very much important.

A student is being bullied when he or she is exposed repeatedly and over time to abuse or harassment by one or more other students. As observed by authors like Cohn and Canter, and Koki, there are three forms of bullying: physical - including hitting, kicking, spitting, pushing, stealing and destruction of property, verbal taunting, malicious teasing, name calling, and making threats; psychological - spreading rumours, manipulating social relationships, exclusion from a peer group, extortion, and intimidation. Cyber bullying is a big issue and many people don't know how to face it on society. Hence the researcher has adopted Descriptive Research Design.

Cyber bullying among high secondary school children in Piravom Municipality

The school children above 10th standard are quite knowledgeable about the information technology and they need to be given awareness on the negative aspects associated with bullying using technology. Piravom Municipality situated in the Ernakulam district, during the researcher's interaction with few higher secondary school students in Piravom Municipality, it was understood that they possessed less awareness and

knowledge about the concept of cyber bullying and they were not aware about how it can negatively affect their life if they ever become victims of this crime. It is important that the students should understand clearly the negative impacts on this crime on the victim and the possible punishments for those who practice this.

Anti-Bullying Laws for Cyber Related Bullying In India

- **Security Promotion & Publicity Cyber Laws:** Provides legal recognition to electronic documents and a framework to support e-filing and e-commerce transactions and also provides a legal framework to mitigate, check cybercrimes.
- **Information Technology (IT) Act 2000:** The Act provides legal framework for electronic governance by giving recognition to electronic records and digital signatures. The formation of Controller of Certifying Authorities was directed by the Act, to regulate issuing of digital signatures. It also defines cyber-crimes and prescribed penalties for them
- **IT (Amendment) Act, 2008,** for user information Document title is "The Gazette of India" Dated February 5, 2009.
- **ICERT: Indian Computer Emergency Response Team:** Is an office within the Ministry of electronics and information technology it is the nodal agency to deal with cyber security threats like hacking and phishing it strengthens security-related defense of the Indian Internet domain.
- **CCA: Controller of Certifying Authorities:** The IT Act provides for the Controller of Certifying Authorities (CCA) to license and regulate the working of Certifying Authorities and also to ensure that none of the provisions of the Act are violated.



- **The IT Act, 2000:** It states that punishment shall be given to all those publishing information which is obscene as also to any form of breach in privacy and confidentiality. The Indian Penal Code also covers this issue. Apart from legal help, victims can also hire private investigators specializing in tracking down cyber bullies. For those who want to find the culprit on their own, you can simply Google Reverse E-mail Finder to find a list of websites which can help you unmask the bully. These websites primarily track the email address down to its user and returns the users identity as also some other personal information.

Review of Literature

According to the journal article **“Cyber bullying: An Indian Perspective by Ashna Mehta &Rishabh Jaiswal, published in 2016** reported that social media has become a large platform for cyber bullying. Confession pages are new and have held attention of most. A confession page of a community or institute allows people to post anything about anybody without their identity being revealed. The administrators of such pages receive inbox messages which they post on the page for everybody to ready. People who like these pages are connected and remain in that circle and keep getting notifications of posts on the page. Face book pages and twitter pages are new in the trend. People can inbox anything to the admin to post it. These posts can be any specific confession also. Sometimes it includes posting of photos too which can be humiliating, also posting some secret information of the victim. People post anything since there is no threat of their identity being released.

Dewey, Cand Susan, P. L(2015) article identifies the conceptual challenges that bullying poses for legal and policy efforts, reviews judicial and legislative efforts to reduce bullying, and makes some recommendations for school policy. Recognition that all children have a right to public

education would be one avenue for broadening protection against bullying to all children. In conclusion, author recommended that school policies should reflect best practices informed by scientific research, and so greater reliance on evidence-based practices and rejection of disciplinary practices that are known to be ineffective. Because bullying behavior is so widespread and so varied in form and severity, reliance on criminal sanctions would be ill-advised. A strategy that combines education, school-based interventions, and policy reform leading to cultural change would seem most appropriate.

Shibu and Sevukan (2015) discussed the use of social networking sites by the research scholars of Pondicherry University. The findings indicate that Face book is the most preferred social media by all categories of researchers followed by Google+ and YouTube. Majority of the researchers spent time daily on social media.

Singh and Sing (2015) in a research study evaluate and assess the awareness and extent of the use of social media by the students and research scholars of universities of north India. The finding shows that all the respondents were making use of such applications in their academic affairs. Face book is the most popular social media among the respondents.

Objectives of The Study

- To know the socio – demographic details of the respondents.
- To understand Students Awareness on occurrence of Cyber Bullying
- To obtain knowledge about students experiences of cyber bullying
- To understand the students awareness towards legislations pertaining to cyber bullying.



Research Methodology

The Study conducted to measure the knowledge of the higher secondary students perspective against cyber bullying and to find out the prevalence of cyber bullying among students in Piravom municipality. This would clear the high school students and the school authorities about how we can prevent our children from being cyberbullied. This study showed us how teenagers were cyberbullied and the facts are that being a victim of cyberbullying can be a painful experience.

Scope of the Study

The problem regarding cyber bullying in school is when some one's got bullied, they are afraid to express their problems to others because they are threatened by the bullies. This situation can trigger their being an antisocial person. Physical damage can be healing by just a week but when it comes to the mental aspects it will grow bigger and bigger until you can't handle it and do something wrong. This is the worst effect of being bullied, as you can observed in our society there are many cases that has been spoken out but try to think of it.

This would clear the high school students and the school authorities on how we can prevent our children from being cyber bullied. This study showed us how teenagers were cyber bullied and the facts are that being a victim of cyber bullying can be a painful experience. This study would enable everyone to understand how do victims react to this specific issue because, we all know that cyber bullying can happen in a number of ways and it can have a negative impact on a wide scope of people in our society. This study would enable the school authorities to create a proper awareness among higher secondary school students on adopting protective measures.

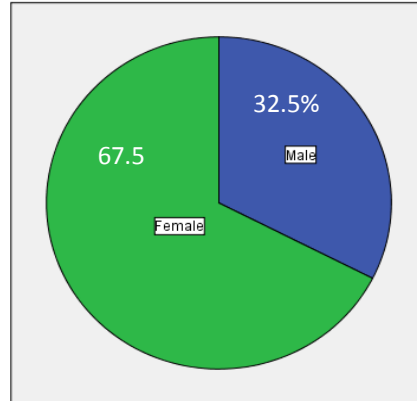


Fig. 1: Distribution among the respondents based on gender

The above diagram showed the pie diagram of distribution of the respondents on the basis of gender. In the above diagram it was clearly evident that majority 67.5 percentage of the respondents were female in comparison to males. i.e., the researcher realized that the female students were more interested in providing necessary data for the research study than male students.

Table 1: Distribution of respondents based on the awareness on the meaning of bullying

	Frequency	Percent
Yes	8	20.0
No	32	80.0
Total	40	100.0

The above table showed that majority 80 percent of respondents were unaware about the meaning of bullying while the remaining 20 percent of respondents were aware about the meaning of bullying. Hence the researcher understood that there is a serious necessity for building awareness on the meaning of bullying among higher secondary school children.



Table 2: Distribution of respondents based on Source of information on bullying

	Frequency	Percent
Through Media	5	12.5
Through Educational Institutions	2	5.0
Others	1	2.5
Not Applicable	32	80.0
Total	40	100.0

Since majority 80 percent of the respondents were unaware about the meaning of the term bullying, they were placed under not applicable category. The study clearly indicated that out of the remaining 20 percent respondents who were aware about the meaning of bullying learned about the concept through media, educational institutions and through verbal information. From the 20 percent respondents 12.5 percent respondents understood about

Bullying through media which includes visual and print media, very less amount of information were provided by the educational institutions. Researcher felt that media can influence large audience so if we provide awareness on cyber bullying through media it can create a positive impact in creating awareness in the society.

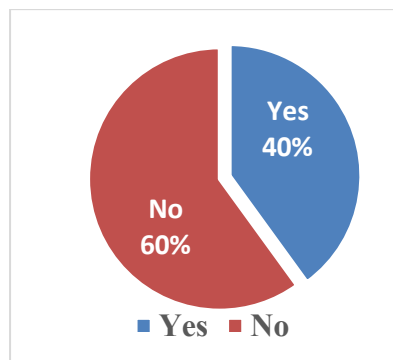


Fig. 2: Distribution among the respondents experience on posting photos/videos online without permission

The above image showed that 60 percent of the respondents haven't encountered any kind of incidence whereas 40 percent of the respondents agree that their photos/videos were posted online without their permission.

The majority respondents have not encountered any incidents, might be due to their inactiveness in such online platforms. The other reasons may involve their un-awareness on the issue. The 40 percent who were exposed to such situations might be an active involved in the online media hub and may have any rivalries with someone through the online media so as to defame them.

Table 3: Distribution of respondents based on Perspective on effectiveness of existing laws

	Frequency	Percent
Yes	3	7.5
No	37	92.5
Total	40	100.0

Majority 92.5 percent of respondents disagreed that the existing laws were sufficient to deal with cyber bullying and only 7.5 percent of respondents agreed that existing laws were sufficient to deal with cyber bullying. This perception may be due to the lack of awareness regarding cyber bullying of the respondents, the less number of cases reported and justice acquired due to these laws.

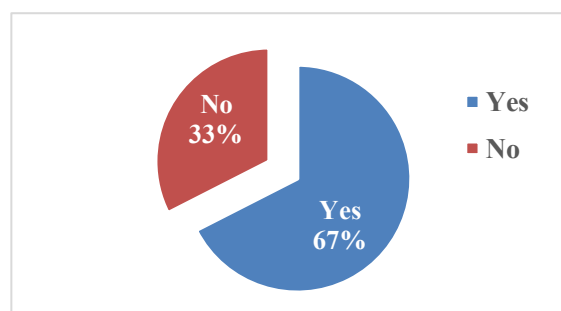


Fig. 3: Distribution among the respondents Perspective on need of new law to cover cyber bullying



Among all the respondents 67 percent were of the opinion that the government should enact a new law to cover all aspects of cyber bullying where 33 percent of respondents reported that there was no need of such a law. Researcher felt that this perception comes from that the future generations depend more on internet and technologies. According to Asha Mehta and Risabh Jaiswal in the journal “cyber bullying – An Indian Perspective” states that There is a need for defining separate laws for the purpose of cyber-crime offences since the mode, consequences, gravity and probable targets are different. Cyber bullying is one of the offences which can take an ugly shape in the future and needs to be addressed soon. In making of the cyber bullying law, law makers should take opinion of the psychiatrist since such offence affects the psyche of a child very much. This also leads the researcher to the conclusion that, the need of more vigilant laws and regulations to scrutinize cyber bullying cases.

Conclusion

The research study on Cyber bullying was conducted among the higher secondary school children of seven schools of Piravom Municipality .A total of 40 students as the samples for the study. A detailed questionnaire was used for collecting data. The identification of bullying behavior and the creation of a successful anti-bullying program is critical in successfully dealing with the problem. Many researches were conducted on this topic. It is very much evident that most of the students have experienced cyber bullying in one way other and out of it most of they have gone through cyber bullying. An important observation in the case of cyber bullying is that the students are not aware that they are getting bullied in online, which may in turn leads to other problems. The cyber bullying is an inarguably stressful experience that carrying increased risk for depression, anxiety and stress in adolescent’s life. Bulling is a serious issue so the present research will be a productive addition

and open doors for new Investigations as well as parents and teachers for better understand of the adolescent's problems and psychopathologies.

Reference

- [1] R.Srisiva, R. Prevalence and Prevention of School Bullying- A Case Study of Coimbatore City, Tamilnadu India,2013 [http://ijhssi.org/papers/v2\(5\)/version-4/F2503645.pdf](http://ijhssi.org/papers/v2(5)/version-4/F2503645.pdf)
- [2] Charles E. Notar, S. P Cyberbullying: A Review of the Literature,india, 2013 <https://files.eric.ed.gov/fulltext/EJ1053975.pdf>
- [3] Li, T. B, The Relationship between Cyberbullying.India, 2007 <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.586.7345&rep=rep1&type=pdf>

Reports & Article

- [1] Baier, S. *A Critical Review of Literature: Understanding Bullying Behaviors of Children*. University of Wisconsin-Stout 2007. <http://www2.uwstout.edu/content/lib/thesis/2008/2008baiers.pdf>
- [2] Brzezinski, M. S. *Gender Diffrences in Bullying & Perceptions of Bullying*. Rowan University. 2016. <https://rdw.rowan.edu/cgi/viewcontent.cgi?article=2276&context=etd>
- [3] Children, C. f. *secondSTEP*. Retrieved from cfchildren.org 2012 <https://www.cfchildren.org/wp-content/uploads/programs/docs/sel-bullying-paper.pdf>



BOUND BY BLUE: AN EXPLORATION INTO CONSUMPTION AND PSYCHOSOCIAL IMPACT OF PORNOGRAPHIC MATERIALS FROM INTERNET AMONG YOUTHS IN KOCHI CITY

Ms. Reny Rajan

School of Social Work
Bharata Mata College
Thrikkakara, Kochi

Ms. Namitha Mary Thomas

School of Social Work
Bharata Mata College
Thrikkakara, Kochi

Abstract

With increased access and affordability of the internet comes the aftermath of increased technological dependence and sedentary lifestyle. One such vile is seen in growing consumption of pornographic materials through the internet. The present study is an attempt to record pornographic consumption among youths in a quantitative method using a descriptive research design. A total of 60 youths were approached using purposive sampling, to suit the demands of privacy. Results of the study showed that a sizable amount of 75 % reportedly viewed Pornographic materials on the internet lesser than 2 hours a day. Measuring the psychosocial impact of pornographic consumption, it was found that (62 %) respondents gave a positive response to feelings of guilt and annoyance on their porn watching behavior and also admitted that watching porn influences their sexual practices. The results are indicative of a need for a preventive approach in managing addiction and psychological or behavioral complications consequent to pornographic consumption among youths.

Key-words: Pornography, Youths, Addiction, sexual deviance

Introduction

Pornography defined as portrayal of erotic behavior designed to cause sexual excitement (De Loreto- "Pornography - Definition, Examples, Cases, Processes") has made its way to the scientific literature since the past few decades. Its consumption, especially with reference to children and youths has been an issue of concern to researchers across the globe. This paper entails an attempt to study the consumption of pornography by youths in Kerala and its impact on their daily lives.

Pornography: The Indian Scenario

Drawing from the legal framework, pornography finds its mention in Section 67 A of the Information Technology Act, 2008 that convicts persons who publish, transmit or cause to be published or transmitted in electronic form that contains sexually explicit act or conduct (*The Information Technology Act*). It is important to note that the provisions of the Act does no harm viewing or procuring of such sexually explicit materials as much as it does to the publication or transmission, viewing, abuse and involvement of children in child pornography.

Pornography has not been clearly defined in the legal discourse and continues to exist as an "aggravated form of obscenity", with every successive case filed with the apex court seeking ban on such materials. (Malhotra)

With internet consumption growing at lightning speed and the availability of high speed internet at affordable prices, statistics of pornography consumption in India have been growing up on the ladder placing India as the third most porn watching country in the world (Review). While viewers of pornography may cut across all age groups from late childhood onwards, the research question of the present study was based on the premise of



impact of pornography consumption among individuals in the most productive years of their life.

India, being the second most populated country in the world, also has to its credit a sizable population of 34.8% of its 120 crore population being youths(Central Statistics Office, Ministry of Statistics and Programme Implementation). While majority of the studies relating to youth center around issues, policy concerns etc, pornography consumption and its impact among youths in a digital world have shown blurred appearances in studies concerning development of sexual attitudes and behaviors, internet addiction, review of sex crimes against women etc. (BadaMath et al.;Manjula, and Dutt)

Pornography and Its Impact on Youths:

With the dawn of internet and its wide-spread use, the western countries saw a rising interest in research on the impact of pornography among children and adolescents. Nation-wide studies on adolescents and young users of sexually explicit internet materials showed its far-reaching impact on attitudes and beliefs pertaining to sex, sexual behaviors especially aggression, self-concept and body image and social development (Owens et.al).

Some of the psychological effects highlighted in studies include unrealistic or misleading attitudes about sex, sexual objectification of women(Impact Of Pornography On Children & Youth)feelings of guilt and shame, inapt and irrepressible thoughts or sexual fantasies, decreased self-esteem (Hodgetts). Usage of pornography among youngsters is also seen as potential to turn addictive and as promoting early sexual activities and high risk sexual behaviors (Anderson, and Oppong; Hodgetts; Joshi, and Chauhan).

Social impact of consumption of pornography have been cited as leading to increasing incidences of crimes against women, rape (Anderson, and Oppong; Singh, and Parveen) loss of interest in obligations ego-centric relationship and poor cohesion between partners (Hodgetts). Among other suggested problems and harms associated with widespread pornography use among people, risky sexual behaviors have been frequently mentioned. Significant, but small, correlations were found between the indicators of pornography use (age at first exposure, frequency of use in past 12 months and personal importance of pornography) and sexual risk taking (Sinkovic et. al).

Stewart & Szymanski found that though pornography consumption is prevalent and normative in many cultures, women's reports of their male partner's frequency of pornography use were negatively associated with their relationship quality. Results also revealed that relationship length moderated the relationship between perceptions of partner's problematic pornography use and sexual satisfaction with significant dissatisfaction being associated with longer relationship length.

Analyzing the impact of Internet on youths, Wolak et al, using a longitudinal survey on Youth Internet Safety Survey concluded that youths using the internet often encountered unintended sexual solicitations and materials. Over the two surveys conducted in a span of five years, increased proportions of youths reported encounter to unwanted sexual materials online and a marginal increase in the number of online harassment cases were also reported. High risk behaviors such as befriending strangers and subsequent exploitation was also reported as a consequence of high internet usage among youths.

Rationale

Enquiries on impact of pornography customarily views individuals as passive recipients of messages propagated through such sexually explicit



materials, thus ruling out a dynamic two-way process where in individuals actively engage with, evaluate and reproduce messages in a personally modified form (May). The study was an attempt to understand the extent of pornographic consumption among youths and explore its psychosocial impact on the lives of respondents.

Methodology

The study based on a descriptive research design, included 60 respondents from the age group of 18 to 30 years including college students as well as working youths. Non-probability method of Snowball Sampling was used for the purpose of study in order to ensure privacy of responses. A semi-structured questionnaire was prepared by the researchers which measured responses for socio-demographic profile; extent and patterns of pornographic usage; psychological, emotional and interpersonal impact of pornographic consumption. The respondents were mailed the questionnaire as a google document, following which the responses were coded and analyzed using SPSS Software.

Results

On Consumption of Pornographic Materials in Internet:

Mean age of all respondents was 23 years with majority of the respondents (61 %) being involved in employment. On reviewing the pornographic usage, it was found that a sizable amount of 75 % reportedly viewed Pornographic materials on the internet lesser than 2 hours a day. On studying the patterns of usage, the results indicated that almost 53% of the respondents would consider to view pornographic materials over other materials online. The use of pornographic materials for the purpose of satisfying curiosity, education, entertainment etc. were negated by the respondents. Though majority of the respondents clearly negated any

psychological or emotional impact of viewing pornographic material online, a sizeable 32 % of respondents agreed that viewing pornographic materials may affect their attitudes and beliefs related to sexual practices. Another 25 % of respondents also admitted that viewing porn also led them to risky harmful relationships, affected their socialization and influenced their attitude towards marriage.

Psychological and Behavioral impact of Pornography Consumption:

Assessing the psychological impact of viewing sexually explicit materials, it was found that while pornographic materials were not accessed to relieve from stress or any other emotions, it had emotional consequences like guilt (52 %) or feeling annoyed while viewing porn (62 %). A sizable amount of 64 % of the respondents agreed that viewing pornographic materials had an influence in their sexual practices.

Discussions

The study marked an attempt to bring out the bottom line of porn consumption among youths in Kochi City. The results confirm to the findings of existing literatures that, pornography consumption is prevalent among youths and also results in psychological disturbances like guilt, annoyance, and influence in their attitudes on sexual practices and beliefs on marriage. Interpersonal relationships were also found to be at stake with increased pornographic consumption leading to high risk relationships, sexual encounters and influence on sexual practices.

Limitations and Suggestions for Future Studies

The present study has been limited to describing findings of pornography consumption among youths in general. Situational factors like age, educational status, occupational status, availability and affordability of internet etc. may have affected the results. Future studies may be targeted at



contemplating the impact of age and such demographic variables on pornographic consumption.

Though reported by very few in numbers among the respondents, tendency of pornography to evolve as an addiction and its behavioral impact is also another relevant area of study.

There is also a need to look in the qualitative aspects of how pornographic materials influences sexual practices, sexual performance, body image and self-esteem in relationships. The impact of pornography consumption on marital quality of youths is another important area that can be considered from the results of this study.

Conclusion

In a country with a huge youth population like India, growth in the rates of pornography consumption and associated issues is bound to adversely affect development of the nation. The study therefore was an attempt to bring into light the patterns of consumption of pornography among youths through the internet. Results suggest that the usage doesn't amount to a drastic impact in the psychological, behavioral or interpersonal make up of youths, but it does point out high risk relationships and influence on sexual practices.

References

- [1] "Pornography - Definition, Examples, Cases, Processes". Legal Dictionary, 2019, <https://legaldictionary.net/pornography/>. Accessed 7 Jan 2019.
- [2] India, The Information Technology Act. Sec 67, Ministry Of Law, Justice And Company Affairs, 2008.
- [3] Malhotra, Namita. Pornography And The Law. 7th ed., Alternative Law Forum, 2010, pp. 1-32, <http://cis-india.org/raw/histories-of-the-internet/law-and-pornography>. Accessed 7 Jan 2019.

- [4] Review, 2017. "2017 Year In Review – Pornhub Insights". Pornhub. Com, 2019, <http://www.pornhub.com/insights/2017-year-in-review>. Accessed 7 Jan 2019.
- [5] Central Statistics Office, Ministry of Statistics and Programme Implementation. Youth In India. Ministry Of Statistics And Programme Implementation, New Delhi, 2017, pp. 1- 20.
- [6] BadaMath, Suresh et al. "Sexual Crime In India: Is It Influenced By Pornography". Indian Journal Of Psychological Medicine, vol 36, no. 2, 2014, pp. 147-152., doi:10.4103/0253-7176.130976. Accessed 7 Jan 2019.
- [7] Manjula, M, and SiddharthDutt. "Sexual Knowledge, Attitude, Behaviors And Sources Of Influences In Urban College Youth: A Study From India". Indian Journal Of Social Psychiatry, vol 33, no. 4, 2017, p. 319. Medknow, doi:10.4103/0971-9962.218602.
- [8] Owens, Eric W. et al. "The Impact of Internet Pornography On Adolescents: A Review Of The Research". Sexual Addiction & Compulsivity, vol 19, no. 1-2, 2012, pp. 99-122. Informa UK Limited, doi:10.1080/10720162.2012.660431.
- [9] "Impact Of Pornography On Children & Youth". Preventtogether.Org, 2011, http://www.preventtogether.org/Resources/Documents/Impact_of_Porn_on_Youth_9.pdf. Accessed 7 Jan 2019.
- [10] Hodgetts, Chani. "The Perception Of Young Adult Males Regarding The Impact Of Pornography In Their Lives". University Of Pretoria, 2012.
- [11] Anderson, George Jnr, and Joseph Oppong. "Youth And Pornography In Ghana: An Ethical Perspective". Amercian Journal Of Social Issues And Humanities, vol 4, no. 4, 2014, pp. 204-207., Accessed 6 Jan 2019.



- [12] Joshi, Beena, and Sanjay Chauhan. "Determinants Of Youth Sexual Behaviour: Program Implications For India". *Eastern Journal Of Medicine*, vol 16, 2011, pp. 113-121., Accessed 7 Jan 2019.
- [13] Singh, Kundan, and ShahidaParveen. "A Study Of Opinion Of Higher Educated Youths In Reference To Increasing Rape Incidents In Indian Society". *The Research Journal Of Social Sciences*, vol 9, no. 5, 2018, Accessed 28 Jan 2019.
- [14] Sinković, Matija et al. "Revisiting The Association Between Pornography Use And Risky Sexual Behaviors: The Role Of Early Exposure To Pornography And Sexual Sensation Seeking". *Journal Of Sex Research*, vol 50, no. 7, 2013, pp. 633-641. Informa UK Limited, doi:10.1080/00224499.2012.681403.
- [15] Stewart, D. N., & Szymanski, D. M. (2012). Young adult women's reports of their male romantic partner's pornography use as a correlate of their self-esteem, relationship quality, and sexual satisfaction. *Sex Roles: A Journal of Research*, 67(5-6), 257-271
- [16] Wolak, Janis et al. *Online Victimization Of Youth: Five Years Later*. National Centre For Missing & Exploited Children, Alexandria V.A., 2006, pp. 1-3. Accessed 6 Jan 2019.
- [17] May, Laura. "Effects Of Pornography Use On Monogamous Adult Pair Bond Relationships: An Adlerian Perspective". *Adler Graduate School*, 2015.

SYNTHESIS, CHARACTERIZATION AND VISIBLE LIGHT PHOTO CATALYTIC STUDIES OF NITROGEN DOPED TiO₂ NANO PARTICLES

Anu K John

Department of Chemistry
Bharata Mata College
Thrakkara, Kochi
Kerala, Pin-682021

Shiny Palaty

Department of Chemistry
Bharata Mata College
Thrakkara, Kochi
Kerala, Pin-682021
Palaty- shinypalaty@gmail.com

Abstract

Nitrogen doped titanium dioxide (N-TiO₂) nano particles with high visible light activity were synthesized by sol gel technique. Triethyl amine was used as the nitrogen precursor. The synthesized nanoparticles were characterized by X-ray diffraction analysis (XRD), UV diffuse reflectance spectroscopy (UV DRS), X-ray photoelectron spectroscopy (XPS) and high resolution transmission electron spectroscopy (HRTEM). Visible light photocatalytic activity of the nitrogen doped TiO₂ samples was determined by using methylene blue as a model pollutant. The results showed that TiO₂ with 1.5mol.% of nitrogen has the highest photocatalytic activity under visible light. It decomposed 86% of the dye solution in 180 minutes whereas the degradation for undoped sample was 84%. The effectiveness of the catalyst can further be improved by reducing the rate of recombination and by increasing the charge carrier mobility. This can be achieved by the incorporation of suitable metal or non metal species as dopant.

Key words: *N-doped TiO₂, sol gel, visible light photocatalyst, methylene blue*



1. Introduction

Nanotechnology is considered as the technology of present and future because of its rapid growth and wide range of applicability. Titanium dioxide (TiO_2) is one of the most investigated nano material for the last decade due to the exceptional properties and versatile applications ¹. Among the various applications of TiO_2 , the most promising one is photo catalysis. The advantages of TiO_2 as a photocatalyst when compared to other similar materials are non toxicity, chemical stability and low cost ².

TiO_2 is a wide band gap n type semiconductor with band gap values of 3.0 eV for rutile and 3.2 eV for anatase ^[3]. Due to the wide band gap, the sun light utilization efficiency of TiO_2 is very low. It can absorb only the UV rays which is less than 5 % of the total sun light ². Another drawback is its poor charge separation ability. In order to overcome these limitations, many approaches have been introduced such as impurity doping and surface modification ⁵⁻¹¹. As far as the doping is concerned, a variety of different dopants which include metals as well as non metals have been introduced into TiO_2 to improve its properties by increasing the percentage of visible light absorption and decreasing the electron-hole recombination ¹²⁻¹⁷. Nitrogen is one of the most promising non metal dopant for TiO_2 because of its comparable atomic size with oxygen, small ionization energy and stability ¹⁸. Nitrogen doping leads to an increase in the visible light activity by narrowing the band gap. The band gap narrowing is either caused by the mixing of 2p states of nitrogen with 2p states of oxygen above the valance band or by the introduction of mid gap states within the band gap ¹⁹. various methods such as sol gel ²⁰, solvothermal ²¹, hydrothermal ²², mechanochemical method ²³, plasma or ion implantation ²⁴, oxidation of TiN in oxygen atmosphere ²⁵ etc. have been used to synthesize nitrogen doped TiO_2 . Out of these different techniques, sol gel method is advantageous due to its simplicity and cost effectiveness.

In the present work, we reports a simple sol gel method for the synthesis of visible light active nitrogen doped TiO_2 nano particles. The precursor used was titanium isopropoxide and the solvent was methanol. Triethyl amine was used as nitrogen source. Visible light photo catalytic activity of the sample was investigated by studying the photodegradation of aqueous solution of methylene blue dye.

2. Experiment

2.1. Synthesis of N-doped TiO_2 nano particles

Pure and N-doped TiO_2 was prepared by sol gel technique. To synthesize pure TiO_2 , Titanium tetra isopropoxide (TIP) and methanol were mixed in a ratio of 1:2. This solution was added to 40ml isopropanol containing 1ml water. The pH of the solution was adjusted using HCl. The detailed procedure was reported in our previous paper²⁶. For nitrogen doping, triethylamine (TEA) was used as the nitrogen source. Desired quantity of TEA was added to the solution containing 40 ml methanol and 1 ml distilled water. This was stirred for half an hour. Methanolic solution of TIP (1:2) was added slowly to this mixture. pH was adjusted to 1 using HCl. Reaction mixture was stirred at room temperature for 1 hour. Then the temperature increased to make it as a sol. The sol was kept unstirred at the same temperature to make it as a gel. Then the gel was kept at 100°C for 3 hours. The dry precipitate thus obtained was powdered and annealed at 400°C . N-doped samples were labeled as NT(x) with x representing the percentage of nitrogen and equal to 0.5, 1, 1.5 and 2 mol.%.

2.2. Characterization of nano particles

The sol gel synthesized samples were characterized using different techniques in order to get an understanding about the size, crystallinity, morphology, optical properties and chemical properties. The X- Ray



Diffraction patterns of the samples were taken by powder X ray diffraction method using Bruker AXS D8 Advance X-ray Powder Diffractometer with Cu K alpha radiation. The diffuse reflectance spectra (DRS) of the samples were measured by Varian, Cary 5000 UV-Vis-NIR Spectrophotometer in which BaSO₄ was used as the reference material. Photoluminescence spectra of the samples were taken using Horiba Fluoromax-4-spectrofluorometer. The samples were excited at a wavelength of 320nm. The surface electronic states were identified using X-ray photoelectron spectroscopy (XPS) in a VG Microtech Multilab ESCA 3000 spectrometer with nonmonochromatized Al KR X-ray ($h\nu = 1486.6$ eV). The morphology and particle size of the samples were determined by HRTEM images which were taken using Jeol/JEM-2100 high resolution transmission electron microscope.

2.3. Measurement of photocatalytic activity

Methylene blue (MB) dye was used as the model pollutant for the evaluation of photo catalytic activity of N-doped TiO₂. 10 mg/L aqueous solution of MB dye was used for conducting the experiment and 1g/L catalyst was added to it. Prior to visible light irradiation, the suspension was stirred in dark for 1 hour to attain the adsorption/ desorption equilibrium. pH of the solution was 6. After that the suspension was kept under radiation in a wooden box which consists of a 125 watt high pressure mercury lamp as the light source. The box also contains cooling fans. The incidence of UV light was blocked using a UV cut off filter. A definite quantity of sample was taken at regular intervals, centrifuged, filtered and the absorbance was measured with the help of visible spectrophotometer at the wavelength around 663 nm, corresponding to maximum absorption wavelength of methylene blue ²⁶. Photo degradation of dye solution without catalyst was used as a reference.

3. Result and Discussion

3.1. Characterization of N-doped TiO_2 nanoparticles

Crystal structure and crystallographic phases in the sol gel synthesized samples were investigated with the help of X-ray diffraction (XRD) studies. Figure 1 shows the XRD patterns of N-doped and undoped samples.

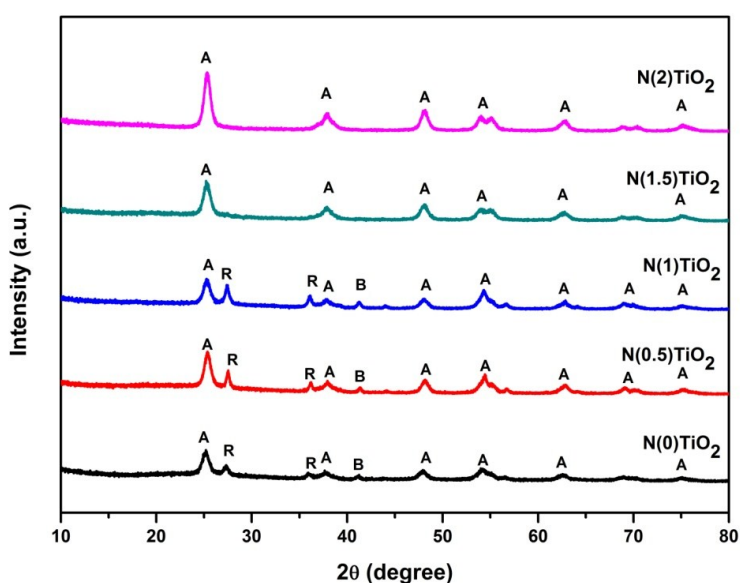


Fig. 1: X-ray diffraction patterns of N doped TiO_2 with different dopant concentration. (A is anatase, B is brookite and R is rutile).

By investigating the XRD patterns of the samples, it was clear that all the samples are crystalline in nature and there is no considerable change in the extent of crystallinity on doping. Anatase (PDF no. 21-1272) is the major phase present in undoped as well as doped samples. Undoped sample and sample with low dopant concentration consist of small percent of rutile (PDF no. 21-1276) and brookite (PDF no. 29-1360) phases. But as the dopant concentration increases, the percentage of rutile and brookite phases



decreases. This is due to the decrease in activation energy for the conversion of anatase to other phase with increasing dopant concentration. Thus the conversion becomes difficult with higher quantity of dopant ²⁷. Average crystallite size of the samples was determined with the help of Debye-Scherrer equation:

$$d = \frac{K\lambda}{\beta \cos \theta}$$

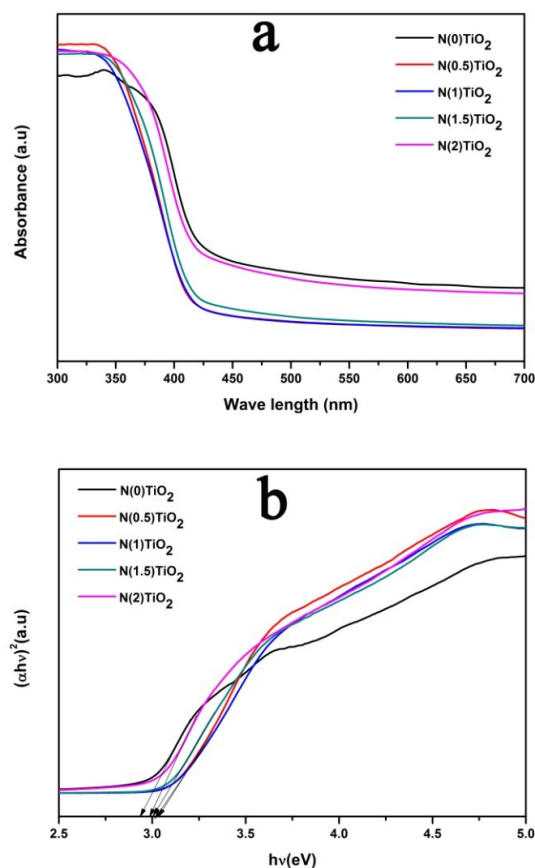
Where d is the crystallite size or grain size, K is a dimensionless constant that may range from 0.89 to 1.39 (here it was taken as 0.94), λ is the wave length of X-ray radiation (1.5406Å for Cu K α radiation), β is full width at half maximum of diffraction peak (FWHM), and θ is the Bragg angle and it is obtained from the 2θ value corresponding to the peak with maximum intensity in the XRD pattern ²⁸. The particle sizes calculated using the above equation is summarized in table 1. By comparing the sizes of doped and undoped samples, it is clear that doping did not make a markable change in the size of the particles.

Table 1: Grain sizes and crystalline phases present in undoped and N-doped TiO₂ samples

Sample code	Grain size (nm)	Crystalline phases
N(0)TiO ₂	10.5	Anatase, rutile, brookite
N(0.5)TiO ₂	10.6	Anatase, rutile, brookite
N(1)TiO ₂	10.6	Anatase, rutile, brookite
N(1.5)TiO ₂	10	Anatase
N(2)TiO ₂	10.6	Anatase

Optical absorption properties of N-doped TiO₂ were studied using UV-DRS spectra. Figure 2 shows the UV-DRS spectra of the doped and undoped samples. Both undoped and doped samples exhibited absorption maximum in the range of 320-350nm which is an indication of the formation of TiO₂

material²⁹. Absorption spectra of all the samples showed a tailing of absorption peak towards the visible region (red shift). As the percentage of dopant increases, the tailing of the peaks are more towards the visible region. This bathochromic shift indicates increased absorption from the visible region. But the tailing is less for the N-doped samples when compared to the undoped one. Band gaps of undoped and N-doped samples were determined with the help of Tauc equation by plotting $(\alpha h\nu)^2$ v/s $h\nu$ and extrapolating the straight portion of the graph to the X axis³⁰. Figure 2 (b) shows the Tauc plots of undoped and doped samples. The band gaps obtained for the samples are listed in table 2.



**Fig. 2: (a) UV-DRS spectra of undoped and N-doped samples
(b) $(\alpha h\nu)^2$ v/s $h\nu$ plots of undoped and N-doped samples**



Table 2: Band gaps of undoped and N-doped samples

Sample code	Band gap (eV)
N(0)TiO ₂	2.92
N(0.5)TiO ₂	3.07
N(1)TiO ₂	3.06
N(1.5)TiO ₂	2.99
N(2)TiO ₂	2.96

From the table 2, it is observed that the band gaps of nitrogen doped TiO₂ are decreased with increase in dopant concentration. This band gap narrowing facilitates to increase the visible light photo catalytic activity of the catalyst. It is also observed from the table that the band gap of undoped sample is larger than any of the N-doped one. This may be due to the defects and oxygen vacancies present in the undoped sample.

X-ray photoelectron spectroscopy (XPS) is used to investigate the chemical and bonding environment of the material. the XPS spectra of N(1.5)TiO₂ are represented in Figure. 3. The survey spectrum (Fig.3(a)) shows the characteristic peaks of titanium, oxygen, nitrogen and carbon. From that spectrum, it is observed that the binding energies of Ti 2p, O1s, N1s and C1s are 459.3, 530.8, 400 and 285.6 eV respectively and these data are in good agreement with the previously reported results^{19, 31, 32}. The peak of carbon is attributed to the residual carbon from the precursor and the adventitious carbon from the XPS instrument itself. Figure 3(b), 3(c) and 3(d) give the core level spectra of Ti 2p, O1s and N1s.

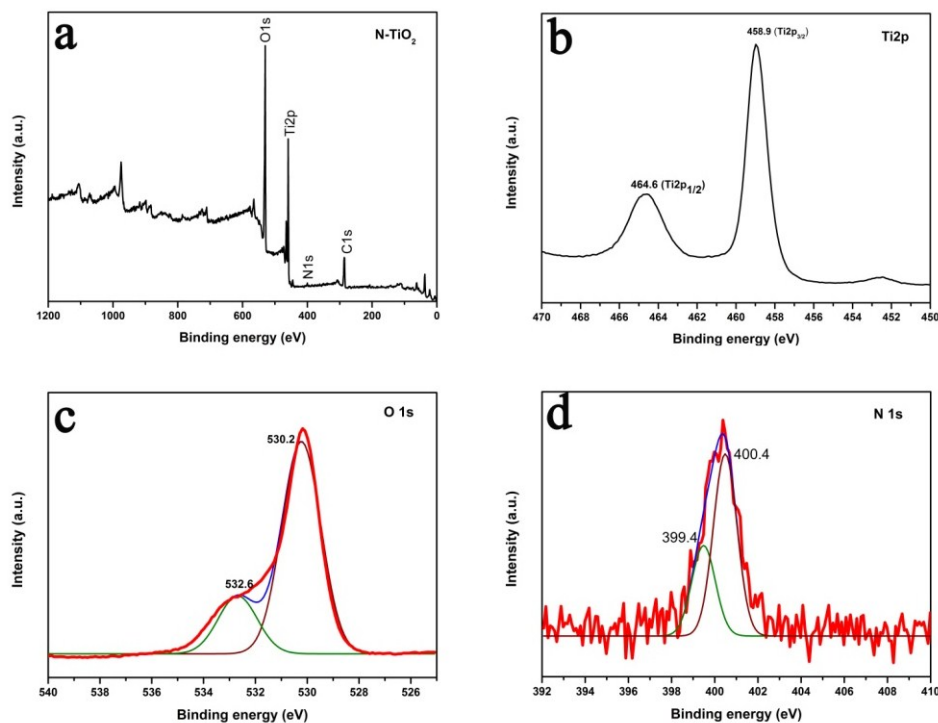


Fig. 3: XPS spectrum of N doped TiO₂ with dopant concentration 1.5 mol.%; (a) Survey spectrum of N(1.5)TiO₂, high resolution spectrum of (b) Ti 2p, (c) O 1s, (d) N 1s in N(1.5)TiO₂.

The high resolution spectrum of Ti 2p splits into two characteristic doublets for Ti 2p_{3/2} and 2p_{1/2} at binding energies of 458.9eV and 464.6eV respectively. These binding energy values are assigned to +4 valance state of Ti³³. The deconvoluted spectrum of O 1s is represented in figure.3 (c). Deconvolution yields two peaks at 530.2eV and 532.6eV. The former peak is assigned to Ti-O bonds of TiO₂ and the latter one is due to the surface hydroxyl groups. Deconvolution of N 1s spectrum gives 2 peaks (figure 3(d)) with binding energies 399.4eV and 400.4eV. The peak at 400.4 eV corresponds to molecular nitrogen at the interstitial positions of TiO₂ (chemisorbed N₂). Peak at 399.4eV is due to the anionic nitrogen incorporated in TiO₂ as Ti-O-N or Ti-N-o³⁴. Thus XPS spectra give clear



evidences for N doping. Nitrogen is incorporated in TiO_2 lattice mainly two forms such as chemisorbed N_2 and interstitially doped anionic nitrogen.

Transmission electron microscopy (TEM) gives a clear idea about the morphology, size and crystallinity of the synthesized samples. Figure 4 shows the HRTEM images and SAED pattern of $\text{N}(1.5)\text{TiO}_2$.

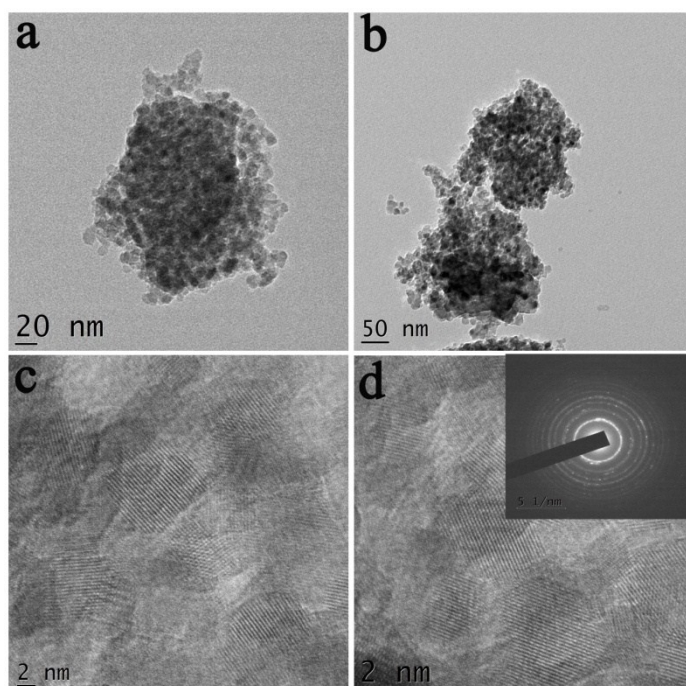


Fig. 4: a), (b), (c) and (d) show the HRTEM images of sample $\text{N}(1.5)\text{TiO}_2$. The inset of figure (d) shows the selected area electron diffraction pattern (SAED) of $\text{N}(1.5)\text{TiO}_2$.

The particle size obtained from TEM images is in the range of 6-10nm which is in agreement with that calculated from XRD patterns (10nm). The number of rings in the SAED pattern indicates that the sample is highly crystalline in nature. TEM images reveal the absence of amorphous domains in the sample which helps to improve the photo catalytic activity.

3.2. Photocatalytic activity

The visible light photo catalytic activity of N-doped TiO_2 with varying dopant concentration was determined by analyzing the photo degradation reaction of methylene blue (MB) aqueous solution. Figure 5 shows the photocatalytic decomposition of MB in the presence of undoped and nitrogen doped TiO_2 under visible light radiation.

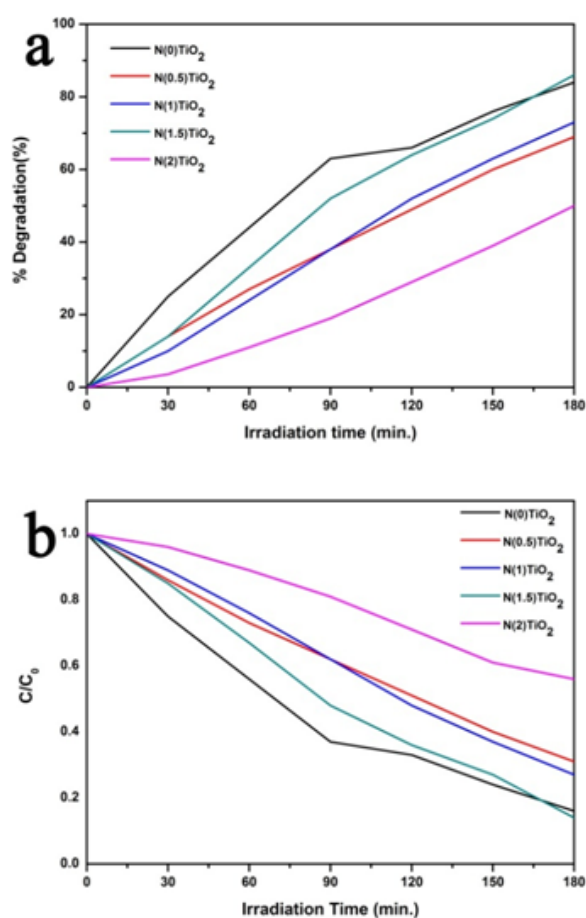


Fig. 5: Evaluation of photo catalytic activity of the catalyst
 (a) plot of rate of decomposition of MB dye with time
 (b) Plot of C/C_0 v/s irradiation time



From the figures 5 (a) and (b) it is observed that the photo catalytic activity increases with increase in dopant concentration upto 1.5 mol.% and N(1.5)TiO₂ showed the maximum photocatalytic degradation of 86% in 180 minutes.. This is explained as that the dopant nitrogen can alter the band structure by narrowing the band gap or introducing impurity levels within the band gap. Also, the presence of nitrogen may increase the number of oxygen vacancies or defect states ³¹. But always a competition is there between the photoreaction and recombination of charge carriers. As the percentage of dopant exceeds certain limit, the process of recombination predominates over photo oxidation or photo reduction ³⁵. This is the reason of the decrease in photo catalytic activity beyond 1.5 mol.% of dopant concentration. It is also observed from the graphs that the photo catalytic activities of all the doped samples are less than that of undoped one. This is due to the higher rate of recombination of photo induced charge carriers in the N-doped samples (except N(1.5)TiO₂) than that of the undoped one. The impurity levels created by nitrogen doping may have acted as recombination centers for charge carriers ³⁶.

4. Conclusion

Nitrogen doped TiO₂ nanoparticles were synthesized by simple sol gel method in which triethyl amine was used as the nitrogen source. The XRD patterns reveal the crystalline nature of the samples and gave a preliminary idea about the size of the particles. It was observed that the percentage rutile and brookite phases decrease with increase in the dopant concentration. The band gap values of the samples (obtained from Tauc plots) indicate a narrowing of band gap with increase in the percentage of doping. XPS studies confirmed the presence of nitrogen in the interstitial position of TiO₂. The visible light photo catalytic activity of N-doped samples was studied using the photo degradation reaction of aqueous solution of methylene blue. The results revealed that N(1.5)TiO₂ has the maximum photo catalytic

activity in visible light. It degraded 86% of MB solution in 180 minutes which is greater than the photo catalytic activity of undoped TiO_2 (84%). All the other doped samples ($\text{N}(0.5)\text{TiO}_2$, $\text{N}(1)\text{TiO}_2$ and $\text{N}(2)\text{TiO}_2$) showed lesser activity than undoped one due to the higher rate of recombination of charge carriers. This recombination process can be suppressed by the careful addition of metal or no metal codopant. By this method, the photo catalytic activity can further be improved.

References

- [1] Selvaraj Mohana Roopan, A. Bharathi, A. Prabhakarn, A. Abdul Rahuman, K. Velayutham, G. Rajakumar, R.D. Padmaja, Mohan Lekshmi, G. Madhumitha, Efficient phyto-synthesis and structural characterization of rutile TiO_2 nanoparticles using *Annona squamosa* peel extract, *Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy*, 2012, 98; 86–90
- [2] Junbo Guo, Zhanghua Gan, Zhihong Lu, Jing Liu, Jingjing Xi, Yang Wan, Lin Le, Hailin Liu, Jing Shi, Rui Xiong, Improvement of the photocatalytic properties of TiO_2 by (Fe+Mo) co-doping—A possible way to retard the recombination process, *Journal of Applied Physics*, 2013, 114; 104903
- [3] Wen-Chung Lu, Hoang-Diem Nguyen, Chun-Yi Wu, Kao-Shuo Chang, Masahiro Yoshimura, Modulation of physical and photocatalytic properties of (Cr, N) codoped TiO_2 nanorods using soft solution processing, *Journal of Applied Physics*, 2014 115; 144305
- [4] V. Jabbari, M. Hamadani, A. Reisi-Vanani, P. Razi, S. Hoseinifard, D. Villagran, In, V-codoped TiO_2 Nanocomposite Prepared via Photochemical Reduction Technique as Novel High Efficient Visible-Light-Driven Nanophotocatalyst, *RSC Advances.*, 2015, 5; 78128-78135



- [5] Anthony Lannoy, Rudina Bleta, Cécile Machut-Binkowski, Ahmed Addad, Eric Monflier, Anne Ponchel, Cyclodextrin-Directed Synthesis of Gold-Modified TiO₂ Materials and Evaluation of Their Photocatalytic Activity in the Removal of a Pesticide from Water: Effect of Porosity and Particle Size, *ACS Sustainable Chem. Eng.* 2017, 5; 3623–3630
- [6] Mohamad Azuwa Mohamed, Wan Norharyati Wan Salleh, Juhana Jaafar, Mohamad Saufi Rosmi, Zul Adlan Mohd. Hir, Muhazri Abd Mutalib, Ahmad Fauzi Ismail, Masaki Tanemura, Carbon as amorphous shell and interstitial dopant in mesoporous rutile TiO₂: Bio-template assisted sol-gel synthesis and photocatalytic activity, *Applied Surface Science*, 2017, 393; 46–59
- [7] Muhammad Sohail, Haoliang Xue, Qingze Jiao, Hansheng Li, Khakemin Khan, Wangshanshan, Yun Zhao, Synthesis of well-dispersed TiO₂@reduced graphene oxide (rGO) nanocomposites and their photocatalytic properties, *Materials Research Bulletin*, 2017, 90;125-130
- [8] Kugalur Shanmugam Ranjith, Tamer Uyar, Rational synthesis of Na and S co-catalyst TiO₂- based nanofibers: presence of surface-layered TiS₃ shell grains and sulfur-induced defects for efficient visible-light driven photocatalysis, *J. Mater. Chem. A*, 2017, 5; 14206
- [9] Junqing Yan, Guangjun Wu, Naijia Guan, Landong Li, Zhuoxin Li, Xingzhong Cao, Understanding the effect of surface/bulk defects on the photocatalytic activity of TiO₂: anatase versus rutile, *Phys.Chem. Chem. Phys.*, 2013, 15; 10978
- [10] Jiaguo Yu, Jingxiang Low, Wei Xiao, Peng Zhou, Mietek Jaroniec, Enhanced Photocatalytic CO₂ Reduction Activity of Anatase TiO₂ by Coexposed {001} and {101} Facets, *J. Am. Chem. Soc.* 2014, 136; 8839–8842

- [11] Nisha T. Padmanabhan, Madambi K. Jayaraj, Honey John, Mechanistic insights into CTAB assisted TiO₂ crystal growth with largely exposed high energy crystal facets, *Journal of Environmental Chemical Engineering*, 2018, 6; 5510–5519
- [12] Christian Andriamiadamanana, Christel Laberty-Robert, Moulay T. Sougrati, Sandra Casale, Carine Davoisne, Snehangshu Patra, Frédéric Sauvage, Room Temperature Synthesis of Iron-Doped Anatase TiO₂ for Lithium-Ion Batteries and Photocatalysis, *Inorg. Chem.*, 2014, 53 (19); 10129–10139
- [13] Yang Liu, Pengfei Fang, Yunlang Cheng, Yuanpeng Gao, Feitai Chen, Zhi Liu, Yiqun Dai, Study on enhanced photocatalytic performance of cerium doped TiO₂-based nanosheets, *Chemical Engineering Journal*, 2013, 219; 478–485
- [14] Diana Rakhmawaty Eddy, Dina Dwiyantri, Iman Rahayu, Iwan Hastiawan, and Husein H. Bahti, Synthesis of gadolinium doped titanium(IV) oxide and their photocatalytic activity to decrease chemical oxygen demand (COD) value of water pollutants, *AIP Conference Proceedings*, 2017, 1848; 030003
- [15] Y. Hirose, A. Itadani, T. Ohkubo, H. Hashimoto, J. Takada, S. Kittaka, Y. Kuroda, Tubular nitrogen-doped TiO₂ samples with efficient photocatalytic properties based on long-lived charge separation under visible-light irradiation: synthesis, characterization and Reactivity , *Dalton Trans.*, 2017, 46, 4435-4451
- [16] Guangri Jia, Ying Wang, Xiaoqiang Cui, Weitao Zheng, Highly Carbon-doped TiO₂ Derived from MXene Boosting the Photocatalytic Hydrogen Evolution, *ACS Sustainable Chem. Eng.* 2018, 6, 10, 13480-13486



- [17] Xiaoqing Yan, Kun Yuan, Nan Lu, Hanjiao Xu, Siyu Zhang, Nobuyuki Takeuchi, Hisayoshi Kobayashi, Renhong Li, The interplay of sulfur doping and surface hydroxyl in band gap engineering: Mesoporous sulfur-doped TiO₂ coupled with magnetite as a recyclable, efficient, visible light active photocatalyst for water purification, *Applied Catalysis B: Environmental*, 2017, 218; 20-31
- [18] Sajid Ali Ansari, Mohammad Mansoob Khan, Mohd Omaish Ansari, Moo Hwan Cho, Nitrogen-doped titanium dioxide (N-doped TiO₂) for visible light photocatalysis, *NewJ.Chem.*, 2016, 40; 3000
- [19] Ye Cong, Jinlong Zhang, Feng Chen, Masakazu Anpo, Synthesis and Characterization of Nitrogen-Doped TiO₂ Nanophotocatalyst with High Visible Light Activity, *J. Phys. Chem. C* 2007, 111; 6976-6982
- [20] S. Sato, *Chem. Phys. Lett.* 1986, 123, 126
- [21] G. Yang, Z. Jiang, H. Shi, T. Xiao and Z. Yan, Preparation of highly visible-light active N-doped TiO₂ photocatalyst, *J. Mater. Chem.*, 2010, 20; 5301–5309
- [22] J. Wang, C. Fan, Z. Ren, X. Fu, G. Qian and Z. Wang, N-doped TiO₂/C nanocomposites and N-doped TiO₂ synthesised at different thermal treatment temperatures with the same hydrothermal precursor, *Dalton Trans.*, 2014, 43, 13783–13791
- [23] Yin S, Zhang. Q. W, Saito F, Sato T, Preparation of Visible Light-Activated Titania Photocatalyst by Mechanochemical Method *Chem. Lett.* 2003, 32; 358.
- [24] M. Masahiko, W. Teruyoshi, Visible Light Photocatalysis of Nitrogen-Doped Titanium Oxide Films Prepared by Plasma-Enhanced Chemical Vapor Deposition *J. Electrochem. Soc.*, 2006, 153; C186–C189
- [25] Morikawa. T, Asahi. R, Ohwaki. T, Aoki. K, Taga. Y, Band-Gap Narrowing of Titanium Dioxide by Nitrogen Doping, *Jpn. J. Appl. Phys. Part 2* 2001, 40; L561.

- [26] Anu K John, Shiny Palaty, Influence of solvent and pH on the synthesis of visible light active titanium dioxide nano particles, *Journal of Sol-Gel Science and Technology*, 2018, 87; 391–399
- [27] Xiangdong Wang, Kui Zhang, Xiaoling Guo, Guodong Shen, Jingyu Xiang, Synthesis and characterization of N-doped TiO₂ loaded on activated carbon fiber with enhanced visible-light photocatalytic activity, *New J. Chem.*, 2014, 38; 6139-6146
- [28] S. Mahshid, M. Askari, M. Sasani Ghamsari, The interplay of sulfur doping and surface hydroxyl in band gap engineering: Mesoporous sulfur-doped TiO₂ coupled with magnetite as a recyclable, efficient, visible light active photocatalyst for water purification, *Journal of Materials Processing Technology*, 2007, 189; 296–300
- [29] Shirajahammad M. Hunagund, Vani R. Desai, Jagadish S. Kadadevarmath, Delicia A. Barretto, Shyamkumar Vootla, Ashok H. Sidarai, Biogenic and chemogenic synthesis of TiO₂ NPs via hydrothermal route and their antibacterial activities, *RSC Adv.*, 2016, 6; 97438
- [30] Wen-Chung Lu, Hoang-Diem Nguyen, Chun-Yi Wu, Kao-Shuo Chang, Masahiro Yoshimura, Modulation of physical and photocatalytic properties of (Cr, N) codoped TiO₂ nanorods using soft solution processing, *Journal of Applied Physics*, 2014, 115; 144305
- [31] G. Sauthier, E. György, A. Figueras, R. S. Sánchez, J. Hernando, Laser Synthesis and Characterization of Nitrogen-Doped TiO₂ Vertically Aligned Columnar Array Photocatalysts, *J. Phys. Chem. C* 2012, 116; 14534–14540
- [32] Jin Wang, De Nyago Tafen, James P. Lewis, Zhanglian Hong, Ayyakkannu Manivannan, Mingjia Zhi, Ming Li, Nianqiang Wu, Origin of Photocatalytic Activity of Nitrogen-Doped TiO₂ Nanobelts, *J. AM. CHEM. SOC.* 2009, 131; 12290–12297



- [33] Guilian Zhu, Tianquan Lin, Xujie L^u, Wei Zhao, Chongyin Yang, Zhou Wang, Hao Yin, Zhanqiang Liu, Fuqiang Huang Jianhua Lin, Black brookite titania with high solar absorption and excellent photocatalytic performance, *J. Mater. Chem. A*, 2013, 1; 9650
- [34] Ming-Yang Xing, Wei-Kun Li, Yong-Mei Wu, Jin-Long Zhang, Xue-Qing Gong, Formation of New Structures and Their Synergistic Effects in Boron and Nitrogen Codoped TiO₂ for Enhancement of Photocatalytic Performance, *J. Phys. Chem. C* 2011, 115 (16); 7858-7865
- [35] Yong Nian Tan, Chung LengWong, and Abdul RahmanMohamed, An Overview on the Photocatalytic Activity of Nano-Doped-TiO₂ in the Degradation of Organic Pollutants, *ISRN Materials Science* 2011, 261219, 18 pages
- [36] Yanming Lin, Zhenyi Jiang, Xiaoyun Hu, Xiaodong Zhang, Jun Fan, The electronic and optical properties of Eu/Si-codoped anatase TiO₂ photocatalyst, *Applied Physics Letters* 2012, 100; 102-105

ISOLATION AND MOLECULAR IDENTIFICATION OF BIOPLASTIC (POLYHYDROXYBUTYRATE) PRODUCING BACTERIA FROM SOIL

Anagha A Kurup,

UniBiosys Biotech Research Labs
Cochin, Cochin

Anjusha Mohan

UniBiosys Biotech Research Labs
Cochin, Cochin

Rishad K. S

UniBiosys Biotech Research Labs
Cochin, Cochin
rishad61@gmail.com

Abstract

Bacteria producing chemical compound, Poly- hydroxy butyrate (PHB) has been identified as an effective thermoplastic, and has many characteristics similar to those of standard commercial plastics like polypropylene. Many studies revealed that PHB based plastic substitutes are less flexible than traditional plastics; they are completely biodegradable and leave behind no residue. Biodegradable polymer plays a predominant role as a biodegradable plastic due to their hydro-lysable ester bonds. The foremost objective of this study was to isolate potential strains of PHB producing bacteria from soil, and its molecular identification employing 16S-rDNA-PCR. The isolated bacterium was identified as *Bacillus subtilis*. The biopolymer accumulated was estimated and the result revealed that 34.39 % PHB accumulation was obtained which indicated that the isolate is an efficient PHB producer and can be explored industrially for developing bioplastic materials.



Introduction

Bioplastic is defined as a form of plastic synthesized from renewable resources such as plant starch and microbial species. Bioplastics are made from a compound called polyhydroxyalkanoate (PHA). The family of PHAs includes several polymeric esters such as polyhydroxybutyrate, polyhydroxybutyrate co-hydroxyvalerate (PHBV), polyhydroxybutyrate co-hydroxyhexanoate (PHBHx) and polyhydroxybutyrate co-hydroxyoctanoate (PHBO). Poly 3-hydroxybutyric acid (PHB) is the most common natural microbial PHA.

From a biotechnological point of view, the ability of bioplastics to be biodegradable makes them a desirable substitute for petrochemical-based plastic, an environmental pollutant ¹. Increased production of bioplastics can significantly reduce carbon dioxide emissions, curtail plastic waste generation and decrease consumption of fossil fuels. Although, the high cost of industrial production and recovery of bioplastics is presently not able to compete with traditional ways of synthetic plastic production, fermentation processes have been greatly improved by the use of genetically engineered organisms capable of producing these polymers at a high rate, utilizing cheap carbon sources such as molasses ².

Microbes have been reported to be the potent producers of PHB due to their high adaptability in various extreme environmental conditions. Out of these, *Bacillus* spp., *Pseudomonas* spp. and *Vibrio* spp. are found to be more efficient for PHB production due to their higher stability and reproducibility under environmental stress.

Bacillus is an established organism which can withstand adverse conditions, by undergoing sporulation, compete well with other organisms by producing antibiotics and antibacterials such as acylhomoserine lactonases, biosurfactants, and hydrolytic enzymes ³. In addition, the most important

feature is that *Bacillus* spp. are among those few organisms, which can produce homopolymer and co-polymer of PHA from pure substrates as well as biological wastes ⁴. The present study is focused on the isolation and identification of bacteria capable of producing PHB.

Materials and Methods

Isolation and identification of PHB producing bacteria

Soil samples were collected 10 cm beneath the soil surface. 14 bacterial strains were isolated by serial dilution method and the isolates were screened by Sudan black staining test under oil immersion microscope for the presence of PHB granules. Four bacterial isolates that appeared positive (blue-violet) was selected, and used for further experiments. Gram staining was performed to test purity.

Estimation of Phb Produced by the Bacteria

Cell dry weight

Inoculum was prepared in nutrient broth medium incubated at 37°C for 48h with continuous gentle shaking. After incubation, cells were harvested by centrifugation at 10000 rpm for 10 min, washed in sterile saline centrifuged. Pellets were collected aseptically, dried at 60°C to estimate the dry cell weight (DCW) in units of g/ml.

Extraction and quantification of PHB

The dried pellet was digested with 4% sodium hypochlorite solution at 37°C for 20 minutes. Then pellet was collected by centrifugation at 10,000 rpm for 15 minutes, washed with water, acetone, ethanol respectively for washing and extraction. Finally polymer was dissolved in chloroform and kept for complete evaporation. Dry weight of extracted PHB was estimated as g/ml. Residual biomass was estimated as the difference between dry cell weight and dry weight of PHB. The percentage of intracellular PHB accumulation



was estimated as the percentage composition of PHB present in the dry cell weight.

Residual biomass (g/ml) = DCW (g/ml) - Dry weight of extracted PHB(g/ml)

PHB accumulation (%) = Dry weight of extracted PHB(g/ml) X 100

DCW (g/ml)

Molecular identification of PHB producing bacteria

Total bacterial DNA was isolated using Chloroform-Isoamyl alcohol method ⁵. Purity and quality of the DNA was analyzed by agarose gel electrophoresis. PCR reactions for 16S rDNA amplifications were carried out in Agilent gradient thermal cycler (USA) employing the (For-ward Primer) 8F: 5'-AGAGTTTGATCMTGG-3' and (Reverse Primer) 1492R: 5'-ACCTTGTTACGACTT-3'. PCR amplifications were performed in 25µl reaction mixtures containing 1X assay buffer (100mM Tris, 500mM KCl, 0.1% gelatin, pH 9.0) with 1.5mM MgCl₂ (Merck, Bangalore, India), 5 pmoles of each primer, 200µM dNTPs (Merck, Bangalore, India), 1.5U Taq DNA polymerase and 20ng of template DNA. To check DNA contamination, a negative control was set up omitting template DNA from the reaction mixture. To check the amplification of products, 4µl of each PCR product were loaded on 1.5% agarose gel in 1X TBE as gel and running buffer. Commercially available 100 base-pair ladder was used as standard molecular weight DNA marker to determine the weight of amplified product.

The amplified product was purified and sequenced. The 16S rDNA sequences was then used for similarity searches using BLAST (Basic Local Alignment Search Tool) programme at NCBI Genbank.

Results

Isolation and identification of PHB producing bacteria

Four bacterial isolates were found to be positive for Sudan black staining evident by the presence of black colonies which indicated PHB accumulation in bacterial cells. Gram reaction revealed that the PHB producing strains belong to gram positive rod shaped bacteria, the morphological and physiological properties of the strains were determined and it was observed that all the isolate d strains belonged to the genus *Bacillus*.

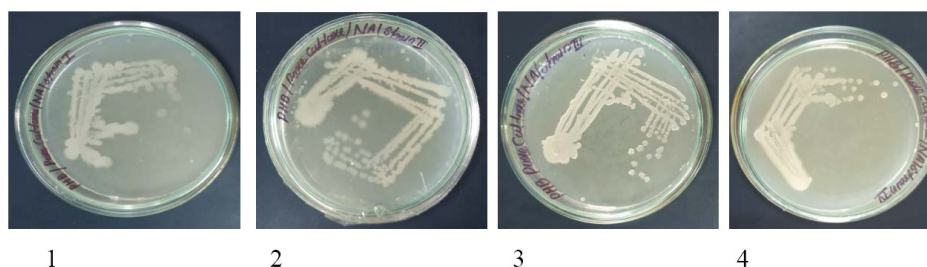


Fig. (1-4): Pure cultures of PHB Producing Bacteria

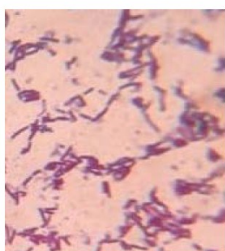


Fig. 5: Gram stained bacteria

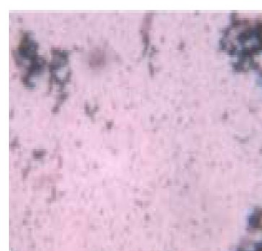


Fig. 6: Sudan black stained bacteris

Estimation of PHB produced by the bacteria

The bacterial isolate that gave the highest values for PHB concentration 34.391% and 0.189g/ml of DCW, was selected for molecular identification.



16S rDNA amplification

16S rDNA based PCR was used to identify the bacteria. A PCR amplicon of 1200 bp were observed on 1.5% agarose gel. The BLAST result showed that the query sequence exhibited 100% identity with the sequence of *Bacillus subtilis*.



**Fig. 7: Agarose gel electrophoresis
Image of isolated DNA**



**Fig. 7: Agarose gel electrophoresis
image of 16rDNA PCR product**

Discussion

The present study is focused on the potent bacterial isolates producing PHB. In bacteria, Biosynthesis of PHB starts with condensation of acetyl-CoA molecules which yield acetoacetyl-CoA. Acetoacetyl-CoA is reduced into hydroxybutyryl-CoA. Hydroxybutyryl-CoA is polymerized into PHB in the presence of PHB synthase^{6,7,8,9}. Morphological identification of bacteria was done by Gram staining. Lipophilic Sudan black B dye was used for the screening procedure. According to^{10, 11} sudanblack staining is a rapid and easy screening procedure.

Quantification of PHB production is reported by^{12, 13} in their studies using different techniques. In this study, the quantification is mainly done by sodium hypochlorite and chloroform dispersion method. In the present study the isolate produced 34.39% PHB. These results are also supported by

the finding of the ¹ who utilized the raffinose as a major carbon source for the isolation of PHB producer microorganisms and many of isolates were *Bacillus* spp..

References

- [1] Lee S.Y, *Bacterial Polyhydroxyalkanoates*. *Biotechnol. Bioeng*, 1996, 49; 1-14.
- [2] Luengo J.M, GarciaB, Sandoval A, Naharro G, Olivera E.R, *Bioplastics from Microorgan-isms*, *Curr. Opin. Microbiol*, 2003, 6;251-260.
- [3] Kumar PSingh MMehariya SPatel S.K.S Lee. J-KKalia V.C, *Indian J Microbiol*, 2013, 54(2); 151–157., *Ecobiotechnological Ap-proach for Exploiting the Abilities of Bacillus to Produce Co-polymer of Polyhydroxyalka-noate*.
- [4] Singh M, Patel S.K, Kalia V.C, *Bacillus subtilis as Potential Producer for Polyhydroxyalka-noates*. *Microb Cell Fact*, 2009, 20; 8-38.
- [5] Tsai Y-L, Olson B.H, *Rapid Method for Direct Extraction of DNA from Soil and Sediments*, *Appl. environ. Microbial*, 1991, 57(4): 1070 – 1074.
- [6] Verlinden R.A.J, Hill D.J, Kenward M.A, William C.D, Radeckal, *Synthesis Bacterial of Bio-degradable Polyhydroxyalkanoates*, *Journal of Application Microbiology*, 2007,102; 1437-1449.
- [7] Ayub N.D, Pettinari M.J, Ruiz J.A, Lopez N.I, *A Polyhydroxybutyrate-Producing Pseudomonas sp. Isolated from Antarctic Environments with High Stress Resistance*. *CurrMicrobiol*, 7.2004, 49(3);170-4.
- [8] Ayub N.D, Tribelli P.M, Lopez N.I, *Polyhydroxyalkanoates are Essential for Maintenance of Redox State in the Arctic Bacterium Pseudomonas sp. 14-3 During Low Temperature Adaptation*. *Extremophiles*, 2009, 13;59- 66.



- [9] Numata K , Doi Y, *Biosynthesis of Polyhydroxyalkanoates by a Novel Facultatively Anaerobic Vibrio sp. Under Marine Condition*, Marine Biotechnology, 2012,14; 323-331.
- [10] Charen T, Vaishali P, Kaushalya M, Amutha K , Ponnusami V, Gowdhaman D, *Isolation and Identification of Polyhydroxybutyrate Producing Bacterial Strain (Bacillus thuringiensis GVP) from Chlorine Contaminated Soil*. International Journal of ChemTech Research, 2014, 5;3197- 202.
- [11] Singh P, & Parmar N, *Isolation and characterization of two novel polyhydroxybutyrate (PHB) - producing bacteria*. African J. Biotechnol, 2011, 10; 4907–4919.
- [12] Panigrahi S, Badveli U , *Screening, Isolation and Quantification of PHB-Producing Soil Bacteria*. International Journal of Engineering Science Invention, 2013, 2(9);01-06.
- [13] Ramadas N.V , Sindhu R , Binod P , Pandey A , *Development of a Novel Solid-State Fermentation Strategy for the Production of Poly-3-hydroxybutyrate Using Polyurethane Foams by Bacillus sphaericus NII 0838*. Annals of Microbiology, 2013, 63(4); 1265-1274.
- [14] Full T.D, Jung D.O, Madigan M.T, *Production of Poly-b-hydroxyalkanoates from Soy Molasses Oligosaccharides by New, Rapidly Growing Bacillus species*. Letters in Applied Microbiology, 2006, 43; 377-384.

VITAMIN C AND ITS SYNERGESTIC EFFECTS IN PREVENTING DIABETES

Nimitha R. Chandran

Assistant Professor

Department of Zoology

St. Teresa's College, Ernakulam

Kochi- 682035, Kerala, India.

E-mail: nimitha91@yahoo.in;

Soja Louis

Assistant Professor

Department of Zoology

St. Teresa's College, Ernakulam

Kochi- 682035, Kerala, India

E-mail: sojalouis@yahoo.co.in;

Abstract

Today human race focuses on health as a key factor for a better living. Nutrition plays a vital role in maintaining health and provides the necessary materials to cells and other parts of the body to support life. It is a known fact that deficiency of nutrients causes deficiency diseases and studies have confirmed that deficiency of nutrients are also the reason for many chronic ailments like cardiovascular diseases, cancer, diabetes, AIDS etc. Many of these diseases can be prevented or alleviated with the intake of a healthy diet or nutrient supplementation. It is not the intake of any one single nutrient that ensures full health, but the intake of a complete spectrum of various different micronutrients, such as vitamins, minerals, amino acids and trace elements. Traditionally there are so many foods that we pair together and unknowingly they are a great combination for a healthy lifestyle. The effective element in each of these combination food items are the synergistic effect of the nutrients present in them. The concept of nutrient synergy maximizes the health benefits of micronutrients i.e., which provide an added effect to the effect of nutrients on combination than their individual effect. Vitamin C has a great synergistic effect with several other nutrients. Vitamin C is a very important nutrient for human survival, it works in combination with many other nutrients which helps in elevating the function of both nutrients and has a great role in preventing many chronic diseases. As human body is incapable of producing Vitamin C, we need to supplement this in our daily diet. The paper focuses on the optimum supplementation of vitamin C and its synergistic benefits for living a healthy life. The clinical effectiveness of this approach has been confirmed in many studies, and also through other independent research.

Keywords: *Health, Vitamins, Nutrients, Synergistic effects.*



Introduction

Vitamin C is an essential component of human physiology and should be supplied either through fresh fruits and vegetables or through supplements. The clinical benefit of vitamin C known so far is the prevention of scurvy. Vitamin C is required for the synthesis of collagen, an important structural component of blood vessels, tendons, ligaments, and bone. Vitamin C also plays an important role in the synthesis of the neurotransmitter, norepinephrine. Neurotransmitters are critical to brain function and are known to affect mood. Vitamin C is also a highly effective antioxidant. Even in small amounts vitamin C can protect indispensable molecules in the body from damage by free radicals. Vitamin C may also be able to regenerate other antioxidants such as vitamin E. The minimum requirement of vitamin C needed to prevent scurvy is 60mg daily for men and women (RDA). The amount of vitamin C to prevent chronic diseases appear to be more than that required for prevention of scurvy. Most of the vitamins and nutrients function as biocatalysts of thousands of enzymatic reactions in every cell and if they are not provided in optimum amounts, the cells and consequently the organs begin to malfunction leading to diseases.

Much of the information regarding vitamin C and the prevention of chronic diseases is based on prospective studies, in which vitamin C intake is assessed in large numbers of people who are followed over time to determine whether they develop specific chronic diseases. This study focuses on the benefits of Vitamin C on diabetes in particular and also its combination effects are also reviewed.

All cells require sufficient amounts of vitamins, minerals, amino acids and other nutrients to function optimally. In order to potentiate immune function or prevent chronic illnesses such as cancer, hypertension, diabetes etc., higher doses of vitamin C are needed. The use of a single nutrient can

lead to either unmasking an underlying deficiency of other micronutrients or causes shift in metabolic balance towards an undesired level. The synergy approach is established on the fact that all cellular functions in the body are based on synergy and the cooperation between nutrients is the basis of metabolism. Many diseases like Cancer, AIDS, Cardiovascular diseases, Diabetes etc have been identified many years back and they have resulted in the death of millions of people and these diseases do not have a potent cure yet. Technologies and knowledge have developed drastically still a permanent cure is not found. These diseases which are now reported to be cured and prevented with the help of nutrient synergy. Using nutrients in combination have an added effect for fighting against various infectious agents hence preventing the onset and also to cure these diseases. Cellular bio-energy cannot be generated effectively without specific micronutrients acting as catalysts of numerous Krebs Cycle enzymes and natural intermediates of the mitochondrial respiratory chain. Research has also shown that the synergistic action of specific cellular nutrients, especially vitamin C, the amino acids carnitine, lysine, and proline, magnesium, coenzyme Q10, and other essential nutrients, combined in the right proportions is the right “fuel” supporting the proper function of heart muscle cells. Deficiencies of these essential nutrients impair the pumping performance of the heart, resulting in shortness of breath, edema, and fatigue. Therefore a review research was done focusing on finding synergistically acting essential vitamin-nutrient teams and its affectivity to assure balanced metabolism and thereby the overall health.

Review of Literature

Cellular Medicine now provides a breakthrough in our understanding of the causes, prevention and adjunct treatment of adult diabetes. The primary cause of adult onset diabetes is a long-term deficiency of certain vitamins and other essential nutrients in the millions of cells in the pancreas



(the organ that produces insulin), the liver and the blood vessel walls, as well as other organs. In individuals with inherited diabetic predisposition, deficiencies of vitamins and other essential nutrients can trigger a diabetic metabolism and the onset of adult diabetes ¹. Conversely, the optimum intake of vitamins and other essential nutrients can help prevent the onset of this disease and help correct existing diabetic conditions and its complications. A study on the effect of vitamin C on blood glucose, serum lipids & serum insulin in type 2 diabetes patients indicated that daily consumption of 1000 mg supplementary vitamin C may be beneficial in decreasing blood glucose and lipids in patients and thus reducing the risk of complications ².

The key to understanding cardiovascular disease and diabetes is to recognize the similarity in the molecular structure of vitamin C and sugar (glucose) molecules. This similarity can lead to metabolic confusion in the process to transporting glucose and vitamin C molecules through cellular membranes. With an abundance of glucose in the bloodstream, the transport of vitamin C molecules through cellular membranes of vascular cells becomes blocked resulting in vitamin C deficiency conditions inside these cells. For the cardiovascular system vitamin C deficiency has especially severe consequences as it leads to developing cardiovascular deposits not only in the arteries of the heart, but also in blood vessels in the legs, eyes and other organs in the body. Therefore, the decisive measure for preventing cardiovascular complications in diabetes is by the optimum daily intake of selected nutrients – in particular vitamin C. Clinical data have shown that with high intake of vitamin C the requirements for insulin becomes lower³. One consequence of this life-long exposure to oxidants is peroxidative damage to lipids in cell membranes and lipoproteins. It is becoming increasingly evident that such peroxidative damage is relevant to many human diseases including atherosclerosis, cancer, rheumatoid arthritis, myocardial reoxygenation injury, and drug-associated toxicity, as well as to

the degenerative processes associated with aging. Preventing lipid peroxidation, therefore, could prove to be a very effective, yet simple, way of preventing these diseases and degenerative processes and ascorbate is a proven remedy⁴. Once ascorbate is consumed completely, micromolar concentrations of hydroperoxides of plasma phospholipids, triglycerides, and cholesterol esters appear simultaneously, even though sulfhydryl groups, bilirubin, urate, and alpha-tocopherol are still present at high concentrations. Human plasma is endowed with an array of antioxidant defense mechanisms. Important plasma antioxidants appear to be ascorbate, urate, a-tocopherol, albumin bound bilirubin, and albumin itself. Protein sulfhydryl groups have also been suggested to contribute significantly to the antioxidant capacity of plasma, although their oxidation could also be considered oxidative damage, depending on the protein affected⁵.

Around the world, more than 200 million people suffer from diabetes, and approximately 18.2 million Americans are affected by this disease. Diabetes is characterized by a high sugar (glucose) level in the blood, which comes as a result of insufficient insulin production in the body, impaired cellular response to it, or both. Diabetes significantly increases the chance of developing atherosclerotic deposits, which by clogging the blood vessels can increase the risk of heart attacks, feet amputation or blindness etc. This concept was tested in a pilot clinical trial in patients with Type II diabetes. To test the effectiveness of the specific combination of nutrients on blood sugar levels in patients suffering from Type II diabetes. Pilot clinical study was conducted in 10 patients suffering from Type II Diabetes also called adult onset diabetes. These patients took a specific micronutrient program comprising vitamins, amino acids and minerals, such as chromium, for 6-months. Blood tests were conducted to measure the effect of this nutrient synergy on blood glucose levels as well as HbA1-c levels (indicator of damage to red blood cells by glucose), before using this micronutrient



program, after two months, after four months and after six months of its use. After 6 months of following the cellular micronutrients program there was a decrease in blood sugar level by 23 % (from an average of 155mg/dl at the beginning of the study to 120 mg/dl at the end of the study). In addition, the HbA1-c levels in the blood were lower by an average of 9.3%. This six-month pilot study, though conducted with a small group of patients, confirmed the positive effects of the synergistic combination of cellular nutrients on regulating blood sugar levels in diabetic patients without any side effects. The effectiveness of the synergistic action of nutrients in type II diabetes has been further confirmed by several testimonials based on patient medical records⁶.

Most studies have found people with diabetes mellitus to have at least 30% lower circulating ascorbic acid concentrations than people without diabetes mellitus. Vitamin C supplementation had little impact on blood glucose concentrations, but was found to lower cellular sorbitol concentrations and to reduce capillary fragility⁷.

A study to investigate the question of whether or not vitamin C administration may help control diabetes mellitus (DM) by stimulating the insulin mechanism of a DM patient was taken up with the anticipation that vitamin C, being detectable in abundance in endocrine cells, may play a cardinal role in the production of hormones. In the preliminary experiment, the relation between glucose, insulin and vitamin C in the plasma of a non-diabetic male volunteer in whom vitamin C was introduced intravenously either by injection or by infusion, and with or without concomitant administration of glucose was investigated. In the follow-up study of 3 DM patients, the effect of the vitamin C infusion therapy on DM was assessed by summing up multiple clinical information. Results obtained are as follows: 1) the drip infusion system was superior to the ordinary injection system for maintaining plasma concentration of vitamin C at a high level and for a long

period. 2) The plasma concentration of insulin, when tested in the vitamin C infusion system, followed a bimodal curve--a finding to suggest that vitamin C may stimulate the insulin mechanism in 2 distinct ways. The early mode was glucose-dependent at its height, but the late mode was independent of glucose charge. 3) The practice of vitamin C infusion produced clinical improvements in 3 DM patients. The therapeutic efficacy of the treatment varied from patient to patient. In all cases, control of DM was started by combined use of the vitamin C infusion treatment and the insulin injection treatment⁸.

In a study on the metabolic benefits derived from chronic pharmacological vitamin C administration in aged non-insulin dependent (Type II) diabetic patients. Forty type II diabetic patients (age: 72 \pm 0.5 years) underwent placebo and vitamin C (0.5 g twice daily) administration in double-blind, randomized, cross-over fashion. All patients were treated by oral hypoglycaemic agents which continued throughout the study. After baseline observation and treatment periods which lasted 4 months, in 20 patients, chronic vitamin C administration improved whole body glucose disposal and nonoxidative glucose metabolism. Percent increase in plasma vitamin C levels correlated with the percent decline in plasma LDL-cholesterol ($r = 0.44$; $p < 0.007$) and insulin levels ($r = 0.42$; $p < 0.006$)⁹.

Methodology

A pilot clinical study was conducted to check the effect of vitamin C on diabetes. 10 patients suffering from Type II diabetes were asked to take 100 grams of amla daily (625-930mg Vit C/100gm) =a rich source of Vitamin C for a period of 4 months.

The fasting sugar levels (A fasting plasma glucose (FPG) test measures in a person who has not eaten anything for at least 8 hours) as well as HbA1-c were measured before the study. The fasting sugar measures were



monitored after every 3 weeks while HbA1-c were measured after every 2 months interval time. Results before and after consumption of Vitamin C was analysed.

Results

Table 1: Fasting Sugar Observations for A Period of 4 Months

NAME	01/08/2016	22/08/2016	12/09/2016	3/10/2016	24/10/2016	16/11/2016
BABU	220mg/dl	218mg/dl	225mg/dl	200mg/dl	200mg/dl	180mg/dl
TREESA	238mg/dl	210mg/dl	206mg/dl	133mg/dl	128mg/dl	119mg/dl
MARY	258mg/dl	238mg/dl	201mg/dl	147mg/dl	120mg/dl	115mg/dl
ANIE	347mg/dl	300mg/dl	225mg/dl	220mg/dl	226mg/dl	210mg/dl
JOY	118mg/dl	112mg/dl	110mg/dl	108mg/dl	104mg/dl	100mg/dl
LOUIS	129mg/dl	125mg/dl	110mg/dl	112mg/dl	110mg/dl	100mg/dl
SHIRLY	489mg/dl	475mg/dl	487mg/dl	480mg/dl	476mg/dl	460mg/dl
LISSIE	138mg/dl	120mg/dl	110mg/dl	105mg/dl	100mg/dl	90mg/dl
ELIZABETH	602mg/dl	600mg/dl	654mg/dl	605mg/dl	603mg/dl	602mg/dl
MIRANDA	201mg/dl	122mg/dl	120mg/dl	110mg/dl	100mg/dl	98mg/dl

Table 2: Observed hba1c levels (<6.4%)

NAME	1.8.2016	12.09.2016	16.11.2016
BABU	6.6	6.5	6.4
TREESA	6.4	6.4	6.3
MARY	6.4	6.4	6.2
ANIE	7.0	6.7	6.7
JOY	6.5	6.4	6.5
LOUIS	6.5	6.4	6.1
SHIRLY	7.8	7.6	7.5
LISSIE	6.4	6.3	5
ELIZABETH	8.5	8.7	8.4
MIRANDA	6.5	6.4	5.2

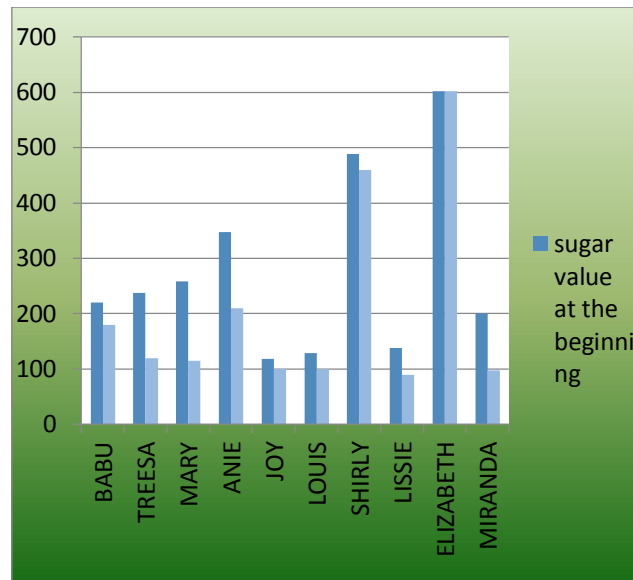


Fig. 1: Graph showing the effect of Vitamin C on Sugar

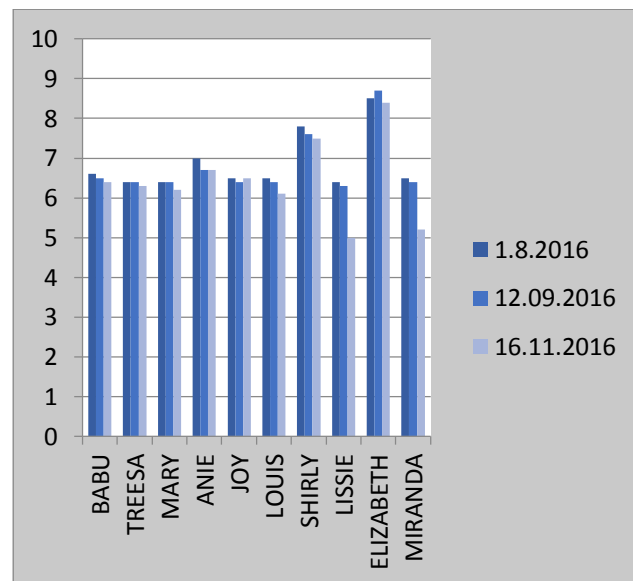


Fig. 2: Graph showing the effect of Vitamin C on HbA1-c levels



Discussion

Optimum dietary ascorbate intake will correct this common metabolic defect and prevent its deleterious consequences. Clinical confirmation of this study should largely abolish diabetes as a cause for mortality in this generation. The present study showed that high dose of natural Vitamin C intake can be a suitable remedy to alleviate diabetes and its associated problems which was well in confirmation with the studies with vitamin C supplements which were fortified with (Anderson and Geil, 1988) and without other nutrients (Kodama *et al.*, 1993). The synergistic effects of Vitamin C and other nutrients showed better results as per the review study conducted.

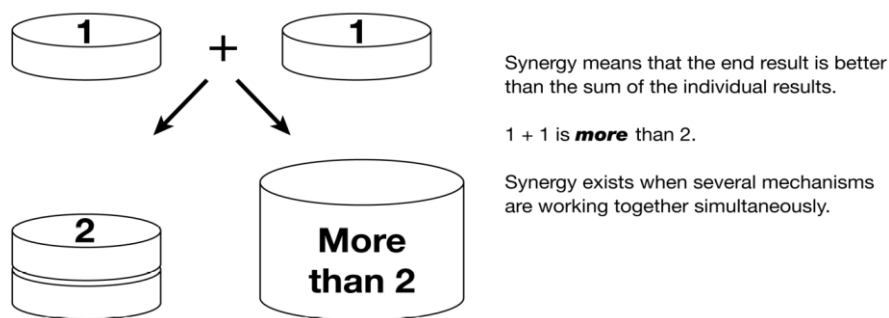


Fig. 3: Synergistic action of vitamins and nutrients

Conclusion

Chronic deficiency of specific nutrients can contribute to the formation of many diseases like AIDS, Cardiovascular diseases, Cancer, Diabetes etc. Several studies, though conducted with a small group of patients, confirmed the positive effects of the synergistic combination of cellular nutrients on regulating blood sugar levels, to prevent loss of elasticity in the blood vessel walls, in preventing metastasis of cells, to increase immunity and hence

prevent and cure many diseases. The effectiveness of the synergistic action of nutrients in type II diabetes has been further confirmed by several testimonials based on patient medical records. This method of treatment show minimum or no side effects and provide the best needed results and can be a potential remedy for many ailments. Health practitioners should consider the benefits of nutrients before implementing widespread increases in doses of dangerous drugs in already frail patients.

References

- [1] <http://www.drrathresearch.org/drrath-discoveries/diabetes>
- [2] Afkhami-Ardekani M., Shojaoddiny-Ardekani A., *Effect of vitamin C on blood glucose, serum lipids and serum insulin in type 2 diabetes patients*. Indian Journal Medical Research, 2007, 126 (5); 471-474.
- [3] Anderson J. W., Geil P. B., *New Perspectives in nutrition management of diabetes mellitus*. American Journal of Medicine, 1988, 85 (5A); 159-165.
- [4] Frei B., Roland Stocker, Laura England, Bruce N. Ames., *Ascorbate: The Most Effective Antioxidant in Human Blood Plasma*, Antioxidants in Therapy and Preventive Medicine, 1990; 155-163.
- [5] Frei B., Stocker R., Ames B. N., Antioxidant defenses and lipid peroxidation in human blood plasma, Proc. Natl. Acad. Sci. USA, 1988, 85(24); 9748-9752.
- [6] Rath, M., Pauling L., *Unified Theory of Human Cardiovascular Disease Leading the Way to the Abolition of This Disease as a Cause for Human Mortality*. Journal of Orthomolecular Medicine, 1992, Vol.7; 5-15.
- [7] Julie C. Will, Tim Byers, *Does Diabetes Mellitus Increase the Requirement for Vitamin C?* Nutrition Reviews, 1996, 54(7); 193–202.



- [8] Kodama M., Kodama T., Murakami M., Kodama M., *Diabetes mellitus is controlled by vitamin C treatment*. In Vivo, 1993, Nov-Dec 7(6A); 535-542.
- [9] Paolisso G., Balbi V., Volpe C., Varricchio G., Gambardella A., Saccomanno F., *Metabolic benefits deriving from chronic vitamin C supplementation in aged non-insulin dependent diabetics*. Journal of the American College of Nutrition, 2013, 14(4); 387-392

A STUDY ON DIVERSITY AND ABUNDANCE OF BUTTERFLY SPECIES IN CHERIYA KADAMAKKUDY

Rahana,
Dept. of Zoology
St. Teresa's college (Autonomous),

Dr. Sherin Antony
Assistant professor
Dept. of Zoology
St. Teresa's college (Autonomous).

Dr. Sugathan
Senior Scientist
Thattekkad Bird Sanctuary
Kothamangalam

Abstract

Butterflies are one of the most important assemblages of insects that act as biodiversity indicators as well as nature's gardeners. The objective of the present study is focused on the assessment of the diversity and abundance of butterfly species and conservation priorities in the study area; which represents mainly island geography. A total of 40 species of butterflies which comes under 5 families were recorded during May 2017 to December 2017 in the Cheriya Kadamakkudy in Pizhala Village, Ernakulam District, Kerala, India. Nymphalidae was recorded as the most abundant family in terms of number of species, represented by 14 species followed by Pieridae (10), Lycaenidae (7), Papilionidae (6) and Hesperidae (3). Butterflies across families generally selected nectar plants randomly, although some showed preference towards herbs. The findings of the present study underline the importance of wetland areas as a preferred habitat for butterflies. The study highlights the need for conservation of the particular area which is under severe anthropogenic impact including change in the land-use system and habitat fragmentation. If the landscaping and maintenance of the habitat are carefully planned, the diversity of butterflies may increase in the wetland region, providing a rich ground for butterfly conservation as well as for research.



Introduction

Butterflies are an important aspect of ecosystems for they interact with plants as pollinators and herbivores ¹. They are also good indicators of environmental changes as they are sensitive to habitat degradation and climate changes ². They have been widely used by ecologists as model of organisms to study the impact of habitat loss and fragmentation, and climate change. As they are sensitive to the changing climatic conditions as well as the habitat, they are also considered most appropriate taxonomic group for environmental evaluation ³. Butterflies may react to disturbance and change in habitat and act as an ecological indicator ⁴. Butterflies and their caterpillars are dependent on specific host plants for food, thus the diversity of butterflies indirectly reflects the overall plant diversity especially that of shrubs and herbs in the given area ⁵.

Thus, change in land use pattern may lead to landscape changes that can reflect into change in butterfly diversity and distribution. As a result, butterflies can also be used as umbrella species (the species whose protection serves to protect many co-occurring species) for conservation planning and management ^{6,7}.

Kerala has rich and diverse butterfly fauna because of the availability of wide range of habitats. Among the 1501 species so far recorded from India, 327 species are found in Kerala region ⁸. Several studies have been conducted on forest butterflies, urban butterfly fauna, butterflies on Grasslands and mountains, but the studies of the butterfly fauna around island is very uncommon. There is a need to study community structure and dynamic group of lepidopteran's with respect to different regions of our country to know the impact of changing natural habitats on diversity and distribution of butterflies. Hence, the present survey was undertaken to study the diversity of butterflies in Cheriya Kadamakkudy, an island in Pizhala Village, Kerala, India.

Methodology

An investigative study of butterfly diversity and richness were conducted at Cheriya Kadamakkudy in Pizhala village. Pizhala is an island near Kochi surrounded by river Periyar. It is the central part and capital of Kadamakkudy Grama Panchayat, Kanayannur Taluk, Ernakulam District in the Indian state of Kerala. Pizhala island was formed naturally due to the great Floods of Periyar in 1341 AD, which choked the Muziris Port (near present – day Kodungallur, one of the greatest ports in Ancient World. Cheriya Kadamakkudy is made up of sedimentary sand. Major portion of the island is wetland i.e. Pokkali paddy field. The island Cheriya Kadamakkudy includes South main land and North main land known as “Paliathuruth”. The Latitude of Cheriya Kadamakkudy Rd is 10.0451. The Longitude of Cheriya Kadamakkudy Rd is 76.2583. Latitude - 10.0451 and 76.2583 Longitude can be mapped to closest address of Pizhala – Cheriya Kadamakkudy.

The butterfly diversity study were conducted at Cheriya Kadamakkudy in Pizhala Village is located on the banks of Periyar in kadamakkudy of Ernakulam district. The study was conducted from May 2017 to December 2017. Observations were made during morning hours. During morning hours, they fly directly towards the sun, hence butterflies are active after increase in intensity of light.

Study Area

The study was conducted at Cheriya Kadamakkudy in Pizhala Village, an island located on the banks of Periyar, from May 2017 to December 2017. The location was surrounded by water on three sides, along with the wide range of climatic conditions that it passes through brings in diverse structure of habitats. The major types of vegetation includes herbs and some shrub.



Fig. 1: MAP Showing Study Area of Cheriya Kadamakkudy



Fig. 2: Study Area

Butterfly Survey

The survey of butterfly was done using transect method (Pollard walk), point count method and opportunistic sightings during May to December 2017. The observations were made from 0800hr to 1100hr, which is a peak time for butterfly activity. Butterflies were primarily identified directly in the field. The identification keys provided by ⁹ were more helpful for this study. Many of the species were photographed in the wild. Collecting live specimens was avoided during the study.

1. TRANSECT (POLLARD WALKS)

It was developed by the institution of Terrestrial Ecology to monitor butterfly status. A straight line walk was covering 1km within a time span of 1 hour 15 minutes was carried out in the study area. Time selected for the study was between 8:00 am to 11:00 am, as the butterflies are active to collect nectar from flowers. The butterflies were observed within 10 meters to the left and right side and five meters in front of the observer.

2. POINT COUNT

Point count is the simplest method for counting butterflies in which a trained observer records all the butterflies seen from a point count station for a set period of time Royer (1998). In the present study, the time period was for 1 hour, for observing different species of butterflies. They were detected and recorded within a circular area of 6m range (vertical and horizontal).

3. OPPORTUNISTIC SIGHTING

Opportunistic or incidental sightings are butterfly sightings that are not part of a formal count. Observers may note signal butterflies or multiple species. An example of an opportunistic sighting is observing a butterfly in garden and reporting, (Harvey, 2009). In this study casual observations were made whenever possible regarding the identity, status, habitat, ecology and behavior of the species for eight months from May 2017 to December 2017. Butterflies were observed and identified. The identification keys provided by, (Evans, 1927) were more helpful for this study. Photographic documentation was done and the data was maintained.

Analysis of Diversity Index

A) Simpson's Diversity Index

Measure of diversity which takes into account the number of species present, as well as the relative abundance of each species. As species



richness and evenness increase, so diversity increases. Probability that randomly selected individuals in a population belonging to different species.

$$D = N(N-1) / \sum n(n-1)$$

Where,

D = diversity index (simply a number with no units)

N = total number of organisms of all species found

n = total number of individuals found of the species you are interested in.

B) Shannon Index (H'). Species diversity was calculated using the Shannon Index.

$$H' = - \sum_{i=1}^S p_i \ln p_i$$

P_i is the proportion of the i th species in the total sample. The number of species (species richness) in the community and their evenness in abundance (or equitability) are the two parameters that define H' . H' gets larger when there are more species.

Result and Discussion

The present study reflects the richness and diversity of butterflies at Cheriya Kadamakkudy in Pizhala Village, Kerala, India. The localities which yielded higher diversity comprise very dense vegetation like shrubs, herbs and abundant flowering plants and high trees which provide a favorable habitat to the butterflies. Our study is the first of its kind in an island geography located in Kadamakkudy, Pizhala Village.

Forty species of butterflies representing five families have been recorded during the study (Table 1). The photographs of the observed butterflies are given in figure 2. Nymphalidae showed the maximum species

richness, comprising of (14 species, 35%), followed by Pieridae (10 species, 25%), Lycaenidae (7 species, 17%), Papilionidae (6 species, 15%) and Hesperidae (3 species, 8%). Among these species, 3 (7%) were very rare, 6 (15%) were rare, 9 (22%) were occasional, 5 (12%) were very common, 17 (44%) were common occurring. It was also noted that 16 species were present in all seasons. Highest number (40) of species was seen during post monsoon. A total of 17 species were observed during summer and 36 during winter. Least number of species (21) was observed during monsoon. Among these 40 recorded species, Common Mormon, Lime butterfly, Grey Pansy, Common Emigrant and Psyche were found in high frequencies in Kadamakkudy.

Diversity Indices

The diversity indices of the study area were calculated and presented as Table-1.

SHANNON – WEINER DIVERSITY INDEX

The species diversity of eight months ranged from 3.11 to 3.89. The maximum diversity was reported in September (3.89) and minimum diversity was found in May (3.11).

SIMPSON DIVERSITY INDEX

The Simpson diversity index ranged from 18 to 33. The index value was highest in September (33) and lowest in May (18).

The Nymphalidae and Pieridae were also seen in abundance during August and September and it may be due to the availability of nectar as many shrubs and herbs were actively blooming. Family Nymphalidae, represented the highest number of butterfly species, followed by Pieridae, Lycaenidae,



Papilionidae and Hesperidae. The family Nymphalidae outnumbered with a maximum of 14 species. This is because of their speciation and high dispersal ability, ecological adaptation and polyphagous nature which probably help these Lepidopterans to survive in a variety of habitats. Many species of this family are active fliers, which helps them to forage larger areas.

However, in the present investigation, Hesperidae was poorly represented in comparison to studies made in other places of Kerala; might be due to lesser availability of habitat and their host plant. Another possible reason for the rarity of this species is due to the difficulties in observing Hesperidae butterflies because of their dull color and ability to fly rapidly following any disturbances. Hesperids are crepuscular habit, ie., they are active early morning and to a lesser extent, in the evening.

The abundance of butterfly species population in the study area may be due to the availability of favorable tropical climate and features of Kadamakkudy in Pizhala Village. The rich diversity of butterflies correlates with the presence of larval host plants and adult nectar plants. The preference of butterfly species at a particular habitat also depends upon other factors like abundance of predators, parasites and prevalence of diseases. The rainfall conditions greatly influence the butterfly count and species distribution. The butterflies tend to avoid dry habitat and prefer moist place.

Biodiversity is rapidly disappearing at local and global scales which affects the functional diversity of ecosystems. The most important threat to butterfly diversity is urbanization. Complete eradication of greenery in an area drives the butterfly population away, since there is a lack of food and reduced chances to increase the progeny ¹⁰. The ever- increasing human population, loss of habitat, urbanization, industrialization and waste disposal are some of factors that have an impact on the wildlife, thus proving a threat to the butterfly diversity and abundance.

With the gradual decrease in greenery and increase in pollution, butterflies are fast disappearing. The net result is a complete imbalance of the ecosystem extinction of many species¹¹. The least number of butterflies were seen during the month of May, when the adequacy of host plants and availability of nectar were observed. As they are sensitive to the changing climatic conditions as well as the habitat, they are also considered most appropriate taxonomic group for environmental evaluation. Several studies are also conducted on butterflies on Grasslands and mountains, but the studies of the butterfly fauna around islands and wetlands are almost nil.

In this study, we found out that, diversity of butterflies is more during the month of August and September and least diverse during May. The study areas contain cultivated plants especially nectar rich flowering plants which host several butterfly species and hence reported high diversity. The high diversity of butterflies is strongly influenced by the presence of vegetation as food and host plants of butterflies and this habitat should be conserved for the survival of the butterfly.

In the present study, *Tirumala limniace*, *Junonia atlites*, *Junonia almana* of family Nymphalidae were found to be Very Common category. The availability of host plants, grasses in Cheriya Kadamakkudy could be the reason for their abundance. There are 28 species including *Appias albina*, *Hebomoia glaucippe*, *Zizula hylax*, *Pachliopta hector* and species of Hesperidae came under Very Rare category. The butterflies and plants are inter dependent and the diversity of butterflies found in an area is a clear indication of its floral diversity.

Most of the species were noticeably absent during May in the disturbed and human impacted areas, due to the absence of shade in these areas. There was no occurrence of unique species in moderately disturbed areas comparable to those of less disturbed areas.



The environmental conditions in Cheriya Kadamakkudy in Pizhala Village, is highly favorable for butterflies to complete its life cycle. Even though its an Urban area, presence of 40 species of butterflies, indicates the ecological importance of this area and calls for a greater conservation strategies like creating butterfly parks, gardens and by preserving the existing vegetation as such. This study is quite significant and it emphasizes the importance of Islands in the conservation of biological diversity of a region. By conserving butterflies, we are indirectly maintaining the ecological balance.

Butterflies may react to disturbance and change in habitat and act as an ecological indicator. Because of their dependence on the plants, butterfly diversity may reflect overall plant diversity in the given area. Thus, change in land use pattern may lead to landscape changes that can reflect into change in butterfly diversity and distribution. As a result, butterflies can also be used as umbrella species (the species whose protection serves to protect many co-occurring species) for conservation planning and management ¹².

The study highlights conservation significance of the area which is under severe human pressure including mining, habitat fragmentation and change in the land-use system. Most types of land use were important for driving the species diversity of butterflies, in contrast to those defining functional diversity, which were related to a few vegetation types. This suggests that areas containing a highly varied landscape might enhance the diversity of species. Measures can taken to maintain and increase the butterfly diversity in the study area which adds to the maintenance of ecological balance and in turn influence the diversity of other organisms in the area. People inhabiting the specific island region can be made aware about the importance of conserving the available biodiversity.

Further study is needed to know about the seasonal and yearly fluctuation in the diversity of butterflies, because the changes in the diversity can also be observed through continuous monitoring and comparing the data annually.

Table 1: Checklist of butterflies of Cheriya Kadamakkudy in pizhala village with status

No:	Common Name	Scientific Name	Status
FAMILY PAPILIONIDAE			
1	Common mormon	<i>Papilio polytes</i>	C
2	Lime butterfly	<i>Papilio demoleus</i>	C
3	Tailed jay	<i>Graphium Agamemnon</i>	VR
4	Common rose	<i>Pachliopta aristolochiae</i>	VR
5	Crimson rose	<i>Pachliopta hector</i>	R
6	Blue mormon	<i>Papilio polymnestor</i>	C
FAMILY NYMPHALIDAE			
7	Striped tiger	<i>Danaus genutia</i>	C
8	Common castor	<i>Ariadne merione</i>	C
9	Common palmfly	<i>Euripus consimilis</i>	VR
10	Grey pansy	<i>Junonia atlites</i>	C
11	Lemon pansy	<i>Junonia lemonias</i>	C
12	Peacock pansy	<i>Junonia almanac</i>	C
13	Glassy blue tiger	<i>Parantica aglea</i>	C
14	Common indian crow	<i>Euploea core</i>	O
15	Plain tiger	<i>Danaus chrysippus</i>	C
16	Common bushbrown	<i>Mycalesis perseus</i>	O
17	Blue tiger	<i>Tirumala limniace</i>	VC
18	Common four ring	<i>Ypthima huebneri</i>	O
19	Common evening brown	<i>Melanitis leda</i>	O
20	Common sailer	<i>Neptis lylas</i>	O
FAMILY PIERIDEAE			
21	Common green yellow	<i>Eurema hecaba</i>	VC
22	Psyche	<i>Leptosia nina</i>	C
23	Mottled emigrant	<i>Catopsila pyranthe</i>	C
24	Common emigrant	<i>Catopsila ponomia</i>	C
25	Yellow orange tip	<i>Hebomonia glaucippe</i>	R
26	Three spot grass yellow	<i>Eurema blanda</i>	O
27	Small grass yellow	<i>Eurema brigitta</i>	C
28	Common albatross	<i>Appias albino</i>	R
29	Tree yellow	<i>Gandaga harina</i>	C
30	Common jezebel	<i>Delias eucharis</i>	O
FAMILY LYCAENIDAE			
31	Tiny grass blue	<i>Zizula hylax</i>	R
32	Plains cupid	<i>Chilades pandava</i>	C
33	Lime blue	<i>Chilades laius</i>	R
34	Gram blue	<i>Euchrysops gnejus</i>	VC
35	Common cerulean	<i>Jamides celeno</i>	VC
36	Pale grass yellow	<i>Pseudozizeeria maha</i>	O
37	Apefly	<i>Spalgis epius</i>	C
FAMILY HESPERIDAE			
38	Small branded flat	<i>Pelopidas mathias</i>	O
39	Common spotted flat	<i>Celaenorrhinus leucocera</i>	R
40	Water snow flat	<i>Tagiades litigiosa</i>	VC

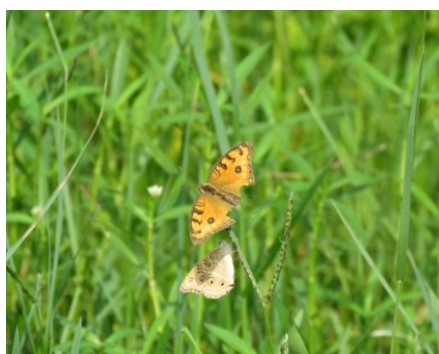
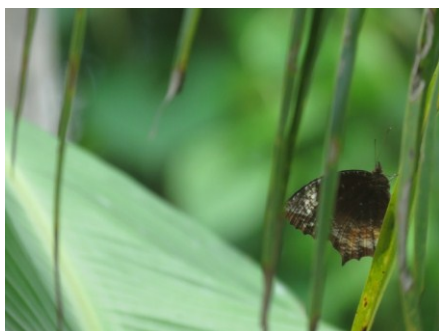
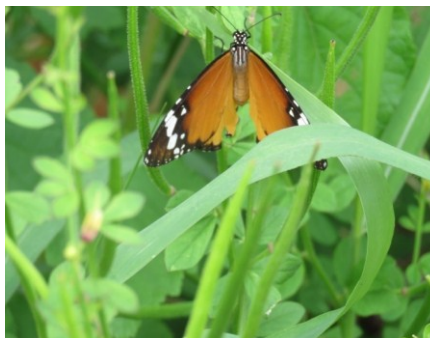
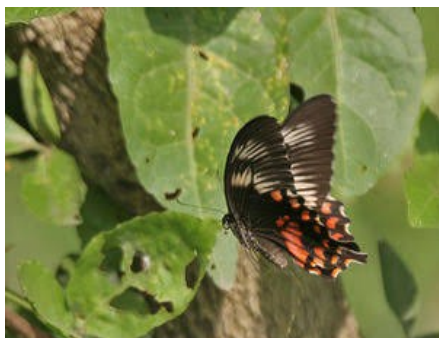




Plate 1: Photographs of the butterflies observed from kadamakkudy
(see table:1 for corresponding names)

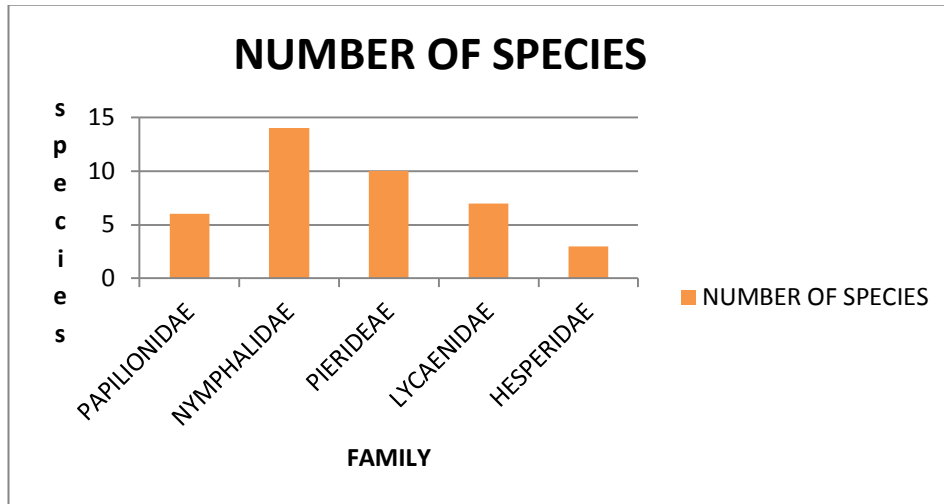


Fig. 3: Family wise distribution of butterfly species in Cheriya Kadamakkudy in Pizhala Village

Table 2: Diversity indices of butterflies at Cheriya Kadamakkudy in Pizhala Village

SI No.	Month	Simpson diversity index	Shannon index
1	MAY	18	3.11
2	JUNE	23	3.17
3	JULY	25	3.31
4	AUGUST	30	3.74
5	SEPTEMBER	33	3.89
6	OCTOBER	29	3.41
7	NOVEMBER	27	3.33
8	DECEMBER	26	3.21

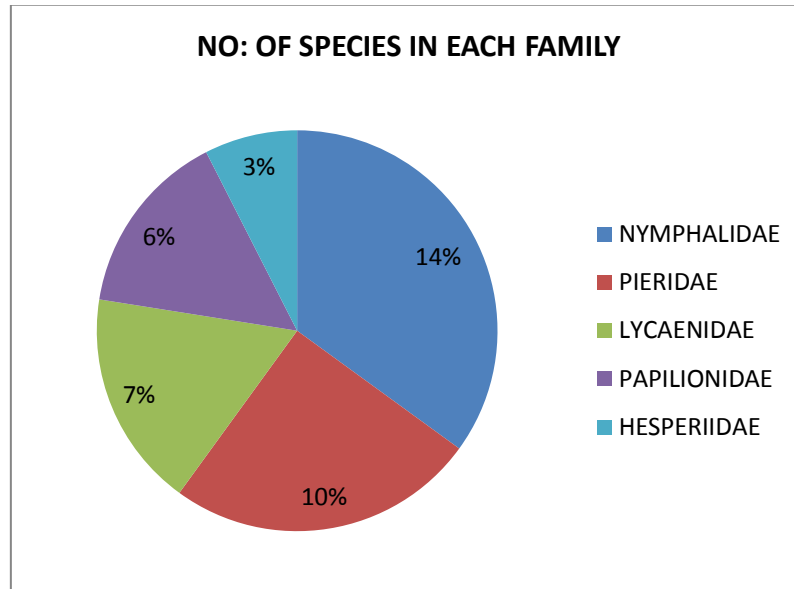


Fig. 4: Abundance of butterfly species in each family at Cheriya Kadamakkudy in Pizhala Village

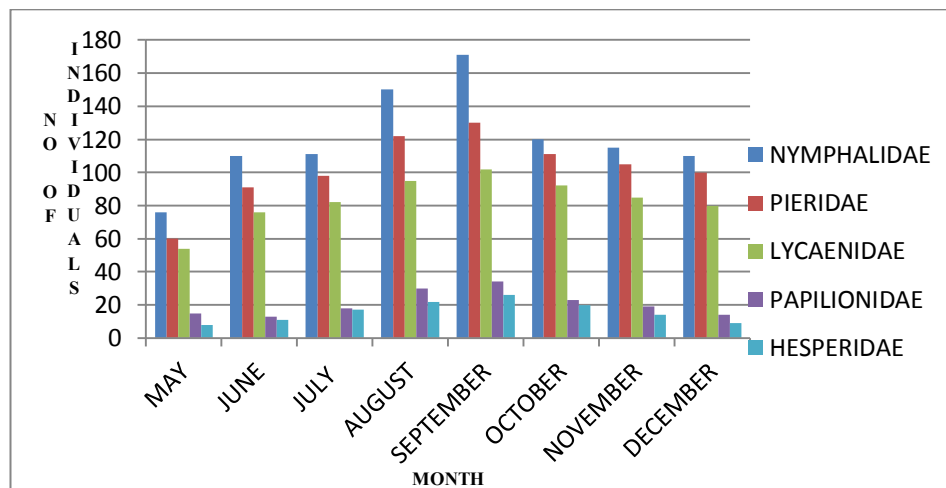


Fig. 5: Monthly variation of species in each family in Cheriya Kadamakkudy in Pizhala Village



Conclusion

The Cheriya Kadamakkudy island in Pizhala Village, is rich in butterfly species, representing five families. The reflects on the availability of diverse habitats as well as microclimatic zones around the project site. The present study on diversity, abundance and habitat preference of butterfly resulted in identification of 40 species. Family Nymphalidae dominated over other Families and *Tirumala limniace*, *Junonia atlites*, *Junonia almana* are the most abundant species recorded. The high diversity of butterflies is strongly influenced by the presence of vegetation as food and host plants of butterflies and this habitat should be conserved for the survival of the butterfly. Hesperidae was poorly represented during the study which comprised three species. One of the possible reasons for this difference could be due to the difficulties in observing Hesperidae butterflies because of their dull color and ability to fly rapidly following any disturbance. With the gradual decrease in greenery and increase in pollution, butterflies are fast disappearing. The Nymphalidae and Pieridae were also seen in abundance during August and September and it may be due to the availability of nectar as many shrubs were actively blooming. Any change in the landscape, land use pattern, loss of vegetation in the habitats are harmful to the butterfly diversity. The present study is the first of this type in Cheriya Kadamakkudy area and hence further study is needed to know about the fluctuation in the diversity of butterflies, because the changes in the diversity can also be observed through continuous monitoring and comparing the data annually. The study area is home to some of the protected species, hence their habitats needs to be conserve to guard the butterfly fauna of this region. The butterfly fauna of the microhabitats are to be protected. The present list of butterfly species is not conclusive, therefore future studies are to be continued to update this list. This is significant and has a beneficial role in nature for protection of all forms. In addition, it is necessary to identify the rare

butterfly species and conserve them by establishing conservatories. Furthermore, long term research and monitoring on the diversity of butterflies with special reference to ecological aspects may be taken up in the area.

References

- [1] Tiple, A.D., V.P. Deshmukh & R.L.H. Dennis., Factors influencing nectar plant resource visits by butterflies on a university campus: implications for conservation. *Nota Lepidopterologica*, 2006, 28: 213–224.
- [2] Kunte K., *Butterflies of Peninsular India*. Universities Press (Hyderabad) and Indian Academy of Sciences (Bangalore), 2000, 254pp.
- [3] Kehimkar I., *The Book of Indian Butterflies*, Bombay Natural History Society, Oxford University Press, 2008.
- [4] Mac Nally R., Fleishman E. A successful predictive model of species richness based on indicator species. *Conservation Biology*. 2004; 18:634-646.
- [5] Padhye AD., Dahanukar N., Paingankar M., Deshpande M., Deshpande D. Season and Landscape wise distribution of Butterflies in Tamhini, North-Western Ghats, India. *Zoos' Print Journal*. 2006; 21(3):2175-2181
- [6] Balakrishnan VC., Palot MJ., A checklist of larval food plants of butterflies in Kerala. *Proceedings of National seminar-cum. Workshop on butterfly diversity of Western Ghats, Malappuram, Kerala*, 2004, 34-35.
- [7] Fleishman E., Murphy DD., Brussard PF., A method for selection of umbrella species for conservation planning. *Ecological Applications*. 2000; 10:569-579.



- [8] Palot MJ. Butterflies of sacred groves of North Malabar Kerala. Eco-Folklore Seminar on Sacred Groves, 12th March, Payyanur, Kerala, 1995.
- [9] Evans, W.H.(1927). *The Identification of Indian Butterflies*. 2nd Edition. Bombay Natural History Society. Mumbai, 454pp.
- [10] Aneesh, K.S., Adarsh C.K. and Nameer P.O., Butterflies of Kerala Agricultural University (KAU) campus, Thrissur, Kerala, India. *Journal of Threatened Taxa*, 2013, 5(9); 4422-4440.
- [11] Aiswarya V. N., Pradarsika M. and Soma A., Studies on the Diversity and Abundance of Butterfly (Lepidoptera :Rhopalocera) Fauna in and Around Sarojini Naidu College Campus, Kolkata, West Bengal, India. *Journal of Entomology and Zoology*, 2014, 2(4); 129-134.
- [12] Anupa K. Antony., G Prasad and Kalesh S., Diversity and Abundance of Butterflies of Kerala University Campus, Kariavattom, Thiruvananthapuram, 2016, 1074-1077.

PROTEAN VISIONS OF THE EMERGING MALAYALEE: READING FOOD IN CINEMA

Sneha Suresh

Research Scholar

University of Madras (Stella Maris College)

Abstract

Images, lyrics, plot and characters are soaked in a delicious medley of food images and metaphors in the Malayalam romantic-comedy *Salt N' Pepper*, released in 2011 and directed by Aashiq Abu . This paper intends to explore how varied notions of identity, gender, marriage, alienation and sexuality are explored in the film using food as the agent /medium of communicating the protean nature of Malayalee culture. Through a taste of the binaries of tradition/modernity, alienation/companionship, and masculinity/femininity this paper contends that the language of food, as used in the film, has helped in redefining and coming to terms with a possible middle ground for the audience/reader.

Keywords: *food in films, culinary culture, Barthesian codes*

Food, informs our identity – who we are and where we come from. It is also one of the foremost definers of culture, a medium through which traditions are passed down through generations. So it comes as an inevitable course of action when, a popular Bollywood director Aashiq Abu, directs a film, the images, lyrics, plot and characters of which are soaked in a medley of culinary images and metaphors.

In this romantic-comedy which enjoyed a highly successful run when released in 2011, the plot revolves around two couples – one young and the other, not so young, who are drawn to each other through a shared passion –



their love for food. Kalidasan played by Lal works in the state archaeological department and is an ardent food lover. He is middle-aged and unmarried. Manu played by Asif Ali is a happy-go-lucky management graduate who stays with Kalidasan along with their chef Babu , assayed in the film by the actor Baburaj. Kalidasan leads a normal life until he happens to be mistakenly called on his phone by Maya (played by Swetha Menon) – a dubbing artiste, who is also middle-aged and unmarried. Maya stays with Meenakshi (Mythili) who is an IELTS student in the city. Maya rings to order a Dosa from a restaurant, but gets Kalidasan instead. Their conversation does not go well at first, but a long-distance romance develops due to their common interest—cooking and food. Kalidasan is a born gourmet while Gowri is indulging in culinary activities in memory of her dead mother.

Since they are jittery on meeting each other they send their younger roommates disguised under their aliases in order to find out about each other. Though a case of mistaken identity develops, it is happily resolved in the end with both the couples ending up together by the close of the film. Food plays an important role in the story and the tagline of the film is *Oru Dosa Undakkiya Katha* ("The story born out of a Dosa"). It is a dosa-induced love story which blends together romance, relationship and food – love, flavour and taste.

This paper contends that the movie cradles several cultural notions in binary oppositions in order to arrive at a middle ground which serves as a defining notion of the changes in Malayalee culture. Roland Barthes' five codes will be used in *reading* the movie, in order to illustrate how food and culinary elements contribute to exploring and coming to terms with the perceived differences.

Binaries or binary opposition is a term which when employed in studying culture can help understand human culture. Binary oppositions, due to the very fact that they cannot possibly co-exist, makes one realise how they can in-fact inform their functioning in a larger system. Many of our society's most enduring ideas are maintained and reinforced by the fact that their meanings are created by the workings of binary opposition. Dominant ideologies are maintained and ingrained through these binaries. Associations and attitudes are part of the cultural notions tied to each part of any binary opposition.

Salt N' Pepper begins its binary opposition in the title which marks out the white/black dichotomy which also turns out to be is a culinary mainstay in flavouring. The other binaries which we will observe would be that of tradition/modernity, alienation/companionship, masculinity/femininity and single/married – to name a few.

As purported by Barthes, all narratives share structural features that each narrative weaves together in different ways. Despite the differences between individual narratives, any narrative employs a limited number of organizational structures (specifically, five of them) that affect our reading of texts. Rather than see this situation as limiting, however, Barthes argues that we should take this plurality of codes as an invitation to read a text in such a way as to bring out its multiple meanings and connotations. Barthes argues in *S/Z* that every narrative is interwoven with multiple codes. Any text is, in fact, marked by the multiple meanings suggested by the five codes. The five codes being: the hermeneutic code, the proairetic code, the semantic code, the symbolic code and the cultural code.

The Hermeneutic Code, as Dino Felluga defines, refers to any element in a story that is not explained and, therefore, exists as an enigma for the reader, raising questions that demand explication. The suspense which



sustains the plot is also the same which unfolds the action or the proairetic code. The movie, opens with a song ‘Chembavu’, which contains the names of over a hundred names given to dishes which are authentic to a Malayalee’s collective heritage. Though it doesn’t introduce any characters, the tantalizing myriad of food images and words would leave the audience hoping for more. Food itself, would begin to play a major role in the rest of the movie -food would help unfold the action. The opening scene starts off with a mysterious kidnapping of an aged tribal, who seems to have in his possession a well-guarded culinary secret. These two embedded hermeneutic codes, these unanswered questions, sustain the unfolding interest in the rest of the story as it progresses and brings us to the next code which drives the narrative – the proairetic code.

The Proairetic Code, is any action that furthers narrative action. It also implies the desire in the viewers to know what happens next. The characters being introduced, the action unfolds as we as viewers are taken into the lives of each of the individuals – Kalidasan, Manu and Babu on one side, and Maya and Meenakshi on the other. Quirky, determined, passionate, all these characters are linked by their devotion to good food. Kalidasan, middle-aged and single, seems to lead a very comfortable existence with his job in the archaeological department and is a food connoisseur. The fact that he goes to arrange his marriage – a ‘pennukannal’ in Malayalam – and that he falls in love with the dishes rather than the girl, and ultimately leaves the house with the cook, is testimony to his quirky love for food and good taste. It is then that the picture completes itself – Kalidasan lives by himself, now he has a cook/assistant in Babu, and enter happy-go-lucky Manu, who stays with Kalidasan while he hunts for a job in the city. This is one thread of the plot, the other unravels with that of the tale of Maya, a middle-aged and single like Kalidasan. She works as a dubbing artiste in the movies and she stays along with young Meenakshi, who is pursuing her studies in the city.

Whereas Kalidasan has Babu , who also besides being his cook, doubles up as his confidant, Maya finds consolation in talking to Mary (played by Kalpana) who is her house owner and who runs a beauty parlour. Though Kalidasan and Maya are both seemingly perfectly compatible – they are both middle-aged, unmarried, self-confessed gourmands – they would never have known of each other’s existence if it hadn’t been for the wrongly dialled phone call by a starving Maya, who wishes to order her favourite dosa aka ‘Thatil Kutty Dosa’ (which ought to be paired with the garlic chutney). She dials Kalidasan’s number by mistake and that is where these two characters begin to figure in each other’s lives, albeit over the telephone. Though initially they start off on the wrong foot, they slowly bond over the sharing of their culinary favourites including that of a special multi-layered cake, Joan’s Rainbow. As the relationship gathers momentum, their insecurities in meeting the other grows simultaneously. This leads them to send a younger namesake to the pre-decided rendezvous. Obvious confusion, frustration and disillusionment follows before they are reunited at the end.

Together, the hermeneutic and the proairetic code drives the narrative. A traditional, ‘readerly’ text tends to be especially dependent on these two sequential codes: the revelation of truth and the coordination of the actions represented. The next three codes tend to work outside the constraints of time. There is no necessary reason to read the instances of these codes in chronological order to make sense of them in the narrative.

The third code, the semantic code points to any element in a text that suggests a particular, often additional meaning by way of connotation. Beginning with the title which extends its connotation to not just the two condiments – salt and pepper, it further signifies the binary of white/black or neutral/fiery. This connotation, on a deeper level sets the tone for a confrontation between binaries – salt is essential to taste even if it be tasteless, pepper adds fire and spice to a dish though it would never be



consumed by itself. The connotation that it is not complete in itself, but only in addition with something else will it be complete – binaries may not be able to classify the world into black and white, there is an area in between that needs negotiation. When extended to the area of human relationships, we find the ‘penukannal’ becomes significant. In a scene which mocks the traditional depiction of such ‘pennukannals’, we see Kalidasan, savouring the snack placed before him. As the intended bride, and her entire family looks on, he asks where the kitchen is, proceeds towards that part of the house to ask Babu who is hard at work, grinding flour, if he would come with him. What should have turned into a conventional marriage arrangement ceremony, it turns out to be a marriage of a different kind – a union of a food connoisseur and a true food artist cum chef. In such ways, the semiotic code probes into what could be seen as an enquiry into the changing cultural notions of what marriage, identity and tradition entails – a dollop of comedy added in for good measure.

The symbolic code - the easiest way to think of the symbolic code is as a "deeper" structural principle that organizes semantic meanings, usually by way of antitheses or by way of mediations (particularly, forbidden mediations) between antithetical terms. The cake that both prepare simultaneously over the phone has deeper significance. The legend of Joan's Rainbow is described by Nita Sathyendran in *The Hindu*:

The story goes that at the end of the Second World War, a French soldier's wife started baking a strawberry cake to give her husband when he returned from the War. He didn't turn up that day, nor did he the next day when she had added a pistachio-flavoured layer to the cake. On the third day she baked a third layer, one in orange flavour, but he didn't come that day either. On the fourth day when she was about to lose hope, her husband arrived bearing a box of chocolates! The woman is said to have melted the

chocolates and made a fourth layer, and served the rainbow of layers to her husband, sealing their bond of love forever.

The cake thus becomes a symbolic code which represents the budding love between the two aging protagonists. The process which takes a couple of days, also sets the pace for the development of their growing intimacy over their telephonic conversations, which culminates in them finally tasting a slice of the cake and being overwhelmed by how delicious it tastes. It echoes how their relationship, which though begun a few days ago, has devoured them and continues to nourish and nurture them, while leaving each of them with a delicious after-taste. It also deserves mention that symbolic code is used where dialogues/words fail to convey as much as the visuals do. For instance, at the point when Babu willingly drives off with Kalidasan after the 'penukannal', the very first thing he hands to him, which forms part of his luggage, are his set of dumb-bells. The binary notions of a muscular man and a feminine occupation of being the food provider is combined in the character of Babu.

The cultural code - designates any element in a narrative that refers "to a science or a body of knowledge"(Felluga). The culinary space, is often culturally considered as a women's space, but in this movie, the cultural complexities of the interconnectedness of social constructions are brought to light. Traditionally savoured food items which were being fast replaced by modern westernised fast food were once again celebrated. Famous hotels, tea stops and 'thattu kadas' were given special prominence (the hotels Zain, Sagar, Paragon, Bombay, Buhari, Ananda Bhavan etc.) What this movie effectively did was it provided a substantial competition against an erasure of a treasured culinary past, and also provided a bridging link to the future. The changing face of the modern malayalee, one who takes pride in their tradition, as well as tackles the complexities of modernity found an echoing sentiment in the masses. The Malayalam rock band, interestingly, who are



known as ‘Avial’ composed the promotional song for the movie, which was performed by the lead singer Tony John , clad in a traditional ‘lungi’ and a T-shirt with Malayalam words on it. The return to the roots for lyrics and inspiration is what made them stand apart.

Together, these five codes function like a ‘weaving of voices’. The codes point to the multi-valence of the text , allowing a viewer/reader to see a work not just as a single narrative line but as a constellation or braiding of meanings: the grouping of codes, as they enter into the work, into the movement of the reading, constitute a braid (*text, fabric, braid*: the same thing); each thread, each code, is a voice. A voice which proclaims the arrival on the scene of a force to reckon with – a protean malayalee, who changes but remains true to one’s roots. The movie was a commercial success and a trendsetter upon its release. There have also been several more movies since like *Ustad Hotel* (2012), which touches upon the relationship between a grandfather and his grandson via the medium of food, as well as *Angamali Diaries* (2017) and *Spanish Masala*(2012) all of which cater to include some instances of a culinary narrative in order to add to the plot. These go a long way in renewing and celebrating the traditional food platter of Kerala as well as merge the modern Malayalee ethos by staying true to their roots.

Works Cited

- [1] Felluga, Dino. "Modules on Barthes: On the Five Codes." *Introductory Guide to Critical Theory*. 31 Jan. 2011, <http://www.purdue.edu/guidetotheory/narratology/modules/barthescodes.html>. 2 Jan. 2016.
- [2] *Salt N’ Pepper*. Directed by Ashiq Abu, performances by Swetha Menon and Asif Ali, Lucsam Creations, 2011.
- [3] Sathyendran, Nita. "Feast on Romance." *The Hindu*, 7 July 2011.

ANANGANMALA ECO-TOURISM PROJECT A SWOT ANALYSIS

Rathi K. N.

Assistant Professor
PG. Department of Commerce and
Management Studies
S.V.T.B. College
Mannampatta, Palakkad
9995667927
rathikn14@gmail.com

Rekha P. T.

Research Scholar
Department of Commerce and
Management Studies
Bharatamata College
Thrikkakkara
9961222577
rekhapt77@gmail.com

Abstract

Ecotourism is a sub-component of the field of sustainable tourism. As an alternative tourism, it involves visiting natural areas in order to learn, to study, or to carry out activities environmentally friendly, that is, a tourism based on the nature experience, which enables the economic and social development of local communities. It focuses primarily on experiencing and learning about nature, its landscape, flora, fauna and their habitats, as well as cultural artifacts from the locality. As per Forest department of Kerala, there are nine ecotourism destinations in Palakkad district, Kerala. Anangamala Eco tourism project started in the year 2010. Anangan Mala is located 45 Kms from Palakkad district headquarters. The area immediately following the mountain, the valley, is called Ananganadi. The highest point is 400Metre. Its a pleasant sight to see the tribes on the other side of the hill set some parts of the forest on fire, looking for honey. It's a common sight to see goats that sometimes climb the full height of the mammoth hill. As a legend Anangan mala had a folk story which established between the local people which is related to epic Ramayana. It has emerged as a famous shooting location of Malayalam film industry. The hill is made up of granite rock and the major tourist attractions are trekking, panoramic view and beautiful landscape. It is near to the river Nila, called as Nile of Kerala and several cultural heritage centers of Kerala. The investigators intended to study the strength, Weaknesses, Opportunities and Threats of the project. The major objectives of the study were to know the potentiality of the tourism destination. Both qualitative and quantitative data used for the study. The methods used were observation and interview. The interview schedule were prepared collected data from the tourists visited the destination. The observation was done as participative observation. The collected data are analyzed and interpreted. It was concluded that more facilities should be made available for tourists to rest after trekking.

Key words: *Eco-tourism, Ananganmala, SWOT analysis*



Introduction

As a sub component of Sustainable tourism, the ecotourism involves the visit of natural areas for learning, studying or carrying out eco-friendly activities based on natural surroundings. It enables the local community to develop



economically and socially. The ecotourism helps the visitors to learn or experience about the nature and culture of the area. It is aimed to minimize the damage to the area ecologically or culturally. The Ananganmala ecotourism project is included in the list of ecotourism spots of Kerala in the year of 2010. Ananganmala is a unique ecological spot of Palakkad district, Kerala. The Ananganmala is a part of the Western Ghats, stretch of mountain that extends between Ottapalam and Cherpulassery, traversing through Ambalappaara and Kizhur. This stretch of mountain is one of the most picturesque natural locations in the entire district of Palakkad.

Ananganmala

A medium sized hill, area famous as a film location, calm village area. Hill extends up to 18 km. through Kizhur, Kothakurssi, Panamanna, and Varode Ambalappaara. Ananganmala is located 10 Kms from Ottapalam, along Cheruppulassery Road. The area immediately following the mountain, the Adivaram, is called Ananganadi. It's a pleasant sight to see the tribal on the other side of the hill set some parts of the forest on fire, looking for honey. It's a common sight to see goats that sometimes climb the full height of the mammoth hill. The highest point is 400Metre.

Need and Significance of the Study

Ananganmala ecotourism project located at a spot the Ananganmala, the important mountain which help to protect the climate of the rest of the part of the district. The hot winds from Tamil Nadu region enters the Palakkad area through the Palakkad gap of Western Ghats but these part of the mountain block it to pass on to the other side. TIES (The International Ecotourism Society) define ecotourism as "responsible travel to natural areas that conserves the environment and improves the well-being of local people." According to International ecotourism society, there are some principles to be followed in the ecotourism projects like Minimize impact, Build environmental and cultural awareness and respect, Provide positive experiences for both visitors and hosts, Provide direct financial benefits for conservation, Provide financial benefits and empowerment for local people, Raise sensitivity to host countries' political, environmental, and social climate and Support international human rights and labour agreements. Here the investigators wanted to know how much these principles are followed in the ecotourism project at Ananganmala. This study may help to analyze the tourists' perception on the project and to know the strengths, weaknesses, Opportunities and Threats of the project.

Objectives of the Study

- 1) To know the Strengths of the Ananganmala Ecotourism project.
- 2) To know the Weaknesses of the Ananganmala Ecotourism project.
- 3) To know the Opportunities of the Ananganmala Ecotourism project.
- 4) To know the Threats of the Ananganmala Ecotourism project.
- 5) To study the perception of tourists on the Strengths, weaknesses, opportunities and threats of the Ananganmala Ecotourism Project.



Review of Literature

Campbell (1999) conducted a study on Ecotourism in rural developing communities which consider the ad hoc development of ecotourism at Ostional, Costa Rica, and the potential benefits for the local community in the absence of government planning or intervention. In 1995, only four percent of Ostional households identified tourism as a source of income; however, this was substantial in comparison to that derived from other economic activities.

Thampi (2005) published an article which describes and evaluates the ecotourism project at the Periyar Tiger Reserve (Thekkady), in Kerala, India. The Ministry of Environment has undertaken to promote local community participation in forest management, through the “India - Eco – Development” programme in seven states. In Kerala, the ‘Thekkady Tiger Trail’ project was launched a couple of years ago in the Periyar Wildlife Sanctuary.

Musthafa and Aiswarya (2014) Studied Identification of Ecotourism Potentialities in Ananganmala and found the ecological, social, cultural and tourism perspectives of the Ananganmala Ecotourism project.

Research Methodology

Collection of Data:

Both primary and secondary data is used in this study. The primary data was collected from visitors, staff and local people of the site carried out on the basis of objectives set for the study and secondary data sources include the websites of Kerala Forest Department and The International Ecotourism Society and other records found.

The data analysis is divided into two parts. The first part discusses the analysis of results of opinion of the visitors, who spent an evening in the site

and the second part interprets data collected from the community members, who have been the residents of the locality for long time and the members of the staff at the collection counter of the project.

Findings

These hills stretch 10 km, covering Thrikkadeeri, Ananganadi and Ambalappara Panchayaths and Ottapalam municipality. Peak height is 1200 meters from ground level and the area covers 2500 acres. It comes under the Ottapalam Forest Range of Palakkad Forest Division, Kerala state. There is an oral testimony related to the mountain among Folklore that a piece of the mountain Lord Hanuman carried from Himalayas to Sri Lanka fell, as he flew over Ottapalam, and this is the Hill - Anangan Mala (meaning mountain that cannot be moved in local language).

Descriptive Findings

Strengths:

- 47 per cent of the respondents strongly believed that the ‘natural beauty of the site’ is the strength of ananganmala and 53 per cent agreed to that opinion.
- 80 per cent of the respondents believed that ‘good climate’ constitute the strength of ananganmala and 20 per cent strongly supported to that point.
- 70 per cent of the respondents agree that ‘rural people are very supportive’ for the growth of ananganmala as a tourist place and 30 per cent of the respondents neither agree nor disagree to that matter.
- 10 per cent of the respondents strongly believed that ‘ecological importance of the place’ contribute strength of ananganmala and 73 per cent of the respondents agreed to that point and 6.7 per cent



disagreed to that point and 10 per cent neither agree nor disagree to the matter.

- 10 per cent of the respondents strongly believed that the strength of ananganmala constitute its 'strict control for non biodegradable waste' and 30 per cent agreed to that point and 26.7 per cent strongly disagreed to the matter and 13.3 per cent of the respondents supported to the this group and 20 per cent neither agree nor disagree to that point.

Weaknesses:

- 13.3 per cent of the respondents have opinion that 'trekking facilities in ananganmala are not so good' and 40 per cent of the respondents neither agree nor disagree to that opinion and 16.7 per cent strongly disagreed to that point and 30 per cent supported to this group.
- 56.7 per cent of the respondents strongly believed that there is 'unavailability of medical facilities in the site' and 13.3 per cent agreed to that opinion and only 3.3 per cent have strong opinion that there is availability of medical facilities if need arise and 6.7 per cent supported to that point and 20 per cent of the respondents neither agree nor disagree to the point.
- 10 per cent of the respondents have opinion that 'no public transportation facilities are available' for travelling to the site and 20 per cent agreed to that opinion and 6.7 per cent of the respondents strongly opposed to the opinion, 36.6 per cent supported them and 26.7 per cent neither agree nor disagree to the matter.
- 3.3 per cent of the respondents have strong opinion that 'waterfall in ananganmala is live only at rainy season and 40 per cent of the

respondents agreed to that opinion and 16.7 per cent of the respondents strongly disagreed to the point and another 16.7 per cent supported to this group. And 23.3 per cent neither agree nor disagree to the matter.

- 6.7 per cent of the respondents have the opinion that there is no comfort station and cloak room maintained in ananganmala but 30 per cent strongly disagreed to that point and 36.6 supported them and 26.7 per cent remain silent.

Opportunities:

- 10 per cent of the respondents have opinion that ananganmala is 'maintained as plastic free zone' and 13.3 per cent agreed to that point but 16.7 per cent of the respondents disagreed to that opinion and 60 per cent is silent to the matter.
- 50 per cent of the respondents believed that film park at Ottapalam may increase the number of visitors to ananganmala and 13.3 per cent strongly supported to that opinion and 13.3 per cent disagreed to that point and 23.3 per cent remain silent.
- 23.3 per cent of the respondents believed that film shootings may increase the income of ananganmala eco tourism project and 30.1 per cent of the respondents disagreed to that opinion and 3.3 per cent strongly supported to them and 43.3 per cent neither agree nor disagree to that point.
- 10 per cent of the respondents strongly believed that there is good support from Kerala Tourism Department to the said project and 20 per cent of the respondents agreed to that point and 13.3 per cent disagreed to that opinion and 56.7 per cent remain silent means neither agree nor disagree.



- 40 per cent of the respondents have opinion that forest area is separated with fences for conservation and 6.7 per cent strongly supported to that opinion and 23.3 per cent of the respondents disagreed to that point and 30 per cent remain silent.

Threats:

- 3.3 per cent of the respondents have strong opinion that trekking is a risky venture and 60 per cent agreed to that opinion and only 10 per cent of the respondents disagreed to that opinion and 26.7 percent remain silent.
- 3.3 per cent of the respondents believe that crusher units in the locality become harmful to the site and 40 per cent strongly disagreed to that opinion and 46.7 per cent also have disagreement to that matter.
- 56.7 per cent of the respondents have opinion that there is extremely hot climate in the summer season and 13.3 per cent disagreed to that point and 30 per cent remain silent.
- 6.7 per cent of the respondents strongly believed that excessive number of tourists may adversely affect the serenity of the site and 50 per cent of respondents agreed to that opinion and 6.7 per cent strongly disagreed and 13.3 per cent disagreed to the matter. And 23.3 per cent remain silent to the matter.
- 30.1 per cent of the respondents strongly believed that increasing number of hotels and restaurants will lead to pollution and 43.3 per cent agreed to that opinion and only 3.3 per cent disagreed and 23.3 per cent remain silent.

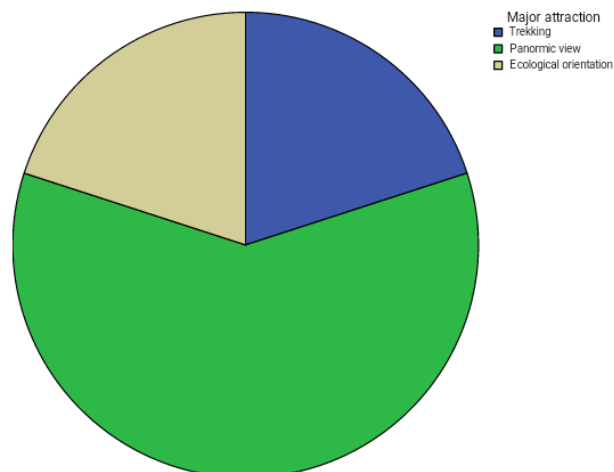
Major Findings

- Natural beauty, ecological importance and good climate are the major strengths of Ananganmala.
- Unavailability of medical facilities and no view of waterfalls at summer season are the major weaknesses of ananganmala.
- Film Park at Ottappalam contributes more visitors to this site. And also forest area conservation constitutes the opportunities of this project.
- Trekking as a risky venture and extreme hot climate at summer constitutes major threats and also excessive number of visitors and the increasing number of hotels and restaurants may adversely affect the site in future.

Other findings

Major attraction

Items	Percentage of frequency
Trekking	20
Panoramic view	60
Ecological orientation	20
Total	100





Conclusion

The Forest Authorities have so far become proactive in regulating the tourism activities and innovative in introducing the activities with strict adherence to the ecotourism guidelines and the International Ecotourism Society (TIES). The participants or the tourists are largely enlightened with the relationships in the ecosystem and their interdependences. So efforts should be taken to maintain these eco tourism projects.

References

- [1] Campbell, L. M. "Ecotourism in Rural Developing Communities." *Annals of Tourism Research*, vol. 26, no. 3, 1999, pp. 534–553.
- [2] Thampi, Santhosh P. "Ecotourism in Kerala, India: Lessons from the Eco-Development Project in Periyar Tiger Reserve." *E Paper Series*, 13 June 2005, www.ecoclub.com/library/epapers/13.pdf.
- [3] Musthafa and Aiswarya. *Identification of Ecotourism Potentialities in Anaganmala*. 2014. University of Calicut, PhD dissertation.

DEMOGRAPHIC DIVIDEND AND PRODUCTIVITY: ROLE OF DDU-GKY

Dr. Tessy Thomas

Assistant Professor

P.G. Department of Commerce,

Bharata Mata College, Thrikkakara

Abstract

The human capital is rightly regarded as a productive element, nevertheless the age and quality of the population is significant. Demographics has an impact on economic performance, especially, the changing age structure of the population is a significant component in the growth and progress of an economy. The Indian scenario unfolded that, with a median age of around 24 years in 2010, India has one of the youngest populations in the world. This paper is an attempt to understand the concept of demographic dividend on the basis of various theoretical and empirical literature. It also examines India's economic panorama through a demographic lens and discusses policy issues related to skill training and to capturing the economic potential they create. A significant scheme, the Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY), which is a placement linked skill development scheme, is selected and the performance across the country is analyzed, by using secondary data related to various states.

Key words: *Demographic dividend, skill development, Deen Dayal Upadhyaya Grameen Kaushalya Yojana*



Introduction

The world encountered striking population growth during the past 100 years, with the number of inhabitants is over 7.6 billion in June 2018. The global population, though grew at a rapid rate of roughly 2% per annum, which is a level unsustainable in the long term, has not yet met the Malthusian pessimistic prophecy of human wretchedness and mass mortality. On the contrary, human capital is recently rightly regarded as a productive element, which could be read along with the saying; “man is born with one mouth to feed and two hands to work”. However, the age and quality of the population is significant, to make it a prolific element of economy. Such demographics has an impact on economic performance, especially, the changing age structure of the population is a significant component in the growth and progress of an economy.

In a constructive demographic transition, a ‘baby boom’ might occur in the beginning, which requires more resources, which may slow economic growth. However, when babies born in such a boom period reach working ages, the productive capacity of the economy expands on a percapita basis and produces a demographic dividend. The phenomenon of higher economic growth on account of changes on the demographic profile of a country is called ‘demographic dividend’. It is defined as the benefits derived from a rise in the ratio of working age (15-59 years) to dependent or non-working population (aged under 15 and above 60). This ‘window of opportunity’ due to the changing age structure, is available for a limited period as improvements in various dimensions. Economists have garnered evidences from countries across the globe regarding the economic growth spurred by demographic transitions. However, increase in working-age population doesnot automatically leads to an accelerated economic progress. Appropriate planning and resultant policies are a prerequisite to take advantage of demographic dividend. In the absence of such policies, the

resultant large number of unemployed and under-employed working age individuals will create a scenario of ‘demographic disaster’.

As India encountered more than threefold increase in her population in sixty years, the pessimistic and panicky view has focused on the negative impact of population growth with environmental sustainability and increased threat of social unrest being major concerns. At the same time, the Indian economy is currently at a stage where high economic growth has been projected over the next few decades by various agencies. As the role of demographic factors are on the spotlight now, variations in demographic patterns have some apparent socio-economic implications on economic growth, poverty and inequality, sustainability of natural resources, education, health and urbanization. According to the United Nations Population Statistics, by 2020, the average age of an Indian person will be 29 years. This huge bulge working-age population combined with a medium fertility rate will bring about a declining dependency ratio. The low dependency ratio together with the properly planned investment is likely to result in an elevated growth trajectory in the future years (Govt of India, 2013).

Objectives and Methodology

This paper is an attempt to understand the concept of demographic dividend on the basis of various theoretical and empirical literature. It also examines India’s economic panorama through a demographic lens and discusses policy issues related to skill training and to capturing the economic potential they create. A significant scheme is selected and the performance across the country is analyzed, by using secondary data related to various states.

Literature Review

Several studies have attempted to explore this issue of demographic dividend with in an econometric framework. In the context of the BRIC economies, Wilson and Purushothamam (2003) discussed about favourable



demographic pattern supporting the growth momentum, without openly mentioning the issue of dividend. Thereafter, Mohan (2004) discussed the issue of demographic dividend in the context of East-Asian economies, but did not provide any estimate of the quantum of such dividend. Gribble (2012) discusses the situations in various countries like Malawi, Thailand, Bolivia, Brazil and Ethiopia, in the path to tap the demographic dividend.

Researchers have discussed the issue of demographic dividend in the Indian instance, around the same time. Acharya (2004) has noted that, the demographic dividend could turn out to be a disaster if the potential incremental labour supply is not successfully absorbed into the workforce. Likewise, The Economic Survey 2012 (Government of India, 2012) had made the following observation: “With over 1.2 billion people, India accounts for nearly one-sixth of global population. While the rate of growth of population has consistently declined, India’s population has increased by nearly 180 million during 2001-2011. However, India is also passing through a phase when its dependency ratio will decline from an estimated 74.8 in 2001 to 55.6 in 2026 with a corresponding increase in the share of persons in working-age group. With labor being a key factor of production, a demographic dividend is a clear positive for growth. It has, however been pointed out that much of the growth in population will occur in states that are currently poor. Therefore, for this dividend to accrue, it will be necessary to build human capital in adequate measure.”(pp. 348)

So as to reap the benefits of demographic dividend, the working-age populace should be properly trained. Patel (2011) in his research about poverty Alleviation Programmes, pointed out the need for capacity building. Monika et al. (2012) and Karmavir (2013) suggested need for training for the beneficiaries in various aspects. Tessy (2016) recommended that the rural youth with genuine flair in entrepreneurial talents are to be identified and given training so as to enhance our human capital. Nevertheless, there is a

significant gap between skill requirements in industry and skill levels of those graduating out of the training institutes. Keeping pace with the dynamism of the industry, the current quantity and quality of training of new entrants in the workforce need to be synchronized. Mehrotra et al. (2014), after significant analysis and estimation suggest that the degree of this problem, though not so stupendous, is certainly very challenging. He also points out the obvious mismatch in supply-demand, both in terms of quantity and quality, and the urgency of patching it up with proper policy measures and the implementation at grass-root level.

Government-Funded Programme

Thus, it could be argued that India's success in realizing its DD is crucially tied up with its capacity to conduct a stable but progressive macro-economic policy or sustaining high growth in the medium to long term. In successive Five Year Plans and public expenditure programmes, rural employment creation were given due importance. A number of social welfare programmes such as Training of Rural Youth for Self Employment (TRYSEM) and Supply of Improved Tool kits to Rural Artisans (SITRA) were aimed at skill development. Swarnajayanti Gram Swarozgar Yojana (SGSY) was introduced in 1999, which subsumed various erstwhile self-employment programmes namely IRDP, TRYSEM, DWCRA, SITRA, GKY and MWS. Later, in 2011, SGSY was restructured into National Rural Livelihood Mission, which include 'Ajeevika Skills'. The scheme is succeeded by Deen Dayal Upadhyaya Grameen Kaushalya Yojana since 25 September 2014.

Deen Dayal Upadhyaya Grameen Kaushalya Yojana (DDU-GKY) is the placement linked skill development scheme of the Ministry of Rural Development (MoRD), Government of India, with the twin targets of adding up multiplicity to the incomes of bucolic poor families and cater to the career ambitions of the rural youth. Scaffolding their occupational aspirations and enhancing their skills for wage employment is the focal point of the scheme.



The paper makes a detailed study of DDU-GKY, and thus attempts to look into the steps taken by the government to harvest its demographic dividend. The functioning of the scheme across the country is analyzed, by using secondary data related to various states. The data of 2 years- 2015-16 and 2016-17 related to training, placement and funding are looked into. The data regarding 21 states are considered, after eliminating the outliers and missing figures. As DDU-GKY is specifically for the rural inhabitants, the percentage of rural population between 15 to 59 years is also taken note of, regarding the states under study.

Table 1: The statewise data regarding training, placement, funding and rural population

States	Trained 15-16 (in no.s)	Placed 15-16 (in no.s)	Funding 15-16 (in no.s)	Trained 16-17 (in no.s)	Placed 16-17 (in no.s)	Funding 16-17 (in lakhs)	rural populace (in %)
Andhra Pradesh	4013	1989	8619.25	11121	6976	82.9	68.9
Assam	5010	3663	3337.45	7267	1479	10046.83	63.6
Bihar	8248	3951	5637	7743	2097	3606	57.9
Chhattisgarh	11007	6578	145	6767	1987	8947.2	62.5
Gujarat	9894	0	225.54	2192	2075	154.29	63.5
Haryana	13409	6463	598.6	9956	586	58.04	64.1
Himachal Pradesh	0	8807	342.91	0	0	3670.44	65.6
Jammu & Kashmir	18609	0	2266.7	6935	6453	7360.09	67.2
Jharkhand	10326	16524	153	7383	2198	6464.43	61.4
Karnataka	12426	8384	7485.55	9985	4432	256.74	66.6
Kerala	5255	6411	139	10516	5149	4711.71	64
MadhyaPradesh	13883	0	188	10654	3436	7546.46	61.4
Maharashtra	2091	4307	9665.58	3307	1123	96.07	62.8
Odisha	28959	21411	4214.82	29112	27348	2195.44	64.3
Punjab	0	0	2862.5	0	0	11.3	66.9
Rajasthan	23143	12494	375.5	3837	3397	63	61.1
TamilNadu	25054	12428	4390.23	113	6385	2591	66.3
Telangana	3554	1830	4422	7636	6336	2190.62	69.3
UttarPradesh	69070	11306	1048.13	10407	2052	549.56	61.5
Uttarakhand	1588	780	65.09	0	0	1891.12	60.1
WestBengal	3983	3117	146	2186	979	8890.37	66.8

Source: compiled using various data sheets obtained from Indiatat.com

Data Analyses

The data is put to analysis and for the statistical testing purpose, following null hypothesis are framed.

H₀1: There is no correlation between training and placement.

H₀ 2: There is no correlation between funding and training.

H₀3: There is no correlation between funding and placement.

H₀ 4: There is no correlation between training and age group.

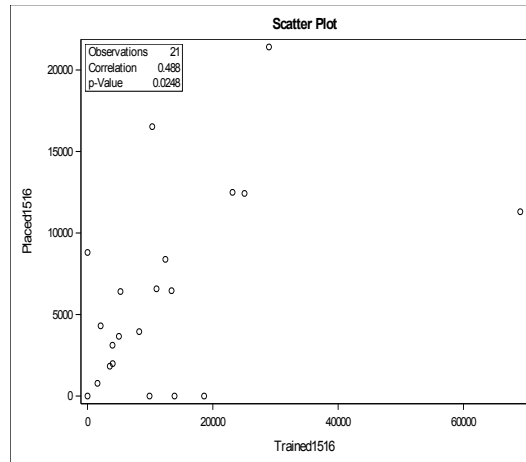
H₀ 5: There is no correlation between funding and age group.

H₀ 6: There is no correlation between placement and age group.

Rejection Criteria: If the p -value associated with any of the Pearson Correlation Coefficients corresponding to the given pair of enquiry is less than .05, the corresponding null hypothesis will be rejected. The testing is done separately for the data regarding each of the two years.

Results of Data Analysis

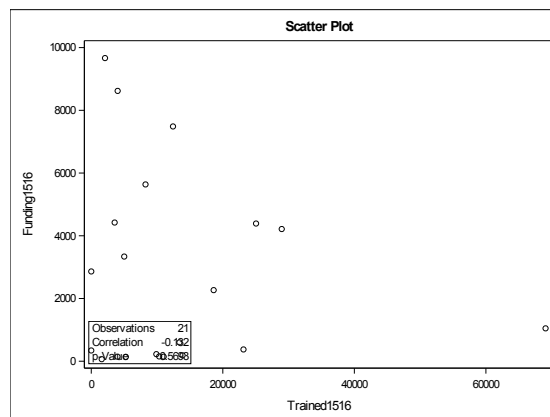
As per the rejection criteria, H₀1 is disproved, for both the years. Thus, the alternate hypothesis, saying that there exists a significant relationship between the concerned variables (training and placement; in both years) is accepted. The H₀ 2, H₀3, H₀ 4, H₀ 5 and H₀6 are accepted, proving that there is no significant relationship between the variables. The Charts gives a detailed view of the analysis.



Source: Data Analysis output

Chart 1: Placed and trained – 2015-16

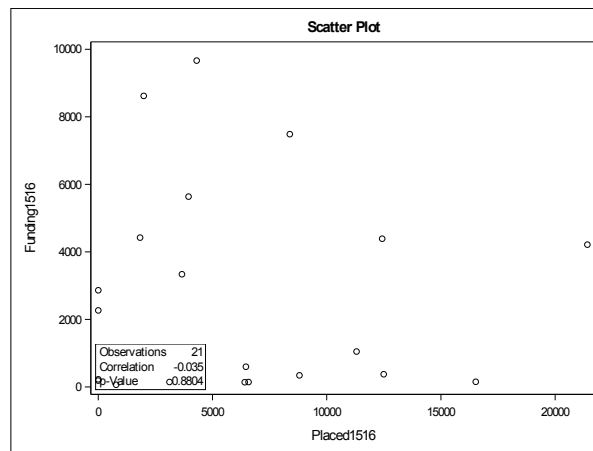
The scatter diagram (Chart 1) shows the correlation between the trained and placed in the year 2015-16, the correlation coefficient being 0.488. There is significant relation between these two variables in the year 2016-17 also, the correlation coefficient being 0.827, which shows betterment of the scheme in the focus area of skill training and employment creation. Based on the P value, which is less than .05, there is significant correlation between training and placement, for both the years.



Source: Data Analysis output

Chart 2: Funding and trained – 2015-16

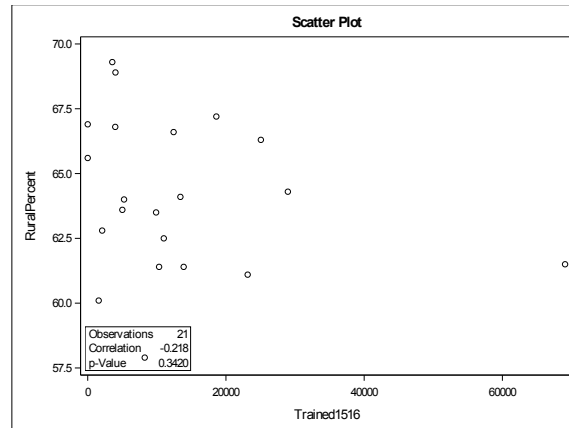
The scatter diagram (Chart 2) shows the correlation between the trained and funding in the year 2015-16, the correlation coefficient being -0.13. There is not much positive relation between these two variables in the year 2016-17 also, the correlation coefficient being 0.0026, which shows need of monitoring the fund utilisation.



Source: Data Analysis output

Chart 3: Funding and Placed – 2015-16

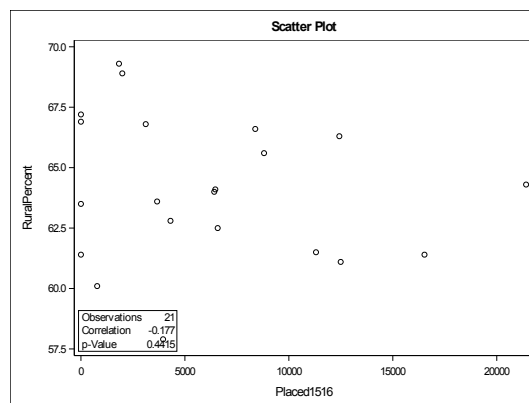
The scatter diagram (Chart 3) shows the correlation between the placement and funding in the year 2015-16, the correlation coefficient being -0.03495. There is no positive relation between these two variables in the year 2016-17 also, the correlation coefficient being -0.08, which shows need of observing the fund utilization and intensive placement orientation.



Source: Data Analysis output

Chart 4: Rural percentage and Trained: 2015-16

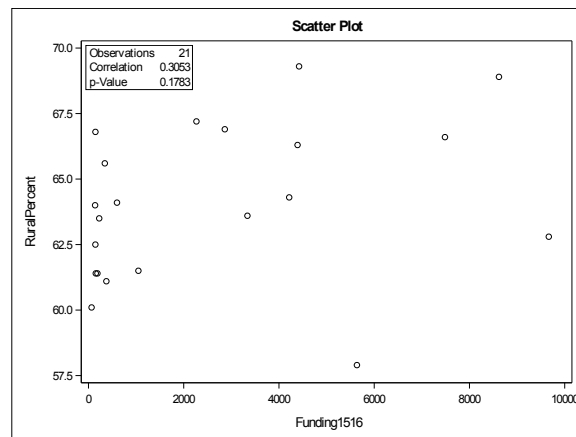
The scatterplots (Chart 4) shows the correlation between the percentage of rural population and training in the year 2015-16, the correlation coefficient being -0.218. There is no positive relation between these two variables in the year 2016-17 also, the correlation coefficient being --0.007, which brings to light the need of sticking to the guidelines by giving opportunities to the rural youth, as much as possible.



Source: Data Analysis output

Chart 5: Rural percentage and Placed: 2015-16

The scatterplots in Chart 5 shows the correlation between the percentage of rural population and placement in the year 2015-16, the correlation coefficient being -0.177. There is a positive relation between these two variables in the year 2016-17, the correlation coefficient being 0.202, showing improvement.



Source: Data Analysis output

Chart 6: Rural percentage and Funding: 2015-16

The scatterplots in Chart 6 showing the correlation between the percentage of rural population and funding in the year 2015-16, depicts the correlation coefficient 0.305. There is a positive relation between these two variables in the year 2016-17, the correlation coefficient being -0.084, showing necessity of planned disbursement of funds mostly catering to the needs of rural youth, based on requirement of skill training.

Conclusion

There are statistically significant correlations between the training and placement in both the years. This reveals that the guidelines given by the government is strictly adhered to and the trained candidates are given



opportunities for job and that they are suitable for the industry requirement. This is a positive sign of harnessing the demographic dividend.

The funding for the project in both the years did not statistically correlate significantly with training, placement, and the percentage of rural population. This gives an alert regarding the funding process and signifies the need of detailed grass-root investigation, both from the sides of policy makers and project implementing agencies.

The Percentage of rural population did not statistically correlate significantly with training, placement, and funding of the project. The reason for this non-correlation is that, in all the states the scheme is not functioning specifically in proportion to the rural populace. In some states the project implementing agencies are exceptionally successful in obtaining the appropriate candidates and training them and making it fruitful by ensuring a job. In some states there need to be more number of project implementing agencies with the DDU-GKY courses. Further, there needs counseling for the rural unemployed youth, so that the appropriate DDU-GKY courses are to be identified and suggested to the training aspirants.

This paper was an attempt to understand the economic benefit and adversity India may face during the decade, as she is on the crowning time of her demographic dividend era. To ensure that this massive workable population is a bonus, the policies should be framed with utmost care and rapidity; and India is seen to have taking right stride, with a long-term view. The detailed analysis of DDU-GKY pointed out that the policy makers are right but needs more care in the implementation.

References

- [1] Acharya, S. "India's growth Prospects Revisited", Economic and Political Weekly, Vol 39, 2004. pp.4537-4542
- [2] Bloom D and Williamson J. "Demographic Transitions and Economic Miracles in Emerging Asia". World Bank Economic Review, 1998, Vol 12, pp. 419-456
- [3] Bloom D.E., Canning, D., and Sevilla J., "The Effect of health on economic growth: A Production Function Approach" World Development, 2004, Vol 32, 1-13
- [4] Bloom, D.E, and Canning D, "Global Demographic Change: Dimensions and Economic Significance" Population and Development Review, 2008, 34 (Supplement), pp.17-51
- [5] Bloom, David E, Population Dynamics in India and Implications or Economic Growth, in The Oxford Handbook of the Indian Economy, edited by Chetan Ghate, Oxford University Press, New Delhi, 2012, pp 462-492
- [6] Bloom. D.E, and Finlay. J. (2009). "Demographic Change and Economic Growth in Asia", Asian Economic Policy Review, Vol 4, pp.45-64
- [7] Chandrasekhar, C.P., Ghosh, J. and Roychowdhury, A. "The Demographic Dividend and Young India's Economic Future", Economic and Political Weekly, 2006, Vol. 41, pp. 5055-5064
- [8] Ghosh, Saibal, "Estimating the Demographic Dividend: Evidence from Indian States", Journal of Population Ageing, 2016, Vol 9, pp.249-262
- [9] Government of India, Economic Survey 2012, New Delhi, Government of India



- [10] Government of India, Seizing the Demographic dividend. Economic Survey 2012-13 Pp.26-55
- [11] Gribble, James N.; Bremner, Jason, "Achieving a Demographic Dividend", Population Bulletin, (012, Vol 67, issue 2, pp.1-13
- [12] Karmavir, "Self Help Groups under SGSY", *International Journal of Research in Social Sciences*, Vol: 3 no: 1, February 2013, Pg: 502-506
- [13] Lee, Ronald; Mason, Andrew, "What is Demographic Dividend?", Finance and Development, Washington, Vol 43, Issue 3, September 2006, pp 16-17
- [14] Mehrotra, Santhosh; Saxena P.K., The Skill Development System in India, in "India's Skill challenge", edited by Santosh Mehrotra, 2014, pp.246-285
- [15] Mohan, R., "Fiscal Challenges in Population Ageing: The Asian Experience" RBI Bulletin, October, pp. 825-849
- [16] Patel, Amrit (2011) "A Decade of Financing SGSY – The Report Card", The Indian Banker, 2004, Vol.VI No.9, pp.38-46
- [17] Priyadarshini S, Ranjan Bhattacharya, "Skill Development Initiatives in India: Fails to Bridge the Skill Deficits despite Big Promises", International Journal of Innovative Research and Development, October 2016
- [18] Rao, Kajal B "From Silence To Soft skills through Life Skills : A case study of BPL Students at DDU – GKY Central Government Sponsored BPO Training Center, Anand, Gujarat", Global Journal of English studies, 2015

- [19] Singh, Monika, Ajay Kumar, Verma N.M.P “Assessment of Self-Help Groups From The Lenses Of Poverty In Uttar Pradesh: A Study Of SGSY”, *Asian Journal Of Research In Social Science And Humanities*, 2012, Vol. 2, Issue 10
- [20] Tessy Thomas, “A Critical Analysis of Swarnajayanti Gram SwarozgarYojana and its impacts on Rural Empowerment”, Thesis, Mahatma Gandhi University, Kottayam, 2016
- [21] Williamson, Jeffrey G., “Demographic Dividend Revisited”, *Asian Development Review*, 2013, Vol 30, Issue 2, pp.1-25

**BHARATA MATA JOURNAL
Of
Multidisciplinary Studies**

BMJMS is a biannual multidisciplinary reference journal with a wide spectrum of contemporary contributions in the various genres of science, management, humanities and social sciences aimed for fertile interaction, interpretation and sharing of knowledge.

SUBSCRIPTION RATES

Individual Annual (two issues) Rs. 300/-
Institution Annual (two issues) Rs. 500/-

Payment must be made through demand draft in favour of Principal, Bharata Mata College, Thrikkakara, Kochi-21 payable at State Bank of Travancore, Vazhakkala.

CALL FOR PAPERS

Next Issue	: Volume 6 Issue 1, January 2019
Last Date for submission of Research papers	: December 1, 2018
Address for Communication	: Chief Editor Bharata Mata Journal of Multidisciplinary Studies Bharata Mata College Thrikkakara, Kochi Kerala- 682021 Mob: 9446947917, 9895719059 E mail: bharatamatajournal@gmail.com

Guidelines for submission of research paper

1. Electronic submission of the manuscript as MS word file attached to an e-mail message sent to bharatamatajournal@gmail.com along with a hard copy, is the desired format for submission of papers.
2. Manuscript should have a size of 7-10 pages (A4 sized) ; 12 point Times New Roman, 1.5 spacing. Papers from humanity category should follow the MLA style of documentation.
3. Centred title should be brief, followed by centred name, affiliation and address of author(s). Indicate to whom correspondence should be sent, including a telephone number and e-mail address.
4. Manuscript should be in the order – 100 to 150 word abstract, 200 to 300 word Introduction followed by the main text document and 50-100 word conclusion summarising the findings of the paper.
5. Illustrations
 - a. Computer generated graphics should be in tif files, in 300 dpi resolution
 - b. Graphs should not be larger than 20x25 cm. Measurements should be indicated in SI units. Grids should not be shown in the graph.
 - c. Photographs should be supplied as glossy prints, of the same size as they are to appear in the journal.
 - d. Illustrations should be referred to as Fig.1, Fig.2 etc followed by a caption at the bottom of the figure.
6. Journal and Book references should be identified in the text using the Vancouver system (numbered throughout the text and numbered list at the end of the article).

Reference should be listed by number at the end of the manuscript as reference number, Author(s), *title of article*, Journal name, year of publication, volume; page.

Eg. 1. Name A.A. , Name B.B. , *Effect of Carbon Black on Devulcanized Ground Rubber Tire Vulcanizates*, Journal of Elastomers and Plastics, USA, 2013, **56**(2); 275-283.

Text references as reference number, Author(s), *name of the chapter*, Name of the book and publisher, year of publication, page.
7. Figures, tables and equations should be inside the text near/after where they are referred in the text. Tables should be numbered consecutively with a heading. Use Arabic numerals. Column headings should be explanatory and carry units. Do not include vertical lines.

Table 1 Damage location accuracy

Sl.No	Predicted location(m)	Actual location(m)	Error (%)
1	1.54	1.53	0.002
2	1.98	1.67	0.006
3	1.87	1.61	0.224

8. Papers prepared on the basis of a questionnaire survey must include the questionnaire also along with the manuscript.
9. Contributors' assurance in the prescribed format that the paper is original in nature and has not been published/accepted for publication elsewhere is needed.
10. The copyrights of the contributions published in the journal lie with the publishers of the journal.
11. The author alone will be liable in respect of any dispute involving violation of the copyright in respect of the material given by him or her for publication in the journal.
12. The editor reserves the right to make required editing of the manuscript.
13. The journal is published bi-annually in January and July.
14. The decision regarding the acceptance or otherwise of any contribution will normally be intimated within two months. We do not take the responsibility to return unaccepted manuscript.
