ISSN 0975-8941

RESEARCH LINES

Peer Reviewed
Interdisciplinary Research Journal

DEVA MATHA COLLEGE
Kuravilangad, Kerala-686 633
An ISO 9001:2008 Certified Institution
Reaccredited with 'A' Grade by NAAC
www.devamatha.ac.in

Volume XII No.1&2 June-December 2019

ISSN 0975-8941 JUNE-DECEMBER 2019

RESEARCH LINES

Peer Reviewed
Interdisciplinary Research Journal

DEVA MATHA COLLEGE
Kuravilangad, Kerala-686 633
Phone No. : 04822-230233, 232951
Email: researchlineseditor@yahoo.in
Website: www.devamatha.ac.in

Owned, Printed & Published by
Dr. JOJO K. JOSEPH
Principal

Chief Editor
Dr. PRIYA JOSEPH

Periodicity: 2 issues per year

ISSN 0975-8941

Research Lines

Peer Reviewed
Interdisciplinary Research Journal published from Deva Matha college Kuravilangad

Contact Address
Dr. Priya Joseph
Chief Editor, Research Lines
Devamatha college, Kuravilangad
Kottayam Dist, Kerala
Website: www.devamatha.ac.in
email: drpriyajoe@gmail.com

ISSN 0975-8941

Contents

1.	Jilu C John Tina Sebastian Jincemon Cyriac Saji Augustine	Structural and Optical Properties of In_2S_3-Gr Nanocomposite Thin Films	5-9
2.	Gopika S Chithra K.N. Priya Joseph	Physico-chemical and Microbial studies of Water Samples from South Gate, Vaikom	10-16
3.	Hilnadas P.H Alphy Maria Thomas	Comparative bioefficacy of selected plant extracts, commercial biopesticides and synthetic pesticides against important household pest, *Periplanata americana*	17-22
4.	Rinu A.R. Justin Jose	Cytotoxic study on the effect of Baby Powders in Cultured Liver cells	23-30
5.	Vysakh V.G. Anju Soma S. Priya Joseph	Biodiversity Status of Fishes in Kadamakudy Panchayath Area of Vembanadu Lake, Kerala	31-36
6.	Balu M. Nair Gincy Baby	Isolation and Identification of Bacteria from External Body Surface of *Musca Domestica Linn* in Kottayam, Kerala.	37-41
7.	Maneesha K Vijayanand Alphy Maria Thomas	Comparison of the Effect of Traditional Methods and Synthetic Medicines Against Three Selected Species of Bacteria Causing Throat Infection	42-46
8.	Sneha T Joe Prasad Mathew	Haematological and Behavioural Responses of A*nabas testudineus* Exposed to the Herbicide, Glyphosate	47-59
9.	Dr. Yaqoob. P.K.	Interest-free MicroFinancing - a Prospective Sector in Kerala.	60-66
10.	Anu Tressa Jose Sherin Cyriac	A Study on the Customer Satisfaction on the Services of Kochi Metro	67-72

11.	Jais Jose	Fabricating Femininity: Social Scripting and Strategies of Legitimizing Patriarchy in India	73-76
12.	Meera Prasannan	Traces of Highbrowed innuendo from the epic: a kaleidoscopic reading of antedated scientific truths in The Mahabharata	77-81
13.	Dhanya P.D.	'ചെമ്മീനി'ലെ പുരാവൃത്തവും ആദർശസ്ത്രീനിർമ്മിതിയും	82-88
14.	Ambily Mereena Kurian	നെഗ്രിറ്റ്യൂഡ് ദലിത് എഴുത്തുകളുടെ സാംസ്കാരിക സമാനതകൾ	89-93
15.	Priyadarshini. S.	Voice of the Silenced as Depicted in the Novels of Shashi Deshpande.	94-97

ISSN 0975-8941

Structural and Optical Properties of In_2S_3-Gr Nanocomposite Thin Films

Jilu C John[a], Tina Sebastian[b], Jincemon Cyriac[a], Saji Augustine[b]

[a]*Department of Physics, St. Thomas College Pala, Kottayam ,Kerala, 686 574.*

[b] *Department of Physics, Devamatha College, Kuravilangad, Kottayam, Kerala, 686 633.*

Received: 31st October 2019 Accepted: 30th November 2019

ABSTRACT

Indium sulphide thin films were grown by chemical Bath Deposition (CBD) method on glass substrates using Indium chloride and Thioacetamide as precursors and acetic acid as the complexing agent. Films were characterized by means of XRD, Raman, Photoluminescence and UV-Vis-NIR spectroscopy. XRD data confirmed that the synthesized film had tetragonal structure. The appearance of peaks corresponding to D and G bands in the Raman spectra of nanocomposite film confirms the presence of graphene in the samples.PL intensity of nanocomposite thin film is increased in the presence of graphene. From the optical analysis, it is seen that In_2S_3- Gr nanocomposite thin film shows lower optical bandgap with enhanced absorption due to the incorporation of Graphene.

INTRODUCTION

Composites are a combination of two materials in which one of the material is called the reinforcing phase, is in the form of fibres, sheets, or particles, and is embedded in the other material called the matrix phase. A nanocomposite is a composite material, in which one of the components has at least one dimension that is nanoscopic in size that is around 10^{-9} m.Indium sulphide is an n type semiconductor having optical band gap in the range 2.0eV to 3.9eV. It is the most versatile material for solar cell, display water splitting and photocatalyst applications due to wide band gap, environmental friendliness, high photosensitivity, photoconductivity and stable chemical composition. Graphene is a two dimensional carbon based material with its unique physical, mechanical, chemical, optical, electric, magnetic and thermal properties. It is a zero band gap substance. Indium sulphide thin films have been prepared by different techniques such as spray ions layer gas reaction, sputtering, chemical spray pyrolysis, thermal evaporation, spin coating, chemical vapour deposition and chemical bath deposition. Among them, CBD has many advantages when compared to other depositing methods, such as the low fabrication cost, repeatability and it is readily scalable to large area deposition.In this work, we are synthesizing In_2S_3-Gr nanocomposite thin films by two step process. First, In_2S_3 films will be deposited by chemical method, then followed by incorporation of graphene by spin coating and thereafter annealing.

MATERIALS AND METHODS

In this work, the substrate used for In_2S_3 deposition was glass. The substrates were washed using soap solution and then cleaned ultrasonically. For the deposition of In_2S_3 thin films, a chemical bath containing $InCl_3$ and Thioacetamide as Indium and sulphur precursors was used. Bath temperature was maintained at 75^0C by using water bath. pH of the solution is controlled in the range 2.3-2.6. Deposition

time is kept fixed as one hour. Cleaned glass slide is placed vertically in the reaction mixture and is kept uninterrupted for one hour.

Graphene powder is dispersed into cold poly vinyl alcohol (PVA) solution and dispersed solution was coated into as-synthesized In_2S_3 thin film by Spin coating. The spin coated film was heated at 275°C for one hour to vapourise PVA and to achieve sufficient chemical stability.

The structural properties were characterized by means of XRD measurements using a Rigaku MiniFlex 600. Raman spectra of graphene incorporated films were recorded by using confocal Raman spectrometer with an excitation of 532 nm laser light. The photoluminescence spectra were taken by Horiba Fluorolog-3 specrofluorometer. The optical measurements were done in the range 300 – 1200nm using JASCO V-670 UV-Vis-NIR spectrophotometer.

RESULTS AND DISCUSSIONS

X-ray Diffraction (XRD) Analysis

The Structural analysis was carried out using XRD with varying diffraction angle 2è from 10° to 60°. XRD pattern (Fig.1a) of CBD grown indium sulphide thin films confirmed that it crystallized in tetragonal structure with diffraction peaks (1 0 3), (1 0 9), (2 0 6), (0 0 12) and (2 2 12) which is in agreement with that of Standard pattern of ICDD card no. 00-025-0390.

XRD pattern (Fig.1b) of In_2S_3-Gr naocomposite thin film shows the presence of graphene with diffraction peak (0 0 2) of reduced graphene oxide.

The average crystallite size was determined using Debye-Scherrer equation:

$$D=0.9\ ë / â \cos(è)$$

where ë is the X-ray wavelength whose value is 1.54Å (CuKá), â is the full width at half maximum (FWHM) of the peak and è is the Bragg angle at the centre of the peak. The values of average crystallite size of pure and nanocomposite thin film were obtained as 11.5 nm and 13.8nm respectively.

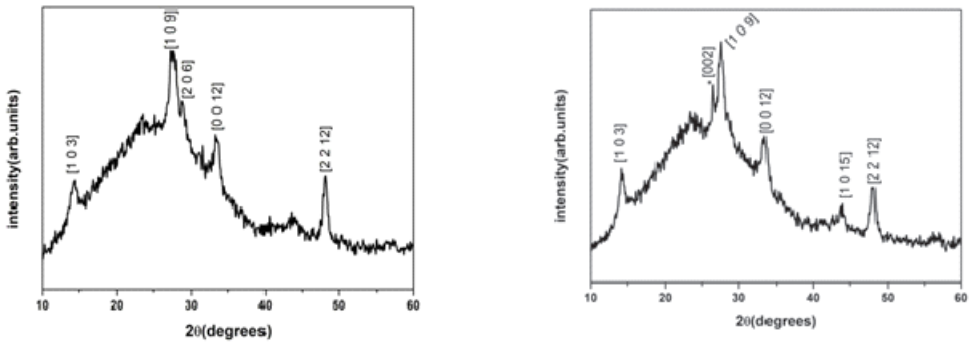


Figure 1: XRD spectrum of In_2S_3 andIn_2S_3-Gr nanocomposite thin film

Raman Analysis

The Raman spectrum of the In_2S_3-Gr nanocomposite films synthesized by CBD is shown in Fig.2. Raman modes are observed in the energy region from 50 cm^{-1} to 2000 cm^{-1}. Raman spectra of carbon based materials are characterized by two characteristic bands: D band and G band. The presence of

graphene was confirmed by two characteristic peaks corresponding to D band and G band in the Raman spectra.

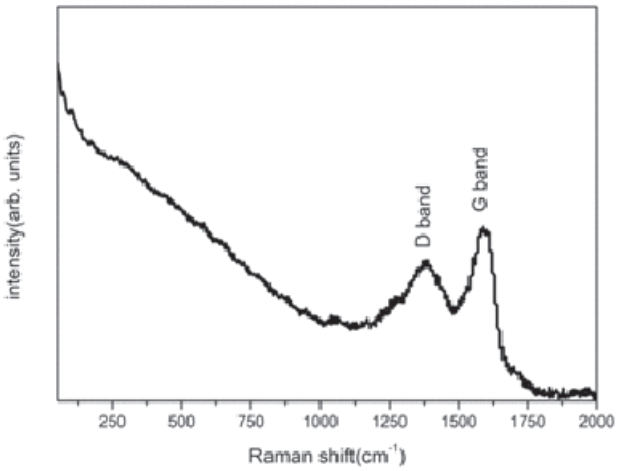
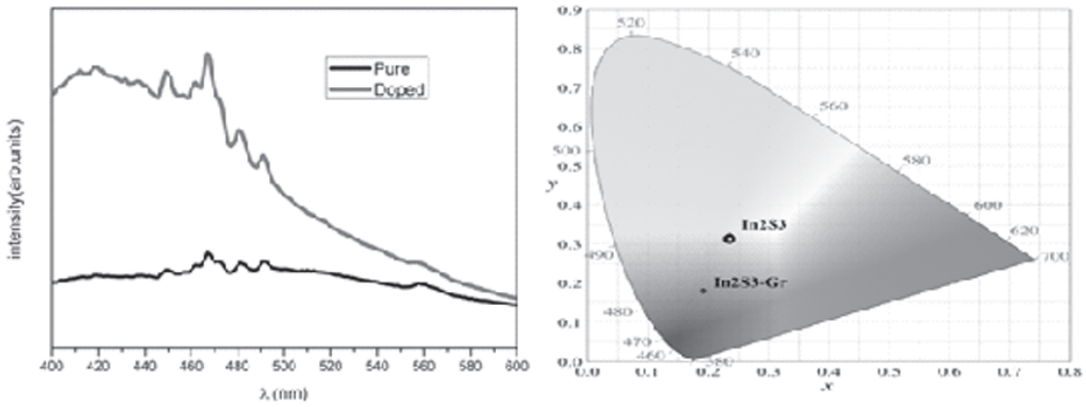


Figure 2: Raman spectrum of graphene doped indium sulphide thin film

Optical Analysis

From the PL spectra (Fig.3a), we notice that PL intensity increases due to the effect of graphene and thickness of the film. When thickness of films wasincreased,lightabsorptionwasalsoincreased.Because more electron-hole pairs were generated by the light absorption of the thicker film, the probability of electrons transitioned from the defect energy levels to the valence band also increased, producing a higher PL intensity. However, such a huge increase in PL intensity is not observed in previous reports due to the thickness of films. So, we reached the conclusion that enhancement in PL intensity is not only the thickness but also the influence of graphene.

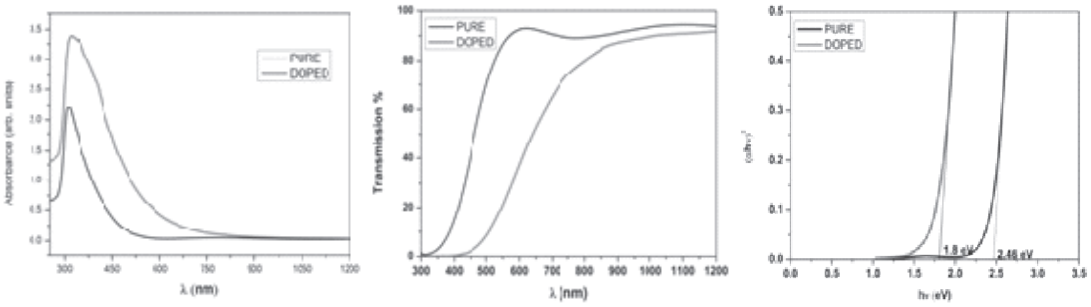


(a) (b)

Figure 3:
(a) PL intensity spectra and (b)CIE chromaticity diagram of pure and nanocomposite thin films

Most often the lighting specifications are given in terms of the 1931 CIE chromatic colour coordinates. The CIE colour coordinates are calculated by using a colour calculator program. The colour coordinates for pure and nanocomposite thin films are shown in Fig. 3b. The changes in colour are found due to the presence of graphene in indium sulphide thin films. From the Figure, we observed that the colour varies from cyan to blue when graphene is incorporated in indium sulphide. It finds a good place in opto-electronics.

Fig. 4a shows that indium sulphide thin film has low absorbance in visible region but high absorbance in ultraviolet region.Graphene's influence helps to increase the absorption range of semiconductors. The pure and nanocomposite films show a range of light absorption with absorption peak at 310 nm and 320 nm respectively. It was also observed that the absorbance is found to increase due to the introduction of graphene.



(a) (b) (c)

Figure 4: (a) Absorption spectra (b) Transmission spectra and (c)(áhí)²versus hí plot of pure and nanocomposite thin films

Fig.4b shows the dependence of optical transmittance T on wavelength ë for pure and doped In_2S_3 thin films, measured from 300 nm to 1200 nm. From the transmission studies, it was obtained that the pure film showed high transparency (around 80 %) in the visible range and it was found that the transparency of the doped film drastically decreases due to the effect of graphene.

Fig. 4c shows (áhí)² versus *hí* plot of pure and nanocomposite thin films.The optical energy band gap, 5Ø8Ü$_o$, of the films was determined using the relation :

$$\alpha h\vartheta = A(h\vartheta - Eg)^{1/2}$$

where 5Ø4Ü is constant depending on the transition probability. The energy bandgap was obtained by extrapolating the linear portions of the tauc plots onto !í axis. The optical band gap of pure and nanocomposite thin films are obtained as 2.46eV and 1.8eV respectively.

CONCLUSION

In_2S_3-Gr nanocomposite thin film was successfully synthesized by two step process. The appearance of D and G bands in Raman spectra confirms the presence of graphene in as-synthesized nanocomposite thin films. Intensity of PL spectra increases due to the presence of graphene.The optical properties can be modified by the incorporation of graphene which opens the possibility of a potential n-type absorber material.

Acknowledgement

We thank and acknowledge to the Universidad Autonoma de Nuevo Leon (UANL) Mexico, SPAP Mahatma Gandhi University Kottayam and DST-FIST (SR/FST/College-101/2012) and the UGC (1904-MRP/14-15/KLMG023/UGC-SWRO).

REFERENCES

1. G. R. Gopinath and K. T. Ramakrishna Reddy (2013).Growth of Polycrystalline In_2S_3 Thin Films by Chemical Bath Deposition Using Acetic Acid as a Complexing Agent for Solar Cell Application, *ISRN Condensed Matter Physics*, Article ID 140230,6 pages. http://dx.doi.org/10.1155/2013/140230.
2. Nan Zhang, Yanhui Zhang, Min-Quan Yang, Zi-Rong Tang, Yi-Jun Xu, A (2013). Critical and benchmark comparison on graphene-, carbon nanotube-, and fullerene-semiconductor nanocomposites as visible light photocatalysts for selective oxidation, *J catal*, 299: 210-221. https://doi.org/10.1016/j.jcat.2012.11.021.
3. YuhuaXue, Lin Zhu, Hao Chen, Jia Qu, Liming Dai, (2015). Multiscale patterning of graphene oxide and reduced graphene oxide for flexible supercapacitors, *Carbon* 92: 305-310. https://doi.org/10.1016/j.carbon.2015.04.046.
4. ParisaEsmaili, HalehKangarlou, HadiSavaloni, Mahmood Ghorannevis, (2017). Structural, optical and electronic properties of indium sulfide compositions under influence of copper impurity produced by chemical method, *Results Phys*. 7: 3380-3389. https://doi.org/10.1016/j.rinp.2017.08.062.
5. R. Jayakrishnan, Tina Sebastian, Teny Theresa John, C. SudhaKartha and K.P. Vijayakumar, (2007). Photoconductivity in sprayed â-In_2S_3 thin films under sub-band-gap excitation of 1.96 eV*, J. Appl. Phys.* 102, 043109. http://dx.doi.org/10.1063/1.2770830.
6. Shinjita Acharya, MrinalDutta,SureshSarkar, DurgaBasak, SupriyoChakraborty, and Narayan Pradhan,(2012). Synthesis of Micrometer Length Indium SulûdeNanosheets and Study of Their Dopant Induced Photoresponse Properties. *Chem. Mater*., 24:1779-1785. https://pubs.acs.org/doi/abs/10.1021/cm3003063.
7. Alejandra Garcia, Cristina Fernandez, Jose R. Herance, JosepAlbero and Hermenegildo Garcia, (2017). Graphenes as additive in photoelectrocatalysis, *J. Mater. Chem. A*, 5 (32):16522-16536. doi: 10.1039/C7TA04045H.

ISSN 0975-8941
10 June-December 2019 (Vol. XII No. 1&2) Research Lines

Physico-chemical and Microbial studies of Water Samples from South Gate, Vaikom

Gopika S, Chithra K.N.* and Priya Joseph
Department of Zoology, Deva Matha College, Kuravilangad
** Department of Botany, Deva Matha College, Kuravilangad*

Received: 13th July 2019 Accepted: 15th September 2019

ABSTRACT

Generally well water, pond water, borewell water are considered as safe sources of water. They contains low microbial loads, however they were also vulnerable to pollution which increases the microbial content and thus there is a chance in lowering the quality of water. In this study an assessment of microbial and physico-chemical qualities of selected water samples from South Gate Vaikom, Kottayam was carried out. The study aimed at determining the levels of various physicochemical parameters like temperature, pH, nitrite, sulphate, total alkalinity, total hardness and dissolved oxygen, dissolved carbon dioxide content and to detect the presence of Enterobacteriaceae (*E.coli,Shigella, Salmonella, Enterobacter)* in the selected water samples. The result were compared with WHO standards. In this study the MPN test was carried out in selected water samples and the MPN Index value obtained was much higher than the expected value. The bacteriological test reveals that microbial load is maximum in pond water followed by well and borewell water samples respectively. The physical parameters obtained during this study were within the WHO limit.

Key words: Water pollution, MPN Index, Physico - Chemical Parameters

INTRODUCTION

Water is a fundamental requirement for all organisms. Water covers 71% of earth surface. Water is vital to our existence in life as all biochemical reactions in our body are water dependent. Well, bore well and pond water are the main sources of water to which the local communities are dependent for fulfilling their needs, such as household works,washing, bathing as well as swimming purposes. During last decade, it is observed that the ground water get polluted drastically because of increased human activities. Consequently number of cases of water borne diseases has been seen increased drastically at an alarming rate.

The public health significance of water quality cannot be over emphasized. Many infectious diseases are transmitted by water through the fecal-oral route. Diseases contacted through drinking water kill about 5 million children annually and make 1/6th of the world population sick (WHO, 2004). The greatest risk to public health from microbes in water is associated with consumption of drinking-water that is contaminated with human and animal excreta. Human faeces can contain a variety of intestinal pathogens which cause diseases ranging from mild gastro-enteritis to the serious dysentery, cholera and typhoid.

Safe drinking water is defined by WHO (2004.) as that water having acceptable quality in terms of its physical, chemical and bacteriological parameters. Bacteriological parameters, especially *Escherichia coli* (*E.coli*) and total coliform have been used to determine the general quality of drinking water worldwide.

(Ashbolt, 2004). The E. coli in particular has been found to be the most specific indicator of faecal contamination in drinking water. Its presence indicates contamination of water with faecal waste that may contain other harmful or disease causing organisms, including bacteria, viruses, or parasites (Zvidzai*et al*.,2007).

Drinking water contaminated with E. coli is known to cause stomach and intestinal illness including diarrhoea and nausea, and even lead to death (Esrey*et al*., 1985). This study was therefore aimed at determining the physical and chemical parameters such as temperature, pH, nitrite, sulphate, total alkalinity, total hardness, dissolved oxygen and dissolved carbon dioxide and the bacterial quality of water in the south gate, Vaikom. The monitoring of water sources has led to increased public health awareness, since it resulted in the detection of specific pathogenic microorganisms. Proper well location and construction, control of human activities to prevent sewage from entering water body is the key to the avoiding bacteria contamination of drinking water.

The objective of this study mainly focuses on, the presence of enterobacteriaceae in the given water samples and the level of E.coli counts in water samples from different drinking water sources in south gate, vaikom and to detect the physico-chemical parameters which determine the quality of water.

MATERIALS AND METHODS

Collection of samples: Domestic water samples from 2 ponds, 2 wells , and 2 bore wells were collected in sterile and covered bottle aseptically from South gate , Vaikom inVaikom Taluk which is an urban area .While collecting the sample from ponds the bottle was held at the base of the aquatic body . Using left hand the bottle neck was kept downward below the water surface which was later tilted upward towards the water current. The bottle was removed from the water and the stopper was replaced. The water which was collected from the well was allowed to overflow for five minutes. The collected samples were transferred to laboratory within 2-3 hours and stored at 4 ^{0}C.

The coliform bacteria in water was detected by most probable number (MPN) test which includesthree test - presumptive, confirmed and completed test which are performed sequentially on water samples. The biochemical characterization of isolates were studied by Gram staining, lactose fermentation test, MRVP test, Urease test, Indole test,Citrate test, Catalase test, Gelatinase test,Spore staining using Himedia KB003 Enterobacteriaceae Identification Kit. The tests are based on the principle of $_p$H change and substrate utilization.Physico-Chemical parameters of water studied weretemperature, pH, nitrite, sulphate, total alkalinity, total hardness, dissolved oxygen and dissolved carbon dioxidein the water samples following the APHA (1998) methods.

OBSERVATION AND RESULT

The bacteriological test reveals that MPN index value in selected water samples is in the order:

Pond-1>Pond-2>Well-1>Well-2=Borewell-1>Borewell-2. The biochemical characterization of isolates shows it is lactose fermenting gas producing bacteria which is acid producing in the nutrient medium having the ability to produce indole from tryptophan and is a gram negative non sporing rod shaped microorganism possessing the enzyme catalyses. The given characters shows that it include *E. coli, Shigella, Salmonella* which were the members of Enterobacteriaceae. Among the 6 samples selected dissolved oxygen was found to be greater in pond water, while the value is found lower in bore well which gives higher value for dissolved carbon dioxide, sulphate and alkalinity. Physico chemical parameters were found to be within the permissible limit.

Table I: MPN index value obtained in different samples

Selected water sample	MPN index value
Well-1	28
Well-2	20
Pond-1	210
Pond-2	150
Borewell-1	20
Borewell-2	15

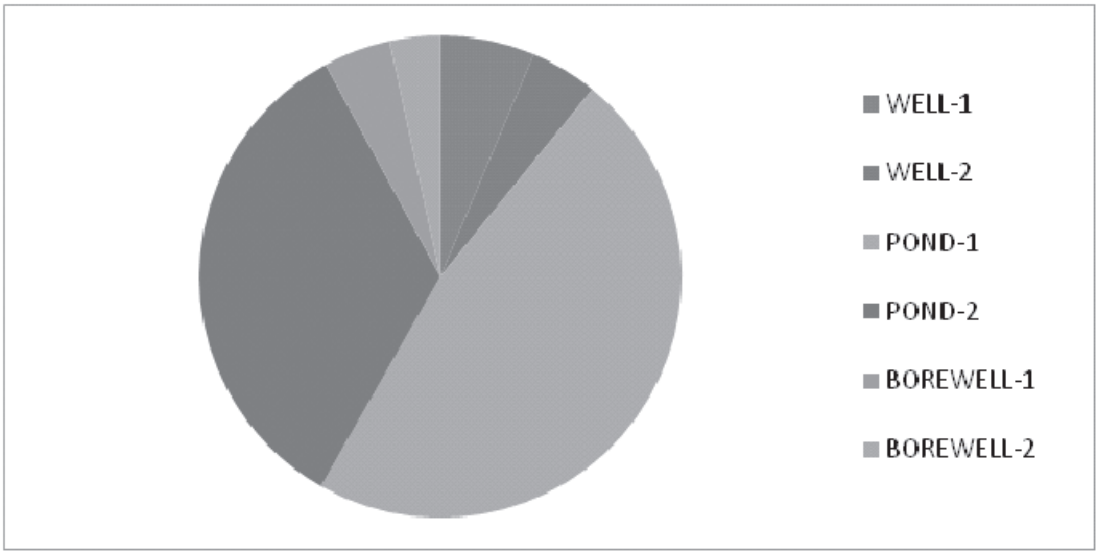


Figure I: Pie chart showing the microbial contamination with respect to the MPN index value obtained in different samples

DISCUSSION

Examination for presence of coliform in water provides a very sensitive method of quality assessment. The pathogenic organism reaches the water sources through faecal and sewage pollution. This project aimed to determine the presence of enterobacteriaceae in the selected water samples and to determine the physical parameters that affect the quality of water. Water is considered as safe when it contains 4 coliforms/ 100ml (microbial and food contamination by Charlestown L. Wilson). But the MPN index value that obtained was far exceeding than this limit. The obtained MPN values indicates that the higher concentration was detected in pond water samples followed by well water samples and only a very low concentration observed in bore well water samples. The biochemical characterization of isolates showed it is lactose fermenting gas producing bacteria which is acid producing in the nutrient medium having the ability to produce indole from tryptophan and is a gram negative non sporing rod shaped microorganism possessing the enzyme catalyses . The given characters showed that it include *E.coli, Shigella, and Salmonella* which were the members of *Enterobacteriaceae*.

ISSN 0975-8941

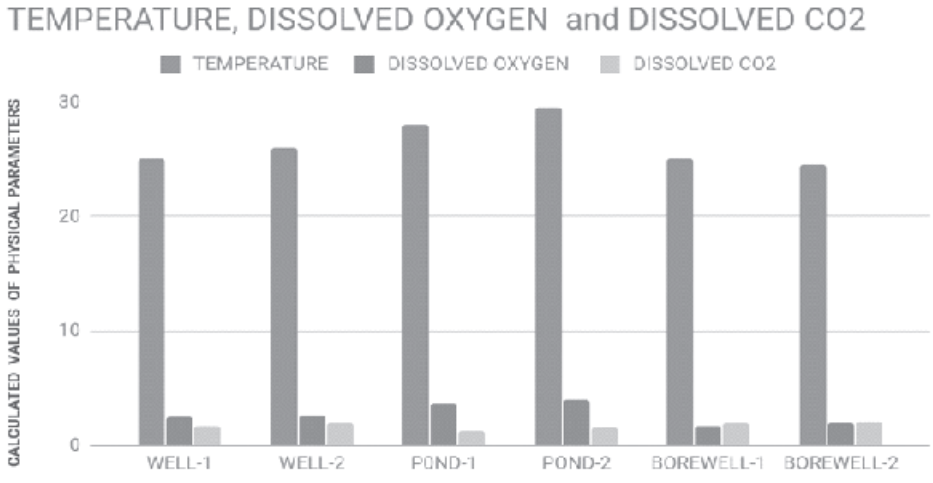
Table II: Biochemical Characterization of Isolates

SL. NO	BIOCHEMICAL TEST CONDUCTED	OBSERVATION	INFERENCE	RESULT
1	GAS PRODUCTION	GAS BUBBLES FORMED IN THE DURGHAM TUBE	LACTOSE FERMENTING GAS PRODUCING BACTERIA	POSITIVE
2	MR TEST	DEVELOPMENT OF A STABLE RED COLOUR IN THE SURFACE OF THE MEDIUM	INDICATES ACID PRODUCTION IN MEDIUM TO LOWER THE PH TO 4.4	POSITIVE
3	VP TEST	COPPER LIKE COLOUR IN SURFACE OF MEDIUM	ACETOIN IS NOT PRODUCED IN THE MEDIUM	NEGATIVE
4	INDOLE TEST	CHERRY – RED RING IN REAGENT LAYER IN TOP OF MEDIUM	ORGANISM HAVING THE ABILITY TO PRODUCE INDOLE FROM TRYPTOPHAN	POSITIVE
5	CITRATE TEST	ABSENCE OF COLOUR CHANGE TO BLUE	ORGANISM DIDN'T HAVE THE ABILITY TO USE CITRATE AS SOLE CARBON SOURCE	NEGATIVE
6	UREASE TEST	ABSENCE OF COLOUR CHANGE	ORGANISM DIDN'T HAVE THE ABILITY TO HYDROLYSE UREA	NEGATIVE
7	SHAPE	ROD SHAPED		ROD SHAPED
8	GRAM STAINING	PINK COLOURED CELLS OBSERVED	GRAM NEGATIVE BACTERIA	NEGATIVE
9	SPORE STAINING	GREEN COLOURED CELLS NOT OBSERVED	NON – SPORING BACTERIA	NEGATIVE
10	CATALASE	BUBBLES OF OXYGEN OBSERVED	ORGANISM HAVING ENZYME CATALASES	POSITIVE
11	GELATIN	PLATE REMAINS SOLIDIFIED	ABSENCE OF ENZYME GELATINASE S THAT HYDROLYZE GELATIN	NEGATIVE

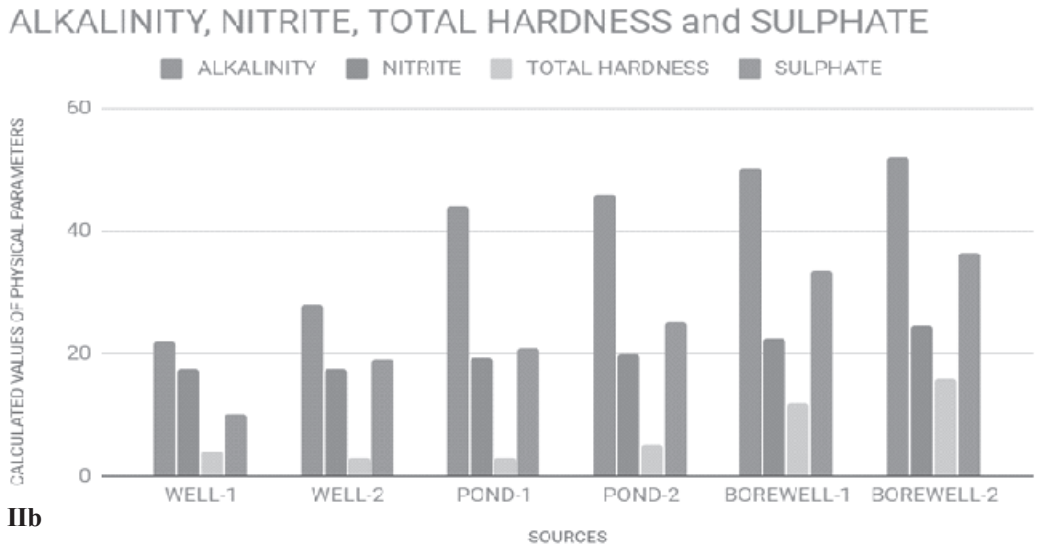
ISSN 0975-8941

Table III: Physico-chemical Parameters of different Water samples

SL. NO	TEST CONDUCTED	WELL-1	WELL-2	POND-1	POND-2	BORE WELL-1	BORE WELL-2	PERMISSIBLE LIMIT
1	pH	6.5	6.8	5.9	5.4	7.2	7.7	6.5-9.2
2	TEMPERATURE	25^0C	26^0C	28^0C	29.5^0C	25^0C	25.5^0C	shall not exceed 5^0C above the receiving water temperature
3	TOTAL ALKALINITY (mg/l)	22 mg/l	28 mg/l	44 mg/l	46 mg/l	50 mg/l	52 mg/l	600 mg/l
4	TOTAL HARDNESS(mg/l)	4 mg/l	3 mg/l	3 mg/l	5 mg/l	12 mg/l	16mg/l	400 mg/l
5	NITRITE(mg/l)	17.4 mg/l	17.6 mg/l	19.4 mg/l	19.8 mg/l	22.6mg/l	24.6mg/l	200 mg/l
6	SULPHATE(mg/l)	10 mg/l	19 mg/l	21 mg/l	25 mg/l	33.5 mg/l	36.5 mg/l	400 mg/l
7	DISSOLVED OXYGEN(mg/l)	2.5 mg/l)	2.6 mg/l)	4.7 mg/l)	5.2 mg/l)	1.7 mg/l)	1.9 mg/l)	4 mg/l
8	DISSOLVED CO_2(mg/l)	1.7 mg/l)	1.6 mg/l)	1.3	1.5 mg/l)	1.9 mg/l)	2.1 mg/l)	



IIa



IIb

Figure IIa & IIb: Graph showing Physico-chemical Parameters of different water Samples

The Physico - Chemical parameters were within the permissible limit as per ISI standards. The permissible limit of pH is 6.5-8.5. All the samples examined were in the acceptable limit. Temperature varies from 25 - 27 degree Celsius which was within the WHO limit. The permissible limit of alkalinity is 600 mg/L (ISI).The level of oxygen 2-5 mg/L is an indicator of healthy state of water. The dissolved oxygen values in the water samples were more than 2 mg/L. The decomposition and oxidation of organic matter reduces the solubility of oxygen in water. The Total Hardness represents the concentration of calcium and magnesium. The desirable limit of hardness is 200 mg/L (ISI).

The physico-chemical parameters were within the permissible limit for all six samples studied. The physico-chemical parameters were found to be suitable for domestic uses even though the bacterial parameters exceed the permissible level.It is observed that the ground water get polluted drastically because of increased urbanisation and industrialization during the last decade.

REFERENCES

- APHA (1998). Standard Methods for Chemical Examination of water and waste water, American Public Health Association 20th edn , Washington D.C.
- Ashbolt, N. J. (2004). Microbial contamination of drinking water and disease outcomes in developing regions. *Toxicology*, *198*(1-3), 229-238.
- Clesceri, L.S., Greenberg, A.E. and Eaton, A.D. (ed.) (1998). *Standard Methods for the Examination of Water and Wastewater* 20th edn. Washington, DC: APHA, AWWA, and WEF. Code of the Federal Register of the United States 1992, 40 CFR,Section 141.63(6)
- Esrey, S. A., Feachem, R. G., & Hughes, J.M. (1985). Interventions for the control of diarrhoeal diseases among young children: improving water supplies and excreta disposal facilities. *Bulletin of*

the World Health organization, *63*(4), 757.

- ISI, Indian Standard specification for drinking water (1983). IS10500, ISI, New Delhi, 1983.
- Lamikanra, A. (1999). Essential microbiology for students and practitioners of pharmacy. *Medicine and Microbiology. 2nd ed, Lagos, Nigeria: AMKRA*, 128-9.
- Wilson, C.L., &Droby, S. (2000). *Microbial food contamination*. CRC Press.
- World Health Organization. (2009). WHO1996 Guidelines for drinking water quality. Vol 3. Geneva.
- Zvidzai C, Mukutirwa T, Mundembe R., SitholeNiang I. Microbial community analysis of drinking water sources from rural areas of Zimbabwe. *African Journal of Microbiology Research* 2007; Vol. 1 (6) pp. 100-103

ISSN 0975-8941
Research Lines (Vol. XII No. 1&2) June-December 2019 17

Comparative bioefficacy of selected plant extracts, commercial biopesticides and synthetic pesticides against important household pest, *Periplanata americana*

Hilnadas P.H &Alphy Maria Thomas
Department of Zoology,Deva Matha College, Kuravilngad, Kerala,India

Received: 20th October 2019 Accepted: 20th December 2019

ABSTRACT

Owing to the fact that the application of insecticides causes adverse effect on beneficial organisms, pollute the environment and are detrimental for human health, plant based products are being tested for the control of variety of insect pests. With this backdrop of knowledge the present study is an attempt to compare the bioefficacy of selected plant extracts (*Azadirachta indica*, *Curcuma longa, Ocimum tenuiflorum*), Biopesticides (Neem oil, Garlic oil, Lemon grass oil) and Synthetic pesticides (Silica gel, Begon bait and Magic chalk) against house hold pest *Periplanata americana*. The antifeedent assay was carried out by five different concentrations (0.01%, 0.1%, 0.2%, 0.5% and 0.7%) of plant extracts, biopesticides and synthetic pesticides. In antifeedent assay *Azadirachta indica* (72.93%), neem oil (81.41%) and magic chalk (98.18%) exhibited highest percentage starvation in their respective categories. Corrected mortality were determined at 24 and 48 hours at different concentrations (1.0%, 2.5%, 5.0%, 7.5% and 10.0%). *Azadirachta indica* (28.26%, 33.71%) neem oil (37.5%, 87.91%) and magic chalk(69.89%, 94.38%) have higher corrected mortality rate at 24 and 48 hours treatment. Determination of LC50 at 24 and 48 hours for plant extracts concluded that *Azadirachta indica* have (51.28%) at 24 hour and it reduced (37.15%) after 48 hour. Neem oil have LC50 value (13.8%) at 24 hour and (2.51%) at 48 hour and for magic chalk LC50 at 24 hour is (3.56%) and 48 hour is (1.86%). High concentration of plant extract can bring the same effect of synthetic chemicals. Present study reveals that *Azadirachta indica* is best effective in controlling *Periplanata americana* followed by *Curcuma longa* and *Ocimum tenuiflorum*. These plant extracts have relatively short lifespan (biodegradable), less toxicity to non target organisms, easily availability, easily accessible, renewable and economically cheap.

Keywords: *Periplanata americana*, Biopesticides, Plant extracts, Antifeedant activity

INTRODUCTION

Cockroaches are medium to large sized insects in the order Dictyoptera. They are oval, flat-bodied, dark coloured, with chewing mouth parts, three pairs of legs and usually two pairs of wings. Cockroaches are primitive insects whose origin can be traced back through the fossil record for at least 200 million years. There are approximately 4,000 species of cockroaches worldwide – though only approximately 50 are regarded as pests. Those species which are classified as pests originated in tropical countries, but now thrive in countries with more temperate climates, having been distributed by international travel and trade. Cockroaches are indiscriminate, omnivorous feeders and can gather together in large numbers in a suitable environment. This behaviour brings them in contact with numerous pathogens, such as those

causing food poisoning and wound infections. Cockroaches are gregarious and nocturnal ('Pest control procedure manual'- The national pest advisory panel (2013). Neem, Tulsi, Adathoda, Turmeric etc., are some of plants which are reported to have the ability to kill or keep away the pests. Neem products are suitable for integrated pest management because of their low toxicity to nontarget organisms, easy preparation and compatibility with other bio-products. All parts of *Azadirachta indica* contain several active volatile compounds that have biological insecticides effects. (Mohamed *et al*., 2014). *Curcuma longa* is antibacterial, anticancerous and also have pesticidal effects. Rhizome also contain free arabinose, fructose and glucose. (Wasim Ahmad *et al*., 2010). *Ocimum sativum* has been widely used for curing various ailments due to its great therapeutic potentials. (Kaplesh J Bhatt 2012). Essential oils are secondary plant substances comprised of many compounds including mono terpenoids, which are responsible for the aromatic characteristics of the plant (Alicia Kyser Phillips 2009). Commonly used biopesticides are to control *Periplanata americana* are neem oil, garlic oil, lemon grass oil and *Euphorbia milli* extracts. These active substances showed considerable potentialities against various pests of stored and field crops, primarily through repellent, antifeedant, growth regulatory and toxic effects. (Abdel rahim Satti *et al*., 2013). Commonly used chemical pesticides are to control *Periplanata americana* are silica gel, begon bait and magic chalk. Pesticides are used to kill pests, they are toxic to the pest and closely related organisms.

MATERIALS AND METHODS

Collection of cockroaches

Cockroaches *Periplanata americana* were collected from dark and damp places by hand picking method. They were kept in different glass containers and supplied with water, bread crumps and rough paper. The cockroaches were kept under the laboratory condition for two weeks for acclimatization. (Zibaee Idin and Pooyabahari Khorram, 2015)

Preparation of plant extract, biopesticides and chemical pesticides

The plant materials were collected from the campus of Deva Matha college, Kuravilangad, Kottayam. The leaves were thoroughly washed with tap water and shade dried under room temperature (28.0ÚC±2ÚC). After complete drying the plant materials were powdered. The powdered materials (50 g) were added with ethanol (200 ml, Merck) and filtered through filter paper. Extracts were concentrated in water bath and the residue obtained called as crude extract was as stock solution. Five different concentrations each of leaf extract (1.0%, 0.75%, 0.5%, 0.25% and 0.01%) were prepared from the stock solutions. The commonly used biopesticides **(**Neem oil, Garlic oil and Lemon grass oil) and chemical pesticides (silica gel, Magic chalk and Begon bait) were collected from different eco and stationary shops of Kuravilangad town. Five concentrations each biopesticide and chemical pesticides (1.0%, 0.75%, 0.5%, 0.25% and 0.01%) were prepared from the stock solutions. (Arif Sana *et. al*.,2017)

Feeding bioassay

1 ml of each concentrations of Garlic oil, Neem oil, Lemon grass oil and leaf extract of *Curcuma longa*, *Azadirachta indica* and *Ocimum tenuiflorum* and each concentration of chemical pesticides of silica gel, Magic chalk and Begon bait were sprayed on the bread crumbs of $1cm^2$ with the help of pipette. The treated bread crumbs were then mashed properly so as to prepare pellet baits and individually fed to starved cockroaches. The control and positive control (P control) was also run beside these samples.

In control only water was used where as in P control Hit Anti roach gel was mixed to prepare the pellet baits.

Antifeedent assay

Pellet baits of different concentrations were prepared and all the above mentioned plant extracts, biopesticides and chemical pesticides were tested for their antifeedant activity. The control bait and P control was also prepared. Five replicates of each treatment and 10 adult cockroaches for each replicate were used. The adults to be used for antifeedant assay were left unfed for around 48 hrs, the starved cockroaches were kept in freezer for few minutes to inactive the cockroaches and their weight were recorded. The cockroaches were fed on the treated baits along with both the control and reweighted after 24 hours. Percentage of starvation was calculated according to the formula by Moustafa and Abdel-Mageed *et. al.* (1969).

Percentage of Starvation = (C-E)/(C-S) x 100 Where:
C = Mean weight gain of control larvae within 24 hours
E = Mean weight gain of treated larvae at each tested concentration within 24 hours S = Mean weight gain of starved control larvae within 24 hours

Statistical analysis

The mortality was corrected using Schneider-Orelli's formula:

$$\text{Corrected \%} = \frac{\text{\% Responded} - \text{\% Responded in Control}}{\text{100 - Responded \% in Control}} \text{ x100}$$

LC_{50} values were determined by Probit analysis (Iram Khan and Ayesha Qamar, 2015)

RESULT AND DISCUSSION

The present study is an attempt to compare the bioefficacy of selected Plant Extracts (*Azadirachta indica*, *Curcuma longa* and *Ocimum tenuiflorum),* Biopesticides (Neem oil, Garlic oil and Lemon grass oil) and Synthetic pesticides (Silica gel, Magic chalk and Begon bait) against the household pest, *Periplanata americana.* Among these three, the synthetic pesticides are highly active against *Periplanata americana* at its lower concentration. But the same effect is noted in plant extracts and biopesticides at its higher concentration. The antifeedent activity of *Periplanata americana* was done by plant extracts, biopesticides and synthetic pesticides at five different concentrations (0.01%, 0.1%, 0.2%, 0.5% and 0.7%). It is noted that the antifeedant activity increased as the concentrations increased. In the case of plant extracts, highest concentration (0.7%) of *Azadirachta indica* exhibited highest percentage of starvation (72.93%) where as it's lowest concentration (0.01%) also showed the antifeedancy which is (15.78%). Like wise, *Curcuma longa* and *Ocimum tenuiflorum* at different concentration showed moderate rate of antifeedant activity. Among the biopesticides, neem oil (0.7%) exhibited highest percentage starvation (81.41%) where as it's lowest concentration (0.01%) also showed antifeedancy (30.60%). In synthetic pesticides highest concentration (0.7%) of magic chalk exhibited highest percentage of starvation (98.18%) where as it's lowest concentration shows 49.65%. All the three chemicals are highly sensitive to the pest. Corrected mortality calculated using Schneider-orellis formula. Corrected mortality of plant extracts, biopesticides and synthetic pesticides were determined at 24 and 48 hours. Corrected mortality in plant

extracts at 24 hour have highest value in *Azadirachta indica* (28.26%) in 10% concentration.

After 48 hours of treatment percentage mortality of *Azadirchta indica* increased by (33.71%) in 10% concentration, followed by *Curcuma longa* (32.58%) and *Ocimum tenuiflorum* (30.43%). Higher concentration increased the percentage of corrected mortality. Duration of exposure period have a positive effect on percentage of corrected mortality. Neem oil have highest corrected mortality (37.5%) in 10% concentration at 24 hours and (87.91%) at 48 hours. Among the synthetic pesticides magic chalk have highest percentage of corrected mortality (69.89%) in 10 % concentration at 24 hours and increased to (94.38%) at 48 hour followed by begon bait (92.05%) and silica gel (85.87%) in the same concentration. Determination of LC_{50} at 24 and 48 hours for plant extracts concluded that *Azadirachta indica* have (51.28%) at 24 hour and it reduced (37.15%) after 48 hour. *Curcuma longa* have (57.54%) at 24 hour and it reduced (39.81%) after 48 hour and *Ocimum tenuiflorum have*(75.85%) at 24 hour and it reduced (44.66%) after 48 hour. LC_{50} at 24 hour higher than that of 48 hour. Increase in exposure period also increase the death rate. In biopesticides neem oil have lesser LC_{50} value (13.8%) at 24 hour and (2.51%) at 48 hour. LC_{50} for silica gel at 24 hour is (4.36%) and 48 hour is (2.13%). Increase in exposure period increases the number of death. In this context the relevance of the study becomes essential as the usage of natural plants can eliminate the possibility of using other harmful pesticides or chemicals. High concentration of plant extract can bring the same effect of synthetic chemicals. Present study reveals that *Azadirachta indica* is best effective in controlling *Periplanata americana* followed by *Curcuma longa* and *Ocimum tenuiflorum.* These plant extracts have relatively short lifespan (biodegradable), less toxicity to non-target organisms, easily availability, easily accessible, renewable and economically cheap. So plant extracts can be considered as good alternative to synthetic and biological method of insect control.

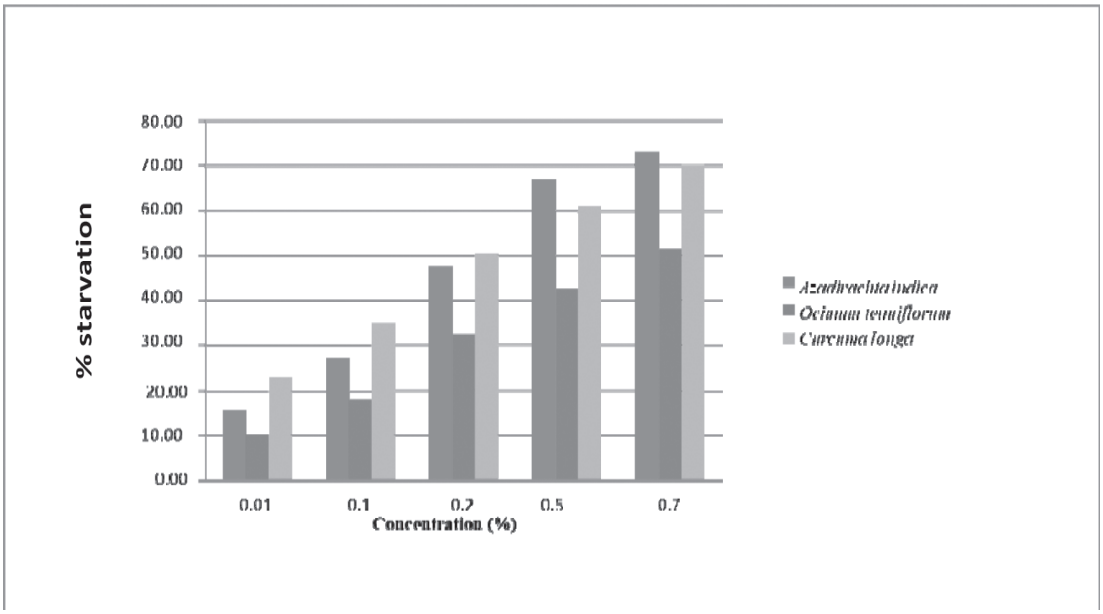


Figure 1: Graph Showing Starvation (%) of different plant extracts against *Periplanata americana* at various Concentrations after 24 hours of treatment.

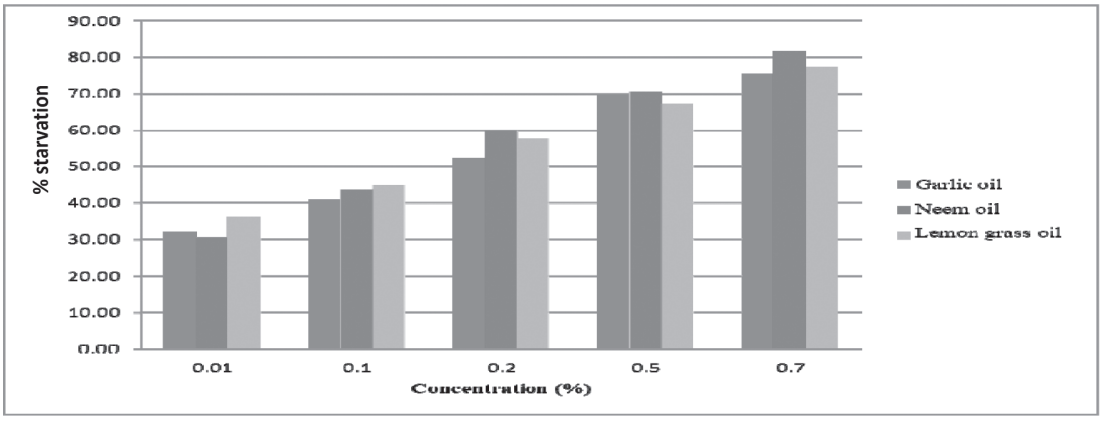


Figure 2: Graph showing starvation (%) of different biopesticides against *Periplanata americana* at various concentrations after 24 hours of treatment.

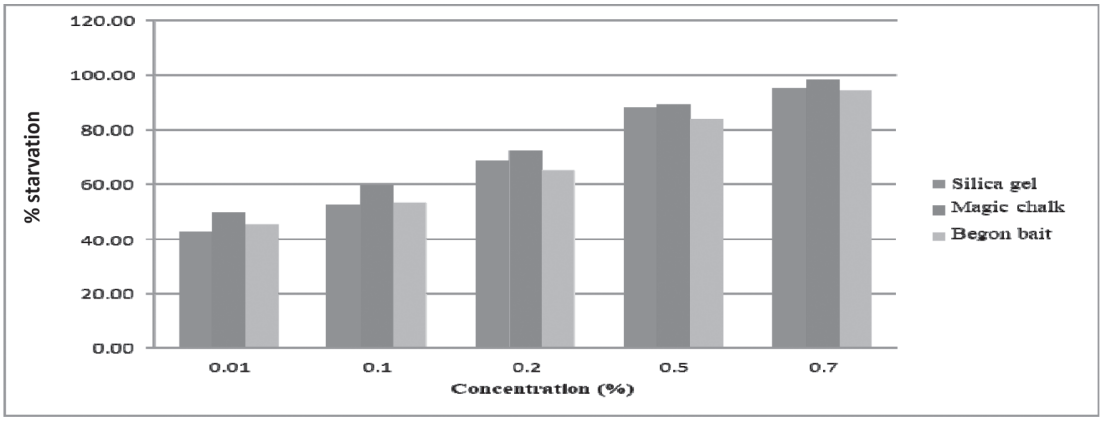


Figure 3:Graph showing starvation (%) of different synthetic pesticides against *Periplanata americana* at various concentrations after 24 hours of treatment.

Table 1: Corrected mortality (%) of different plant extracts, Biopesticides and chemical pesticides against *Periplanata americana* at various concentrations after 24 and 48 hours of treatment.

Concentration (%)	Plant extract						Biopesticides						Chemical pesticides					
	Ocimum tenuiflorum		*Curcuma longa*		*Azadirachta indica*		Neem oil		Garlic oil		Lemon grass oil		Silica gel		Begon bait		Magic chalk	
	24 hr	48 hr	24hr	48 hr	24hr	48 hr	24 hr	48hr	24 hr	48 hr	24 hr	48hr	24hr	48 hr	24 hr	48 hr	24 hr	48hr
1	5.2	10.6	7.3	12	8.4	13.9	11.3	21.2	7.2	17.7	5.2	15.2	25.2	30.8	27.6	32.2	29.4	34.8
2.5	10.5	15.7	12.5	17.5	13.5	18.4	14.7	34.8	11.4	31.8	7.2	27.1	35.7	45.5	37.5	47.2	39.5	49.5
5	15.9	20	17	22.2	18.9	23.6	21.2	51.1	17	47.2	12.6	43	45.7	60.8	47.8	62.2	49.4	64.8
7.5	20.8	25.5	22.5	27.7	23.4	28.5	29.7	69.6	24.7	64.4	15.9	56.	55.2	75.5	57.6	77.7	59.1	79.1
10	25	30.4	27.1	32.5	28.2	33.7	37.5	87.9	30.4	80.9	21.5	71.9	65.6	85.8	67.3	92	69.8	94.4

Table 2: LC_{50} of different plant extract, Biopesticides and Chemical pesticides against *Periplanata americana* at various concentrations after 24 and 48 hours of treatment.

Exposure period	Plant extract	LC_{50}	Biopesticides	LC_{50}	Chemical pesticides	LC_{50}
24 Hr	*Azadirachta indica*	51.28	Neem oil	13.8	Silica gel	4.36
48 Hr		37.15		2.51		2.13
24 Hr	*Curcuma longa*	57.54	Garlic oil	31.62	Begon bait	3.8
48 Hr		39.81		3.31		1.9
24 Hr	*Ocimum tenuiflorum*	75.85	Lemon grass oil	123.02	Magic chalk	3.56
48Hr		44.66		4.67		1.86

REFERENCES

1. Abdelrahim satti. (2013). Insecticidal effect of neem (*Azadirachta indica* A. Jazz) oils obtained from neem berries stored at different periods. *The experiment international journal of science and technology*. V. 6(2), pp.330-337.
2. Abdel-Mageed MI, Shaaban AM, Zidan ZH (1975). The effectiveness of Dursban, Du-ter Brestan and their combination against the cotton leafworm *Spodoptera littoralis* (Boisd). *Bulletin of Entomological Society Egypt: Economic Series*, LX(283).
3. Ali Reza Zahraei-Ramazani, Abedin saghafipour, and Hassan vetandoost. (2018). Control of American cockroach (*Periplanata americana*) in municipal sewage disposal system, central Iran. *Journal of arthropod- borne disease*. V. 12(2),pp.172-179.
4. Ayesha Ilyas, Hafis Azhar Ali khan, and Abdul Qadir. (2017). Effects of leaf extracts of some indigenous plants on settling and oviposition responses of peach fruit fly *Bactocere zonata* (Diptera:Tephritidae). *Pakistan Journal of Zoology*. V. 49(5),PP.1547-1553.
5. Bhatt Kalpesh J. (2012). *Ocimum sanctum*: the indian medicinal plant. *International Journal of chem tech applications.* V. 3(1), pp.53-57.
6. Idin Zibaee, and Pooyahari Khorram. (2015). Synergistic effect of some essential oils on toxicity and knockdown effects, against mosquitos, cockroaches and housefly. V. 4(4), PP.107-123.
7. Khan Iram and Ayesha Qamar. (2015). Comparative bioefficacy of sescted plant extarcts and some commercial biopesticides against important house hold pest, *Periplanata americana*. *Journal of entomology and zoology studies*. V. 3(2), pp.219-224.
8. Mostafa OK (1969). Studies on antifeeding and repellents to economic Lepidoptera. M. Sc. Thesis, Faculty Agriculture Cairo University, 65-68.
9. Sana Arif, Muhammad Kamran Taj, Kashif Kamran, Jawaria Ali Tariq, Imran Taj, Ashfaq Ahamed, Zahoor Ahamed, Ajas-ul-Haq, Fahmeeda Yousaf, and Ghulam Mohammad. (2017). Effects of insecticides on cockroaches of Quetta city Baluchistan. *Bulletin of environment and pharmacology and life science.* V. 6(4), pp.30-34.
10. Wasim Ahmad, Azhar Hasan, Abdullah Ansari, and Tahera Tarannum. (2010). *Curcuma longa*, Linn. *Hipocratic Journal of unani medicine*. V. 5(4), PP.179-190.

ISSN 0975-8941

Cytotoxic study on the effect of Baby Powders in Cultured Liver cells

Rinu A.R. and Justin Jose
Department of Zoology, Deva Matha College Kuravilangad

Received: 4th October 2019 Accepted: 30th November 2019

ABSTRACT

Human beings use different kinds of cosmetic products in their daily life. Most of them contain toxic ingredients which may cause deleterious effect in human beings. The present study is designed to evaluate toxic effects of baby powder extracts on liver cells. Different methods like MTT assay, neutral red assay, LDH leakage assay, DNA fragmentation and FDA staining are used. From the study, taken two brands of baby powder extracts show dose dependent toxicity.

INTRODUCTION

Every day, we are exposed to chemicals in cosmetics, household cleaners, plastics, food, water and many other sources. Common household chemicals have been linked to more than 200 health problems including asthma, depression, anxiety, various cancers (including breast, ovarian and brain), birth defects and developmental disabilities, as well as reproductive, cardiovascular and immune system disorders. Many of these chemicals are stored in our bodies and accumulate over time to cause health problems after years of gradual exposure.

By altering the practices, we can decrease exposure to household chemicals. By reducing family's daily chemical exposure, we can reduce the chances of developing illnesses such as cancer, anxiety, respiratory problems, and even heart disease and stroke attributed to low-level exposure during a long period.

In the cosmetic world, the very products that are marketed as beneficial for our bodies, may actually contain potentially toxic, even carcinogenic, ingredients. Cosmetic companies are minimally regulated and products like soaps, shampoos, lotions, cosmetics and bath and baby products usually contain cheap, synthetic, harmful ingredients which are filled with toxins - detrimental to you and your family's health.

The United Nations Environmental Program estimates that approximately 70,000 chemicals are in common use across the world, with 1,000 new chemicals being introduced every year. Of all the chemicals used in cosmetics, the National Institute of Occupational Safety and Health has reported that nearly 900 are toxic - although other groups attack that figure as being far too conservative.

MATERIALS AND METHODS

Preparation of powder extracts: 100 mg of two different baby powder samples A and B were dissolved using 100 ml distilled water. The mixtures were kept in shaker for overnight. The filtrate obtained from the powder mixtures were allowed to evaporate by keeping in hot air oven. The residue after evaporation was collected by scraping. 10 mg sample was weighed from each powder extract and dissolved in 1ml DMSO.

ISSN 0975-8941

Dulbecco's Modified Eagle's Media (DMEM) Preparation: Suspend 0.67g DMEM in 25ml tissue culture grade water with constant stirring until the powder was completely dissolved. Water should not be heated. Added 0.187g of $NaHCO_3$ powder and stir until dissolved. Adjust the pH to 0.2-0.3 units below desired pH (pH=7.4) using NaOH since the pH tends to rise during filtration. Make up the final volume to 50ml with tissue culture grade water. Sterilised the medium immediately by filtering through a sterile membrane filter with a porosity of 0.22 micron or less using positive pressure rather than vacuum to minimize the loss of CO_2. Aseptically add sterile supplements as required and dispense the desired amount of sterile medium into sterile containers. Store required medium at 2-8^{0}C in dark for further use.

MTT cell viability assay

At first, subcultured the liver cell and after the incubation, sample was added in different concentrations (1µl, 5µl, 10µl) and 30µl 3-(4,5-dimethylthiazole-2-yl)-2,5 diphenyl tetrazolium bromide (MTT) was added and kept it for incubation at 37^{0}C for 3 hours. After incubation 200µl of Dimethyl sulfoxide (DMSO) was added to each culture plate, incubated at room temperature for 30 minutes until all cells get lysed and homogenous colour was obtained. After scraping the absorbance was read at 540nm using DMSO as blank and percentage viability was calculated.

$$\text{Percentage of viability} = [T/C] * 100$$

LDH Leakage Assay

Lactate dehydrogenase (LDH) leakage assay can be performed by assessing LDH released into the media as a marker of dead cells. Target cells were incubated with a cytotoxic agent. During this period, cytoplasmic LDH was released into the culture due to plasma membrane damage.

$$\text{Pyruvate} + \text{NADH} + \text{H}^+ \xrightarrow{\text{Lactate dehydrogenase}} \text{L. Lactate} + \text{NAD}^+$$

LDH leakage is measured spectrophotometrically at 340nm.

Procedure: 2.7 ml potassium phosphate buffer, 0.1ml NADH solution and 0.1ml sodium pyruvate solution were pipetted into a cuvette (light path : 1cm). Equilibrated at 25^{0}C for about 5 minutes. 0.1 ml of sample was added and mixed. Recorded the absorbance at 340nm in a spectrophotometer thermostated at 25^{0}C and calculated the OD/ minute using the linear portion of the curve .

Neutral Red Cytotoxic Assay

The pH of neutral red solution was adjusted in all experiments to 6.35 with the addition of KH2PO4 (1M). 10 Ml of neutral red solution was added to plates and incubated for 3h in CO2 incubator at 370 C. Cells were then washed with PBS & fixed with 200 ml of fixing solution (50% ethanol & 1% acetic acid) was added & centrifuge at 3000rpm for 3 minutes. 200ml supernatant was taken & added to 96 well plate & the absorbance was read using a microplate reader at 540nm & the percentage viability was calculated.

DNA Fragmentation study

This method (Wassom, 1992) is based on the notion of extensively fragmented double stranded DNA, which can be separated from chromosomal DNA upon centrifugal sedimentation. The protocol included the lysis of cells and released nuclear DNA; a centrifugal step with the generation of the two fractions (corresponding to intact DNA and fragmented DNA respectively). Precipitation of DNA hydrolysis and colorimetrical quantification upon staining with diphenylamine (DPA) which binds to deoxy ribose.

Delivered 1ml of cell suspensions in test tubes labeled 'B' (bottom). Centrifuged cells at 600 rpm at 40C for ten minutes and transferred the supernatant carefully in a new tube labeled 'S' (supernatant). The pellet in tube 'B' was treated with 1ml of TTE (Triton Tris EDTA) solution vortexed vigorously. These procedures allowed the release of fragmented chromatin from the nuclei after cell lysis (due to the presence of triton X 100 in TTE solution) and the disruption of the nuclear structure (following Mg3+ chelating by EDTA in TTE solution.)

To separating fragmented DNA from intact chromatin centrifuged tube (B at 14000rpm for 10 minutes at 40C, then transferred the supernatant carefully in new tubes labeled 'T' and added 1ml of TTE solution to the small pellet in the tube 'B'. Then added 25% TCA to the tubes marked T,B and S. Allowed the precipitation to proceed overnight. Cooling at 40C. And the supernatant was discarded by aspiration. DNA was hydrolysed by adding 160µl of 5%TCA to each pellet and heated 15 minutes at 900C in heating block. A blank was prepared with 160µl of 5% TCA alone.

Then to each tube 320µl of freshly prepared DPA solution was added and then vortex. The colour was allowed to develop for about 4 hours at 370C or overnight at room temperature and then transfer to 200µl of aliquot coloured solution (ignoring dark particles) from each tube to a 96 well micro titer plate. Then read optical density at 600nm with a multiwall spectrophotometer reader setting blank to zero.

The percentage of fragmented DNA was calculated by using formula:

Percentage of DNA Fragmentation = $[(S+T)\div(S+T+B)]\times100$

FDA Staining

The staining solution FDA & EtBr was added to the cell culture & incubated in dark for 15'. After washing extensively in PBS the cells were observed under florescence microscope using blue filter. FDA stains cytoplasm giving a green fluorescence. EtBr interact with DNA & give red fluorescence to nucleus. The presence of red colour in the cell was an indication of their damage.

RESULT AND DISCUSSION

Cosmetics and personal care products, more than any other products, come into direct contact with our bodies and stay there for significant periods of time. For this reason, it is necessary for cosmetic formulators and manufacturers to determine whether their product may be toxic or pose a risk to consumers. The present study attempts to validate the toxicity of a major cosmetic product which is widely used by Indians, Talcum powder.

The recent findings regarding possibility of toxicity by talc and other ingredients of powder especially that of Baby powder raises concerns over a large population. Hence a study was designed to evaluate the potential cytotoxic effects of aqueous extracts of baby powder on Human liver cells.

MTT is a colorimetric assay that measures the reduction of 3 -(4,5 dimethyl- thiazole-2-yl)- 2,5 diphenyl tetrazolium bromide (MTT) by mitochondrial succinate dehydrogenase. The MTT enters the cells and passes into mitochondria where it is reduced to an insoluble coloured formazan product. The cells are then solubilized with an inorganic solvent (DMSO) and the solubilized formazan reagent is measured spectrphotometrically at 540nm. Since reduction of MTT can only occur in active cells, the levels of activity is a measure of the viability of the cell. Results shows that percentage cell viability decreases as concentration of baby powder extract increases.

ISSN 0975-8941

Table 1: MTT Cell Viability Assay

Brand A Concentration	Brand B %Viability	%Viability
10	82.37	80.61
50	65.18	63.63
100	57.39	50.65

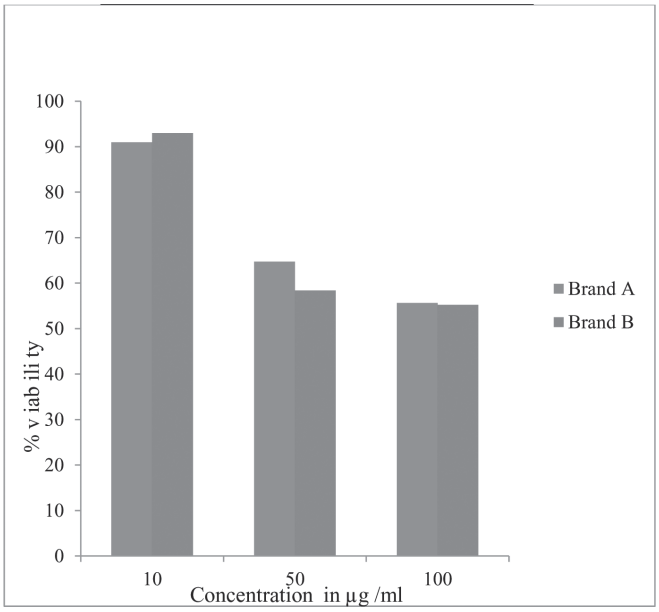


Figure 1: Graph showing percentage of viable cells when cells were treated with different concentrations of Brand A & Brand B powder extracts in MTT cell viability test.

Neutral red cytotoxicity test was based on ability of living cells to uptake and bind neutral red. Neutral red was positively charged dye that easily diffuses through cellular membranes of cells, accumulate in the cytoplasm & was stored in the acidic environment of lysosomes. Principle of test consist in the fact that neutral red are able to absorb and bind only live cells, while this ability declines in damaged or dead cells. The amount of accumulated neutral red was thus directly proportional to the amount of live cells in cell culture. Neutral red assay shows as the concentration of powder extracts increases the percentage of viable cells decreases.

Table 2: Neutral red cytotoxicity test

Concentration	Brand A %Viability	Brand B %Viability
10	91	93
50	64.74	58.4
100	55.67	55.22

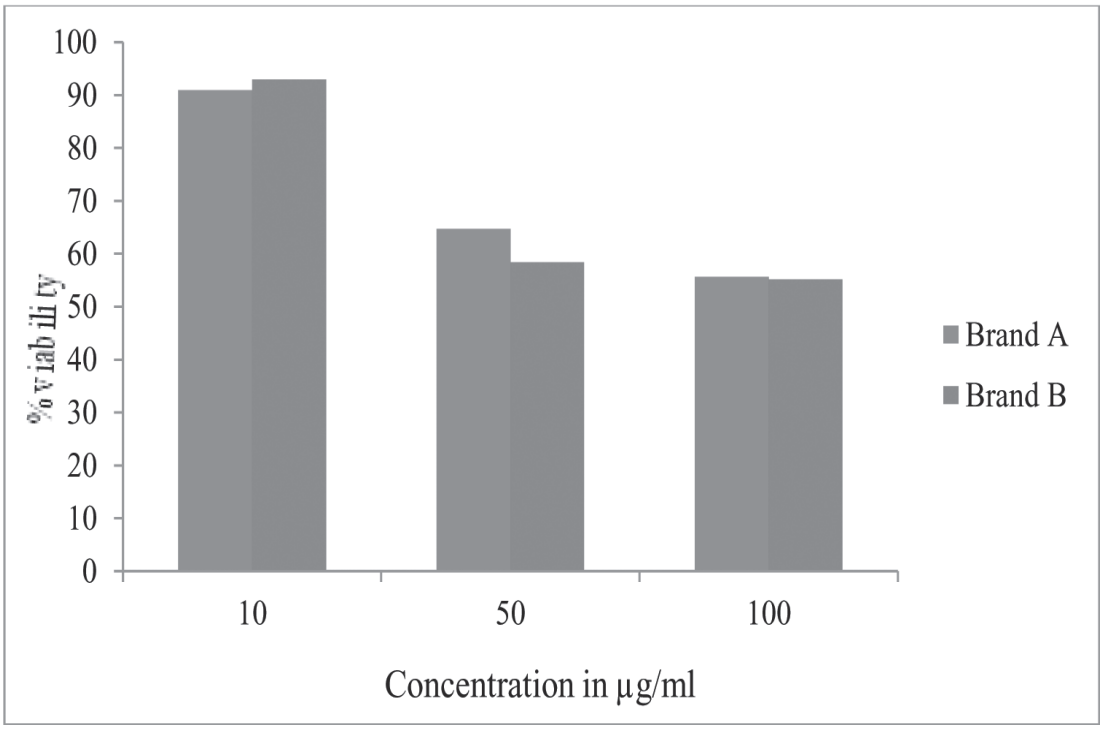


Figure 2: Graph showing percentage of viable cells when cells were treated with different concentrations of Brand A & Brand B powder extracts in a Neutral Red cytotoxicity test.

From our results it can be observed that BPE exhibited toxicity only at higher concentrations and that too in a dose dependent manner. Cellular enzymes in the extra cellular space, although of no further metabolic function in this space, are still of benefit because they serve as indicators suggestive of disturbances of the cellular integrity induced by pathological conditions. Lactate dehydrogenase (LDH) is a cytoplasmic enzyme present in essentially all major organ systems. The extracellular appearance of LDH is used to detect cell damage or cell death and in our study the increased levels of LDH leakage with treatment of powder extracts clearly shows increase in membrane damage.

Table 3: LDH Assay

Samples	OD	Enzyme units/ml
Control	0.001	0.0048
A1	0.002	0.0096
A5	0.006	0.0289
A10	0.021	0.1014
B1	0.003	0.0145
B5	0.011	0.0531

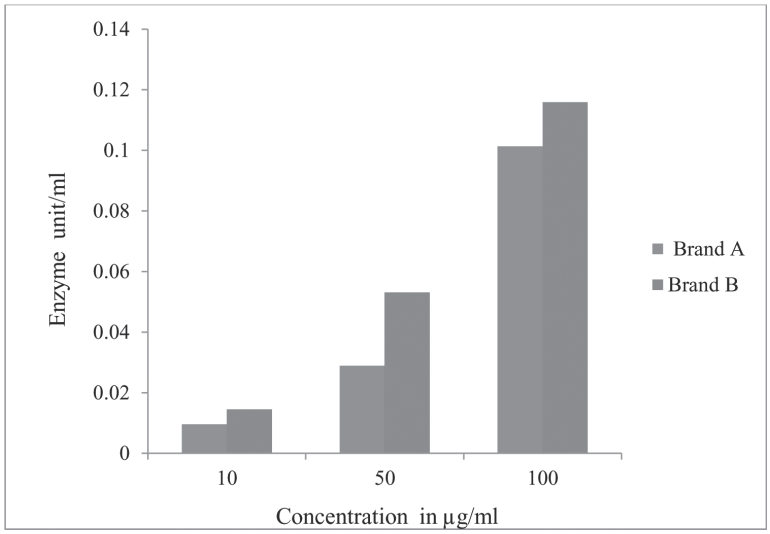
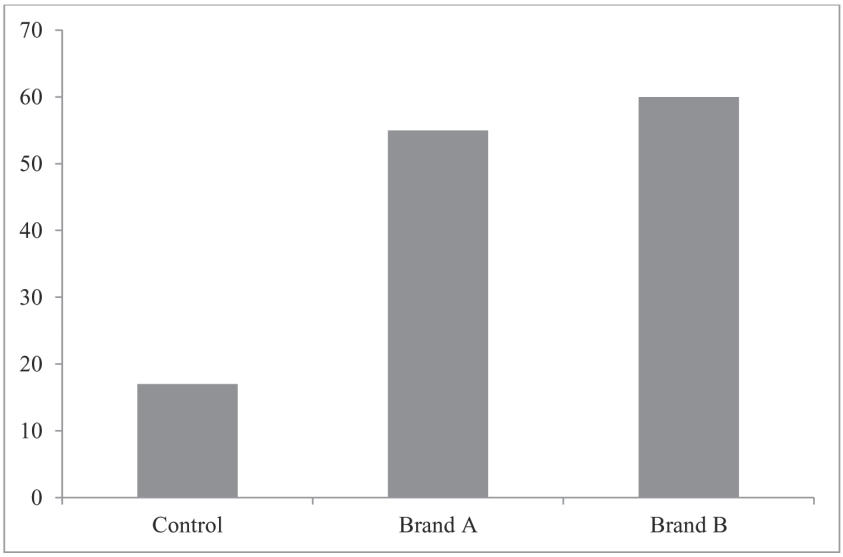


Figure 3: Graph showing the amount of enzyme LDH leakage in different concentrations of powder extracts.

The genotoxicity assays for predicting potential heritable germ cell damage are the same as used for predicting carcinogenicity because the endpoints measured in genotoxicity tests are common precursors for both of these adverse health outcomes and hence DNA fragmentation analysis was performed to evaluate the possible genotoxic effects of baby powder extracts. The results suggest dose dependent increase in DNA fragmentation.

Figure 4: Graph showing percentage of DNA fragmentation in Brand A & Brand B powder extracts.



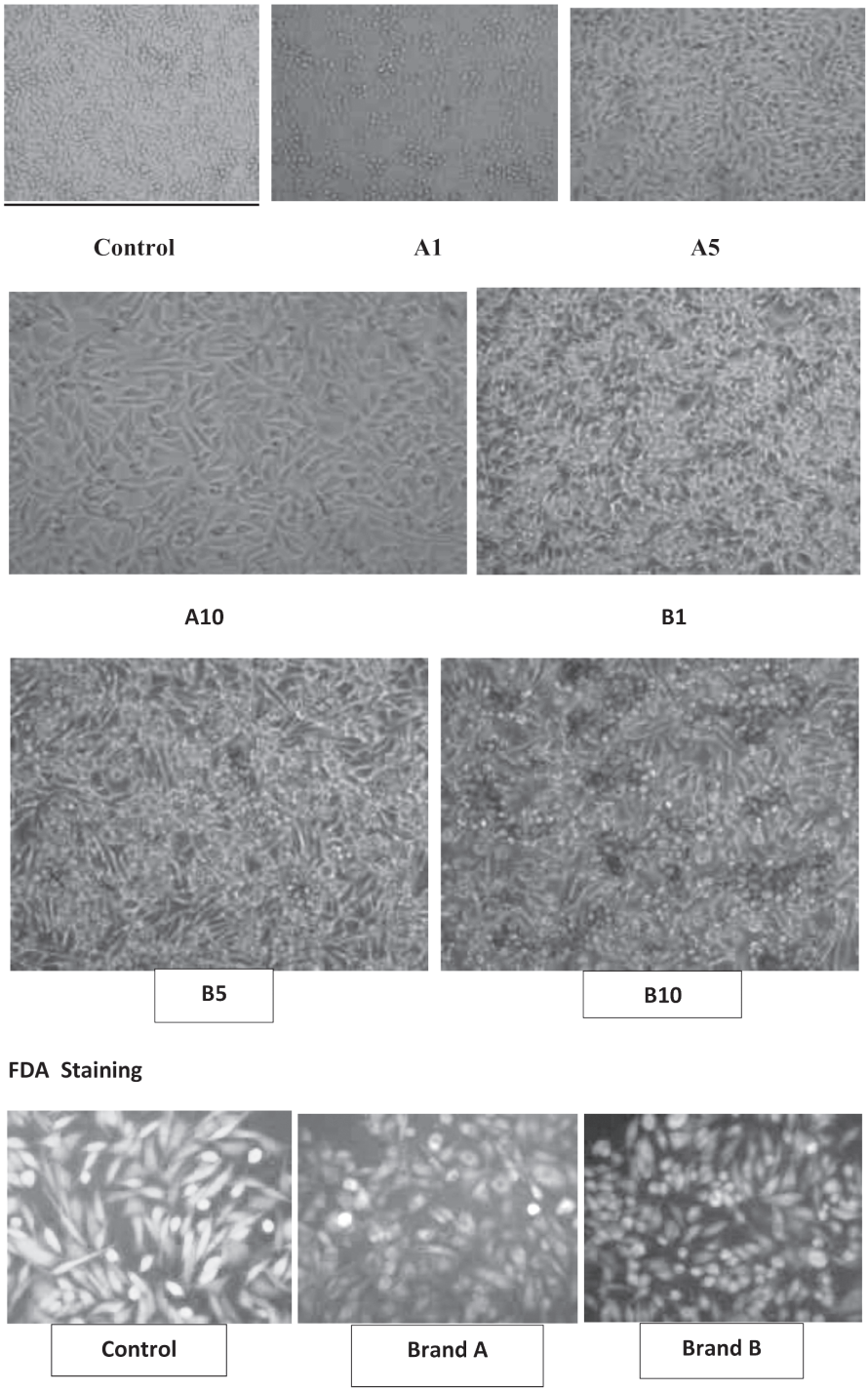


Plate I : Images of Cultured liver cells in different concentration of baby powder extracts

CONCLUSION

The current study determined the cytotoxic effects of baby powder extracts on liver cells by standard MTT assay, Neutral red, LDH leakage assay, DNA fragmentation & FDA staining. From the study, it can be observed that all the two powder extracts shows dose dependent toxicity. The powder extracts were toxic only at concentration above 100µg/ml which is comparatively high.

REFERENCES

- Coggiola M, Bosio D, Pira E, et al.(2003) An update of a mortality study of talc miners and millers in Italy. *Am J Ind Med*. 44: 63-69.
- Cook LS, Kamb ML, Weiss NS. (1997) Perineal powder exposure and the risk of ovarian cancer. *Am J Epidemiol*. 145: 459 - 465.
- Gertrg DM, Hunter DJ, Cramer DW, et al. (2000) Prospective study of talc use and ovarian cancer. *J Natl Cancer Inst*. 92: 249 - 252.
- Harlow BL, Cramer DW, Bell DA, Welch WR. (1992) Perineal exposure to talc and ovarian cancer risk. *Obstet Gynecol*. 80: 19 - 26.
- Hartge P, Stewart PA. (1994) Occupation and ovarian cancer: a case-control study in the Washington DC metropolitan area, 1978-1981. *J Occup Med*. 36:924"927.
- Honda Y, Beall C, Delzell E, et al. (2002) Mortality among workers at a talc mining and milling facility. *Ann Occup Hyg*. 46:575 - 585.
- Huncharek M, Geschwind JF, Kupelnick B. (2003) Perineal application of cosmetic talc and risk of invasive epithelial ovarian cancer: a meta-analysis of 11,933 subjects from sixteen observational studies. *Anticancer Res*. 23:1955 - 1960.

ISSN 0975-8941
Research Lines (Vol. XII No. 1&2) June-December 2019 31

Biodiversity Status of Fishes in Kadamakudy Panchayath Area of Vembanadu Lake, Kerala

Vysakh V.G., Anju Soma S. and Priya Joseph.
Department of Zoology, Deva Matha college, Kuravilangad

Received: 15th September 2019 Accepted: 15th November 2019

ABSTRACT

The Study includes survey and sampling carried out in three sites of Vembanadu lake, revealing the occurrence of 30 species belonging to 13 order and 27 families. The survey was undertaken during the period from February to December -2017 in the Kadamakudy Panchayath of Ernakulam district. The major objective of this study was to find out the Biodiversity status of fishes in the 3 sites of Vembanad lake system in Ernakulam, South India. Conservation status of fishes from the Vembanad lake was assessed by following the IUCN conservation status. It was found that out of 22 species reported in the present study, 13.63 % are Vulnerable, 4.54 % are Endangered, 4.54 % are at Lower Risk and Near Threatened, 27.27 % are at Lower Risk and Least Concern, 31.81% are Least Concern, 4.54% are Critically Endangered, Data Deficient for 4.54 % species and 9.0 % are Not Evaluated as per IUCN Red list category -2011. This is a pioneer study on the fish diversity of Kadamakudy panchayath. The comprehensive listing, distribution as well as the continuous monitoring is a critical requirement for the protection of fish fauna.

INTRODUCTION

Western Ghats is the biodiversity richest region in India (Myers, 1990), comprising highly diverse fish fauna. Around 192 out of total 288 is endemic species (Ponniah and Gopalakrishnan,2000; Dahanukar, Raut and Bhat, 2004)). Kerala is gifted with 41 West-flowing and three East-flowing rivers with rich biodiversity, which originate from Western Ghats (Hamilton, 1822; Shyla, 2011). Vembanad lake is one of the biodiversity rich aquatic habitat in Kerala, supports a diverse aquatic biota with many endemic and threatened organisms. Vembanad Lake is a transitional ecotone between sea and land. Rich biodiversity along with adjacent kole lands led to declare the lake as a Ramsar site (Vembanad fish count, 2009). Faunal diversity of Vembanad lake is threatened by human activities and exotic species (Dahanukar, Raut and Bhat, 2004). Thus the study of diversity and distribution of fishes is necessary for scheming and implementing conservational strategies (Aravazhi Arunkumar and Manimekalan, 2018).

Present paper aimed to study fish fauna of Vembanad lake in Kadamkudy panchayath. The paper also provides information on the distribution, relative abundance, threat status and endemism of various species encountered during the study.

MATERIALS AND METHODS

Study area: The survey was carried out in three sites around the Kadamakudy Island. This place is at mouth of the estuary of the Veeranpuzha (local name) that flows into Arabian Sea.

ISSN 0975-8941

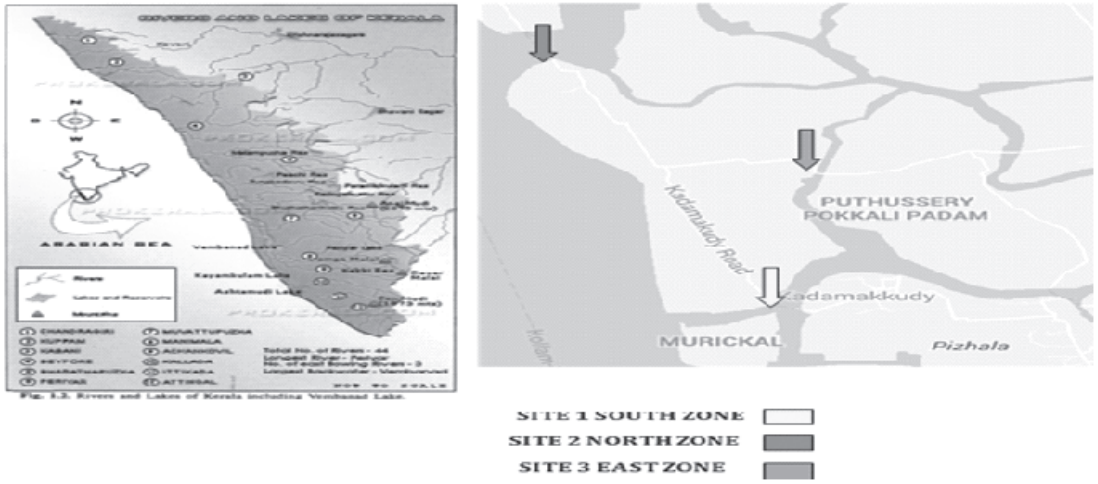


Figure 1: Map of Study Area

Sample collection: Sampling was carried out in three selected sites named as south zone, North zone, and East Zone of Vembanad Lake in three seasons (pre monsoon from February to May, monsoon from June to September and post monsoon from October to December) throughout year 2017 to evaluate the abundance. Fishing is done by using various gears including Scoop nets, gill nets (32mm, 64mm), Chinese net. The catches also collected from fishermen of the river. Fishes were collected with care to avoid loss of morphological features. Fish fauna were photographed. Bottles were labeled with reference number. Collected fish samples were preserved in 10% formaldehyde solution for detailed Identification. Fishes were identified using Jayaram, (1999), Menon, (1999), Day, (1878), and Munro, (2000). Identified specimens were further confirmed by the FAO and fish base.Based on the availability and abundance in collection, fishes were classified into abundant, common, rare, very rare following Radhakrishnan and Kurup, (2013)

Analysis: A number of indices were applied to quantify species diversity (*H'),* the most widely used Shannon index (Shannon and Weaver,1949), Pielou's evenness index (E) (Pielou, 1975) and Simpson's dominance index (D) (Simpson, 1949) were used. The above Statistical analysis were performed using Past (version 3.07) (Hammer *et. al*., 2001).

RESULT AND DISCUSSION

Fishes and distribution: In the present work, a total of three sites were studied, in which, 30 species belonging to 27 families and 12 orders were recorded. The list of fish species and other details including threat status, relative abundance, endemism and distributions are given in Table 1. Perciformes were the dominant order among them with 11 families and 13 species compared to other order. Fish species diversity, abundance, and distribution: Among three sampling locations, high species diversity was observed in Site 2 (*H'*=2.776) and low diversity was observed in site 1 (*H'*=2.576). The maximum species diversity was recorded at site-2 (S = 25), and the minimum was recorded at site-3 of the Vembanad lake (S = 18).The maximum dominance index (D =0.1073) was recorded at site 1 and the lowest (D =0.8581) was recorded at site 2. (Table 2)

ISSN 0975-8941

Table 1: The list of fish species and their IUCN Status

Sl. No.	FISH	IUCN STATUS	TOTAL NUMBER
	Order: Cypriniforms		
1	*Rasbora daniconians*	LC	52
2	*Puntius aurilus*	CE	6
3	*Puntius filamentosa*	VC	15
4	*Apiocheilum panchax*	LC	48
	Order: Synbranchiformes		
5	*Mastacembalus armatus*	LC	1
	Order: *T*etradontiform		
6	*Carinoteradon travencoricus*	V.C	1
7	*Triacanthus biaculeatus*	NE	!
	Order: Perciformes		
8	*Glossogobius giuris*	LC	15
10	*Etroplus suratensis*	LC	10
11	*Etroplus maculates*	LC	34
12	*Oreochomis mossambicus*	NT	9
13	*Parambasis thomsonni*	LC	18
14	*Scatophagus argus*	LC	4
15	*Gerres subfasciatus*	LC	1
16	*Mene maculate*	NE	1
17	*Silage indica*	DD	3
18	*Carangoides malabaricus*	NE	4
19	*Argyrosomus amoyensis*	NE	1
20	*Lates calcarifer*	NE	1
	Order: Batracoidiniformes		
21	*Collectichthys dussumerri*	NE	3
	Order: Pleuronectiformis		
22	*Cynoglossus macrostomi*	NE	3
23	*Psttodes erumeim*	NE	2
24	*Stolephorus commersonni*	NE	28
25	*Mugil cephalus*	LC	10
26	*Arius maculates*	NE	10
27	*Xenodon cancila*	LC	11
28	*Hyporhamphus limbatus*	LC	14
29	*Chanos chano*	NE	1
30	*Platycephlus indicus*	DD	5

EX: extinct; EW: extinct in the wild; CR: critically endangered; EN: endangered; VU: vulnerable; NT: near threatened; LC: least concern; LRlc: low risk, least concern; LRcd: low risk, conservation-dependent; DD: Data Deficient; NE: Not Evaluated

ISSN 0975-8941

Table 2: Past analysis

SL.No.	Indices	Site 1	Site 2	Site 3	Average
1.	Taxa_S	20	25	18	
2.	Individuals	92	99	89	
3.	Dominance_D	0.1073	0.08581	0.08623	0.093113
4.	Simpson_1-D	0.8927	0.9142	0.9138	0.9069
5.	Shannon_H	2.576	2.776	2.618	2.656667
6.	Evenness_e^H/S	0.657	0.642	0.7615	0.686833

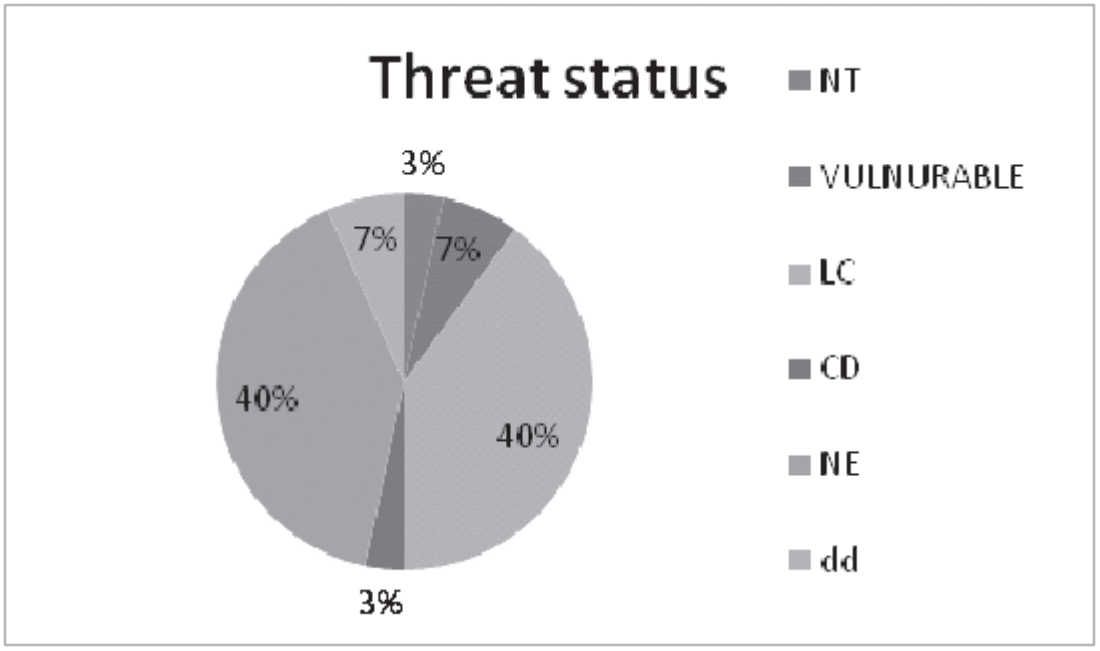


Figure 2: Threat status of fishes collected from Vembanad lake

CR - Critically Endangered, EN - Endangered; VU - Vulnerable; LR - Low Risk; EX - Exotic;

In the present study, 30 species were collected from 3 study sites of Vembanad lake systems of the southern Western Ghats. Species like *Rasboradaniconians*, *Apiocheilum panchax* found in all of the 3 sites of the lake.Over fishing has been observed more in human settlement areas, and this causes many changes in the environment that affect fishery resources. Pollution is also one of the main factors which cause the decline of the ichthyofaunal diversity (Ambili, 2013).

The abundance of fish species is based on the salinity of water. During monsoon season, salinity of water is very less hence; fish fauna is represented by freshwater species. In other words from May to September the water salinity is less, depending upon the period and intensity of rainfall accordingly, at this time water basin contain more freshwater species. The farmers exploit this, so they cultivate pokkali rice variety in their field. After 4 or 5 months when rate of rain fall is decreased the water tends to saline because of the inflow of saline water from ocean. According to local fishermen of the island even

octopus are common. At this time, more marine species can be seen in the estuary, by the inflow of water many marine species are migrated to the water basin. During this time due to high salinity in water, rice cultivationis not possible and hence the farmers culture prawns such as *Penaeus monodon, Feneropaneas indicus* and fishes *like Etroplus surat*ensis and *Tilapia*. Sediments and nutrients formed as a result of rice cultivation improve the life of these animals.

The south east and north zones are selected for sampling; west is avoided because west zone is more deeper and very difficult to reach because of the large fields (to cultivate fishes). But fish abundance is more there due to the presence of sea and water conditions. The south and North zone directly receive the sea water while east zone receive relatively less amount because of some land and other barrier. The factors affecting abundance of fish is based on the temperature, PH, climate change and even factors like pollution and land filling. The difference in salinity and other factors affect diversity.The monitoring and recording of fish stocks are becoming essential to perform regular reviews of the circulation and status of all fish species, and this will be possible by maintaining records (Jatindra Nath Bhakta, 2007). The documentation of genetic resources for aquaculture is also a part of the coverage of the Fish Base database (Pauly and Froese, 2012). The comprehensive listing, distribution as well as the continuous monitoring is a critical requirement for the protection of fish fauna.

CONCLUSION

The present study illustrates the status of Vembanad Lake in Kadamakudy Panchayath as one of the richest areas of fish diversity and endemism within the Western Ghats Hotspot. The presence of a number of endemic and threatened fish species necessitates proper conservation and management actions to be developed and implemented.

REFERENCES

1. Ambili, T. (2013) : Morphological and Molecular Characterization of Genus *Tor* from Southern Western Ghats, INDIA, PhD thesis, Bharathiar University, Coimbatore,.
2. Aravazhi Arunkumar, A. and Manimekalan, A. (2018) Freshwater fish fauna of rivers of the southern Western Ghats, India, *Earth System Science Data*, 10(3), pp. 1735–1752. doi: 10.5194/ed-10-1735-2018.
3. Ashoka Trust for Research in Ecology and Enviornment (2009) Vembanad fish count report.
4. Chacko (1948) A survey of the fisheries of the Tungabhandra River, P. I P. In, p. Sci. B, 28, 166–175, 194.
5. Dahanukar, N., Raut, R. and Bhat, A. (2004) Distribution, endemism and threat status of freshwater fishes in the Western Ghats of India..
6. Day (1878) The fishes of India; Being a natural history of the fishes known to inhabit the seas and fresh waters of India, Burma and Ceylon. William Dawson & Sons Ltd. London.
7. Hamilton, F. (1822) An account of the fishes found in the river Ganges and its branches
8. Hammer Ø, Harper DAT, R. P. (2001) Past 3.07 Paleontological statistics software package for education and data analysis. *Palaeontol Electron* 4 (1): art. 4–art. 9.

9. Jatindra Nath BhaktaP. K. B. (2007) Exotic Fish Biodiversity in Churni River of West Bengal, India, *Electronic Journal of Biology*, 3(1), pp. 2000–2002.

10. Jayaram, K. (1999) The freshwater fishes of the Indian region. Narendra Publishing House, Delhi.

11. Menon, A. G. K. and Devi, K. R. (1992) 'Puntius sharmai, a new cyprinid fish from Madras, *Journal of Bombay Natural History Society*, 89, pp. 353–354.

12. Menon, A. G. K. (1999) Records of the Zoological survey of India Check list-Fresh water fishes of India.

13. Munro, I. S. R. (Ian S. R. (2000) The marine and fresh water fishes of Ceylon. Biotech Books.

14. Myers, N. (1990) The Biodiversity Challenges; Expanded Hot-Spots Analysis. 10(4).

15. Pauly, D. and Froese, R. (2012) 'Comments on FAO's State of Fisheries and Aquaculture, or "SOFIA 2010"', Marine Policy. Pergamon, 36(3), pp. 746–752. doi: 10.1016/J.MARPOL.2011.10.021.

16. Pielou, E. C. (1975) Ecological Diversity,. Wiley, New York.

17. Ponniah, A. G. and Gopalakrishnan, A. (2000) Endemic Fish Diversity of Western Ghats.

18. Ponniah, A. G., Gopalakrishnan, A. and National Bureau of Fish Genetic Resources (India) (2000) Endemic fish diversity of Western Ghats, NBFGR-NATP publ.

19. Radhakrishnan, K. V. and Kurup, B. M. (2013) Ichthyodiversity of Periyar Tiger Reserve, Kerala, India, *Journal of Threatened Taxa*, 2(10), pp. 1192–1198. doi: 10.11609/jott.o2350.1192-8.

20. Shannon, C. E. and Weaver, W. (1949) The mathematical theory of communications, Urbaba, University of IIinois Press, Urbaba.

21. Shyla, M. H. (2011) Ichthyo diversity of Puthenvelikkara and its environs in Ernakulam Kerala India', University. Kottayam.

22. Silas, E. G. (1951) On a collection of fish from the Annamalai and Nelliampathi hill ranges, Western Ghats, with a note on its zoogeographical significance, *Journal of Bombay Natural History Society*, pp. XLIX, 470–481,.

23. Simpson, E. H. (1949) 'Measurement of diversity', *Nature*, pp. 163, 688.

ISSN 0975-8941

Isolation and Identification of Bacteria from External Body Surface of *Musca Domestica Linn* in Kottayam, Kerala.

Balu M. Nair and Gincy Baby
P.G.Department of Zoology, Deva Matha College, Kuravilangad, Kottayam

Received: 20th October 2019 Accepted: 20th December 2019

ABSTRACT
Musca domestica Linnaeus (housefly) found in every habitation causing nuisance, diseases which results in public health problems (Service, 2000). This work include the isolation and identification of bacteria from the housefly to show their vector carrying capacity.The area selected for the study purpose is Kottayam district, Kerala. Biochemical and morphological studies on isolated bacteria confirmed the presence of different kinds of bacteria from the external body surface of housefly collected from three sites (Nagampadam bus stand, Kottayam, Pallickathodu village, Slaughter house Kuravilangad). The identified bacteria genus include *Bacillus sp, Staphylococcus sp, Pseudomonas sp* and *Clostridium sp*.

INTRODUCTION

Throughout history,diseases of one form or other devastated mankind. People have always struggled to understand and conquer the diseases and physical ailments that have plagued their lives and socities.Vectors play a major role in transmitting these diseases. Out of them vectors like *Musca domestica* play a major role in transmitting these diseases. House fly act as significant mechanical carriers of pathogenic bacteria such as *Escherichia coli*, *Salmonella sp*, *Staphylococcus aureu*s, *Shigella sp*, *Vibrio cholera* (Karim, 2018; Holt *et. al.*, 2007). Due to its large population size and high fecundity, the common housefly is recognised as a major pest in livestock communities (Axtell, R, 1986; Carn, 1996; Abbas, Sajeel, & Kausar, 2013). Apart from their nuisance factor, high numbers of houseflies raise health concerns for humans and animals as they act as vector for many microorganisms (Scott *et. al.*, 2000). Houseflies are from the order diptera (Hammack, 2000). The feeding through proboscis is an important feature of housefly that also constitute for its vector carrying capacity. About hundred different pathogen species have been found in and on houseflies (Mian, *et. al*., 2002). The external body surface particularly the legs and proboscis contribute to the vector carrying ability.

MATERIALS AND METHODS

Collection of sample for bacteria species

Houseflies were collected from three sites of Kottayam district –Site A(Nagampadam bus stand, Kottayam), Site B (Pallickathodu village), Site C (Slaughter house Kuravilangadu). The areas were selected for study includes the urban and rural areas to identify the types of bacteria that a housefly can carry. The sample houseflies were collected using insect net and transferred into sterilised test tubes.(Kassiri and Akbarzadeh, 2012)

Isolation and Identification of Bacteria

10ml of autoclaved water is used to wash the houseflies separately. Using this water the houseflies were rinsed thoroughly so that the external body surface gets mixed with water properly. This water is then collected and is subjected for serial dilution.(Hoffman et al., 1997)

Each sample from site A,B and C were serial diluted up to 10^{-5} times. Then the diluted samples were taken and pour culture is carried out. The 3 plates were marked as site A,B and C .Then the cultured plates were incubated for 24 hours at room temperature.

From each plate,two colonies are randomly selected and marked as "A1,A2,B1,B2,C1,and C2.These colonies were streaked separately. From each plate, sub- culture is carried out through streaking for 3 consecutive days so that a single colony of bacteria can be isolated. On the fourth day 6 plates with 6 different bacteria are obtained. Bacteria species were identified using morphological and bio chemical tests. Bacterial identification were done by TIES(Tropical Institute of Ecological Science), Kottayam.

Culture media

Nutrient agar medium is used to culture bacteria species. To prepare the media 5g of peptone, 5g Nacl, 3g beef extract and 15g agar were dissolved in 1L of distilled water and boiled. It was sterilised at a temperature of 121^0C for 15 minutes (Jorgensen & Pfaller, 2018).

RESULTS AND DISCUSSION

The present study is carried out to isolate and identify bacteria species from the external body surface of housefly. Six bacteria colony were randomly selected and sub cultured.This bacteria samples are then subjected for bacterial identification using standard procedures.The identification procedure is carried out at TIES (Tropical Institute of Ecological Science). Bacteria species were identified through biochemical tests and morphological characterisation. The isolated 6 samples belongs to four genus of bacteria namely *Bacillus, Staphylococcus, Pseudomonas* and *Clostridium* (Table 1).

Bacteria sample identified from site A (Nagampadom, Kottayam) belongs to *Bacillus sp* and *Staphylococcus sp*., *Bacillus sp* and *Pseudomonas sp* were identified from site B (Pallickathodu village). Bacteria samples identified from site C (Slaughter house, Kuravilangad) are *Bacillus sp* and *Clostridium sp* respectively. Most of these microbes are pathogenic that causes various problems in human and animals. Bacterial selection after serial dilution indicates the fact that a single housefly can harbour large number of pathogenic microorganisms.

The biology and ecology of *Musca domestica Linnaeus* make it an ideal mechanical vector.This study showed the isolation and identification of six bacteria sp from housefly from 3 sites in Kottayam district.The results of this study indicated that housefly could play a major role as a mechanical carrier of bacteria.

Similar study conducted by Ahmed & Salih, (2013) showed that housefly act as potential vectors of bacteria.They isolated bacteria from the external body surface and these bacteria were identified as *E.coli, Stap.aureus,Staph.albus, Pseudomonas aeruginosa, Klebseilla* and *Salmonella.*

Similar study conducted by (Rogayah, 2005), isolated bacterial species from *M.domestica*. The isolated species were identified to the genus level as *Staphylococcus sp, Bacillus sp, Micrococcus sp,*and *Streptococcus sp*. From the total isolates,41% were identified as *Bacillus sp*.

In this present study bacteria isolated from the external body surface were identified to the genus level. The identified bacteria are belongs to the genus *Bacillus sp,Staphylococcus sp, Pseudomonas sp*

ISSN 0975-8941

and *Clostridium sp*. Like the study conducted by Rogayah (2006) this present study also showed that out of total species 50% belongs to *Bacillus sp.*

Table 1: List of Bacterial Species identified from *M.domestica* and their bio-chemical characteristics

B3 (B1)	B2(A2)	B1 (A1)	Isolate no	
+ rod	+ cocci	+ rod	Gram staining	
'	'	+	Spore staining	
Largre, irregular,circular Raised,smooth	Circular, pinhead.entire convex smooth	large,irregular, undulate,white dull	Agar slant Culture	
'	'	+	Motility	
AG	G	G	Lactose	Fermentation
AG	AG	G	Sucrose	
AG	AG	AG	Glucose	
+	+	+	Mannitol	
A/AK	A/AK	A/AK	Tsi	
'	+	+	H2s	
'	'	'	NO3 reduction	
'	'	'	Indole	
'	'	'	MR reaction	
'	+	+	VP reaction	
+	'	+	Citrate	
'	+	+	Urease	
+	+	+	Catalase	
+	+	+	Oxidase	
+	+	+	OF1	
'	'	'	OF2	
Bacillus sp	*Staphylococcus sp*	*Bacillus sp*	Organism identified	

B6 (C2)	B5 (C1)	B4 (B2)	Isolate no	
+rod	+ rod	- rod	Gram staining	
+	+	-	Spore staining	
Large, convex, Opaque, dried, colonies	Large, irregularly, Circular, raised Smooth,	Oval wavy, Umbonate Mucoid,colonies	Agar slant Culture characteristics	
'	'	'	Motility	
G	G	AG	Lactose	Fermentation
AG	AG	AG	Sucrose	
AG	AG	AG	Glucose	
+	+	+	Mannitol	
-/AK	-/AK	A/AK	Tsi	
+	+	'	H2s	
'	'	'	NO3 reduction	
'	'	'	Indole	
+	+	+	MR reaction	
'	'	+	VP reaction	
'	'	+	Citrate	
'	'	'	Urease	
+	+	+	Catalase	
+	+	+	Oxidase	
+	+	+	OF1	
'	'	'	OF2	
Bacillus sp	*Clostridium sp*	*Pseudomonas sp*	Organism identified	

KEY:G - Gas; A - Acid; AG –Acid Gas; AK -Alkaline

REFERENCES

- Abbas, M. N., Sajeel, M., & Kausar, S. (2013). House fly (Musca domestica), a challenging pest;; biology , management and control strategies. *Elixir Entomology*, 19333–19338.
- Karim M.A. (2018). The effect of aqueous plant extracts of tobacco on Third larvae of house fly *Musca domestica L* ., Diptera : Muscide, *6*(3), 403–408.
- Ahmed, Karim Mohammad, & Salih, S. S. (2013). Isolation and Identification of Bacterial Isolates

from House Flies in Sulaymaniya City, *31*(1), 24–33.

- Axtell, R, C. (1986). Status and potential of biological control agents in livestock and poultry pest management systems. *Miscellaneous Publications of the Entomological Society of America*.
- Carn, M. V. (1996). The role of dipterous insects in the mechanical transmission of animal viruses. *British Veterinary Journal*, *4*, 162–163.
- Kassiri H., Akbarzadeh K.A. G. (2012). Isolation of Pathogenic Bacteria on the House Fly , Musca domestica L. (Diptera/ :Muscidae), Body Surface in Ahwaz Hospitals , Southwestern Iran. *Asian Pacific Journal of Tropical Biomedicine*, 1116–1119. https://doi.org/10.1016/S2221-1691(12)60370-0
- Hammack, S., A. R. O. A. T. (2000). Isolation of Salmonella spp . from the Housefly , Musca domestica L ., and the Dump Fly , Hydrotaea aenescens (Wiedemann) (Diptera/ : Muscidae), at Caged-Layer Houses. *Journal of Food Protection*, *63*(7), 958–960.
- Hoffman, J. S., Chong, F. K., Burstein, N. A., Gru, P., Mepani, C., & Cave, D. R. (1997). Vector Potential of Houseflies (Musca domestica) for Helicobacter pylori. *Journal of clinical microbiology*, *35*(6), 1300–1303.
- Holt, P. S., Geden, C. J., Moore, R. W., & Gast, R. K. (2007). Isolation of Salmonella enterica Serovar Enteritidis from Houseflies (Musca domestica) Found in Rooms Containing Salmonella Serovar Enteritidis-Challenged Hens —“, *73*(19), 6030–6035. https://doi.org/10.1128/AEM.00803-07
- Jorgensen, J H,& Pfaller, M A. (2018). *Nutrient broth specimen collection and handling: warning and precautions:limitations,* 2–4.
- Mian, L. S., Maag, H., & Tacal, J. V. (2002). Isolation of Salmonella from muscoid flies at commercial animal establishments in San Bernardino County , California, 82–85.
- Rogayah, T. (2005). Bacteria fauna from the house fly , Musca domestica (L .), *22*(2), 225–231.
- Service, M. W. (2000). *Medical Entomology for Students*.

ISSN 0975-8941
42 June-December 2019 (Vol. XII No. 1&2) Research Lines

Comparison of the Effect of Traditional Methods and Synthetic Medicines Against Three Selected Species of Bacteria Causing Throat Infection

Maneesha K Vijayanand Alphy Maria Thomas
P.G Deparment of Zoology, Deva Matha College, Kuravilangad, Kottayam
Received: 31st October 2019 Accepted: 30th November 2019

ABSTRACT

In the present study, comparison of effect of traditional methods and synthetic medicines against three selected species of bacteria namely, *Pseudomonas aueroginosa*, *Staphylococcus aureus* and *Streptococcus pyogenes* causing throat infection was assessed using agar disc diffusion method. Natural extracts (honey, mint leaves, ginger, lemon and salt water) and synthetic medicines (clavam, omnix, cepodem, tuspel and tixylix) at different concentrations (25%, 50%, 75% and 100%) were effective against all three tested bacteria. The study revealed that the ginger (100%) is the most effective traditional method and clavam (100%) is the most effective synthetic method. As the concentration of medicines increased, the antibacterial property also increased. Lower concentrations of antibiotics and higher concentrations of mint, lemon, ginger and honey had the same effects. Throat infections are very common among people. It's very harmful to take antibiotics always, to cure from it. As a conclusion traditional methods can be considered as an effective alternative to synthetic medicines.

INTRODUCTION

Infectious diseases account for approximately one-half of all deaths in tropical countries. In industrialized nations, despite the progress made in the understanding of microbiology and their control, incidents of epidemics due to drug resistant microorganisms and the emergence of hitherto unknown disease-causing microbes, pose enormous public health concerns (Iwu *et. al*., 1999).Throat infections are caused in humans mainly due to viral or bacterial infections. The scientific term used for these infections is Pharyngitis. Sore throat is the most common and the first symptom to be seen in a person affected by throat infection. Most times the infection is a viral infection and not the one caused by the bacteria or fungi. The commonly seen symptoms are pain in the throat, difficulty in swallowing food, loss of appetite, fever, body ache, ear pain, headaches and infection in the tonsils. Throat infections are Strep Throat, Sore Throat, Cough, Nosocomial Infection, and Staphylococcal Tonsillitis.

Traditional herbal medicines have received much attention as a source of novel antibacterial drugs since they are considered as safe for human use. Plant based medicines are widely used for primary health care in many developing countries. Plants have also been explored to get crude natural extracts for testing and developing potent and new antimicrobial drugs. A large number of secondary metabolites such as alkaloids, tannins, and flavonoids extracted from different medicinal plants have shown antimicrobial potential (Mehreen *et. al.*, 2016). Antibiotics are drugs that kill or stop the growth of bacteria. They do this by blocking important functions within the bacteria cell.While antibiotics are safe for most people, a small number of people are prone to allergic reactions. These allergic reactions can be to penicillin or other antibiotics.

MATERIALS AND METHODS

Bacterial strains used: Three bacterial species, *Streptococcus pyogenes*, *Pseudomonas aueroginosa* and *Staphylococcus aureus* which are the 3 major causative agents of throat infections were obtained from TIES (Tropical Institute of Ecological Science) Kottayam.

Sample Preparation

The natural products and synthetic medicines used for the study were decided after a survey among people and consultation of ENT doctors.

Natural products selected for the study

Honey: Crude small honey was collected from a home at Kozhikode and stored in a 100ml sterile glass bottle.

Citrus limon (Lemon): Fresh fruits were taken and washed in running tap water and it is surface sterilized with 70% alcohol. Then it was rinsed with sterile distilled water and cut open with a sterile knife and the juice pressed out into a sterile beaker separately and then filtered using filter paper into another sterile container to remove the seeds and used freshly as crude without refrigeration (Kadhim Hindi and Ghani Chabuck, 2013).

Mentha piperita (Mint plant): The leaves were separated and washed under tap water. 0.5 g of mint leaves were refluxed using 20 ml of distilled water. The filtrate was separated and further filtered using Whatman's filter paper. (Padmini *et. al*., 2010).

Zingiber officinale (Ginger): Aqueous extracts from ginger was prepared separately. The fresh ginger rhizomes were washed, peeled, sliced and air dried. After drying, ginger was powdered using electric blender. One gram of ginger powder was soaked in 10 ml of distilled water. The flasks were incubated at room temperature for 72 hours. Then it is mixed well. The crude extract was filtered with filter paper and the extracts were concentrated by evaporation. (Okiki and Oyetunji, 2015).

Salt water: ½ teaspoon salt dissolved in 8 ounce of glass of warm water (Anderson, n.d)

Synthetic medicines selected for the study

Synthetic medicines used for the study purpose include Omnix – 50, Clavam BID, Cepodem, Tuspel LS and Tixylix.

Concentrations of mixtures.

Natural and synthetic products were made up with sterile distilled water to make different concentrations (25%, 50%, 75%, and 100%).

Nutrient broth and Bacterial inoculums

Bacterial inoculums were prepared in different sterile test tubes by inoculating a single colony of test organism in 5 ml of Nutrient broth.

For the preparation of nutrient broth 10g peptone, 5g NaCl and 10g beef extract were taken. 25grams of ingredients dissolved in 1000 ml autoclaved distilled water. Heat if necessary to dissolve the medium completely. Sterilise by autoclaving at 15lbs pressure (121°C) for 15 minutes (Jorgensen and Pfaller, 2018).

Preparation of agar medium

For the preparation of agar medium, 5g peptone, 5g NaCl, 3g beef extract and 15g agar were taken. 28 grams of ingredients were dissolved in 1000ml sterile distilled water. Heat to boil to dissolve the medium completely. Sterilize by autoclaving at 15 lbs pressure (121°C) for 15 minutes. Cool to 45- 50°C. Mix well and pour into sterile Petri plates (Jorgensen and Pfaller, 2018)

Preparation of sterile disc

Whatman's No: 1 filter paper was punched into 5mm disc forms. These discs were sterilized and stored at 4°c for further use (Selvamohan *et. al*., 2016).

Agar disc diffusion method

20ml of sterilized Agar was poured into sterile Petri plates. After it get solidified, 5ml of fresh culture of bacteria were swabbed on to the respective plates. The discs were kept over the agar plates using sterile forceps at various concentrations (25%, 50%, 75%, and 100%) of natural and synthetic products. The plates were incubated for 24 hours at 37°c. After incubation, the diameter of Inhibition zones formed around each disc were measured and expressed in millimetre (mm) (Selvamohan *et. al*.,2016).

OBSERVATIONS

Table 1: Antibacterial activity of natural products against *P. aueroginosa, S. aureus and S. pyogenes* at different concentrations

Natural products	Zone of Inhibition (mm)											
	Pseudomonas aueroginosa				*Staphylococcus aureus*				*Streptococcus pyogenes*			
	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%
Honey	0	6	7	9	0	7	9	10	0	6	7	8
Mint leaves	5	12	14	15	7	11	15	19	0	3	5	6
Lemon	0	0	10	11	9	10	14	15	0	0	7	9
Ginger	0	11	12	13	0	8	14	24	0	0	12	20
Salt water	0	0	0	6	0	0	0	7	0	0	0	5

Table 2: Antibacterial activity of synthetic products against *P. aueroginosa, S. aureus and S. pyogenes* at different concentrations

Synthetic products	Zone Of Inhibition (mm)											
	Pseudomonas aueroginosa				*Staphylococcus aureus*				*Streptococcus pyogenes*			
	25%	50%	75%	100%	25%	50%	75%	100%	25%	50%	75%	100%
Tixylix	7	8	10	11	8	10	11	12	6	7	8	9
Tuspel	9	10	12	15	15	18	19	21	6	8	9	10
Cepodem	14	15	17	21	20	22	23	26	7	12	13	15
Clavam	11	24	27	29	30	31	33	34	7	8	9	12
Omnix	14	16	19	21	25	28	30	32	8	11	14	15

RESULTS AND DISCUSSION

The antimicrobial activity of traditional methods and synthetic products were investigated against three selected bacteria species causing throat infections using agar disc diffusion method and determination of minimal inhibitory concentration (MIC) at different concentrations. All the examined traditional methods and synthetic products showed varying degrees of antimicrobial activity against three selected bacteria species namely *Streptococcus pyogenes*, *Staphylococcus aureus* and *Pseudomonas aueroginosa*. Among the four concentrations 25%, 50%, 75% and 100% of selected natural and synthetic products, 100%

concentration showed highest zone of inhibition (mm) against all pathogenic bacteria tested.

The antibacterial activity of natural products against *Streptococcus pyogenes*, *Staphylococcus aureus* and *Pseudomonas aueroginosa* were analysed. Maximum Zone of Inhibition noted in *Zingiber officinale* against *Staphylococcus aureus* about 24mm, 12mm, 8mm at 100%, 75%, 50% concentrations respectively. Minimum Zone of Inhibition showed by the salt water against *Staphylococcus aureus* (7mm), *Pseudomonas aueroginosa* (6mm) and *Streptococcus pyogenes* (5mm) only at 100%concentrations.

The antibacterial activity of synthetic medicines against *Streptococcus pyogenes*, *Staphylococcus aureus* and *Pseudomonas aueroginosa* were analysed. Maximum Zone of Inhibition noted in clavam against *Staphylococcus aureus* about 34mm, 33mm, 31mm and 30mm at 100%, 75%, 50% and 25% concentrations respectively. Minimum Zone of Inhibition showed by the tixylix against *Staphylococcus aureus*, about 12mm, 11mm, 10mm and 8mm and for *Pseudomonas aueroginosa* about 11mm, 10mm, 8mm and 7mm and for *Streptococcus pyogenes*, about 9mm, 8mm, 7mm and 6mm at 100%, 75%, 50% and 25% concentrations respectively.

Comparing the effect of natural and synthetic products; synthetic medicines show more Zone of Inhibition than the natural methods on three selected species of bacteria. In *Pseudomonas aueroginosa*, the effect of 25% concentration of tixylix (7mm) and 75% concentration of small honey (7mm) are similar. 75% concentration of tixylix (10mm) and 50% concentration of tuspel (10mm) are similar to the effect of 75% concentration of *Citrus limon* (10mm). And also the effect of 100% concentration of tixylix (11mm) and 25% concentration of clavam (11mm) is similar to the 50% concentration of *Zingiberofficinale*(11mm) and 100% concentration of *Citrus limon* (11mm) against *P. aueroginosa*. 25% of tuspel concentration (9mm) is similar to the effect of small honey of 100% concentration (9mm), 100% of tuspel (15mm) and 50% of cepodem (15mm) shows the effect similar to 100% concentration of *Menthapiperita*(15mm), 75% concentration of tuspel (12mm) gives the similar effect of *Zingiber officinale*at 75% concentrations and 25% concentration of omnix and cepodem is similar to the effect of 75% concentration of *Menthapiperita*extract against *P. aueroginosa*.

In *Staphylococcus aureus,* the effect of 25% concentrations of tixylix is similar to effect of 50% concentration of small honey (7mm). 50% of tixylix is similar to the effect of 100% of small honey and 50% of *Citrus limon* (10mm), 75% concentrations of tixylix (11mm) and tuspel (19mm) show the similar effect of 50% (11mm) and 100% (19mm) concentrations of *Mentha piperita* respectively and 25% concentrations of tuspel are similar to the effect of 75% of *Mentha piperita* and 100% of *Citrus limon* (15mm) against *S. aureus.*

In *Streptococcus pyogenes*, 25% of tuspel and tixylix is similar to the effect of 100% of *Mentha piperita* (6mm).25% of cepodem and clavam and also 50% tixylix are similar to the effect of 75% of small honey and *Citrus limon*; 50%of tuspel and clavam, 25% of omnix and 75%of tixylix is similar to the effect of 100% of small honey concentrations (8mm); 100% of tixylix and 75% concentration of tuspel and clavam is similar to the effect of 100% *Citrus limon* (9mm); 50% cepodem and 100% clavam is similar to effect of *Zingiber officinale* (12mm) at 75% concentration against *S.pyogenes.*

Kadhim Hindi & Ghani Chabuck (2013) suggested that the juice of *Citrus limon* has antimicrobial activities against *S.aureus* (26mm) and *S. pyogenes* (20mm). But juice of Citrus limon has no effect on the *P.aueroginosa*. From these study the three bacterial species namely *Streptococcus pyogenes*, *Staphylococcus aureus* and *Pseudomonas aueroginosa* show an inhibition at different concentrations of *Citrus limon*juice.

Al-sum & Al-arfaj, (2013) suggested that extract of Mint was the most effective antibacterial activity against *Staphylococcus aureus* and *Pseudomonas aueroginosa* with inhibition zones (mm) of 18 and 13

respectively. These result agreed with the results of recent study as the extracts of mint leaves has effect on the *P.auerоginosa*(15mm) and *S.aureus* (19mm).

Ahmed *et. al*., (2012) conducted the study on the antibacterial effect of *Zingiber officinale* against *Staphylococcus aureus* and *Streptococcus pyogenes*. These bacteria's exhibited zone of inhibition 24mm and 20mm respectively. These result agreed with recent study results as the extracts of ginger has effect on *Staphylococcus aureus* and *Streptococcus pyogenes* about 24mm and 20mm respectively.

Selvamohan *et. al.*, (2016) studied the antimicrobial activity of various types of honey against throat infection causing pathogens by agar disc diffusion method showed the zone of inhibition (18mm) against *Pseudomonas sp.* and the minimum zone of inhibition against (6mm) against *Staphylococcus sp.* In recent study zone of inhibition of honey show only 9mm and 10mm against *Pseudomonas aueroginosa* and *Staphylococcus aureus* respectively. Lower concentrations of antibiotics and higher concentrations of mint, lemon, ginger and honey had the same effects. Throat infections are very common among people. It's very harmful to take antibiotics always, to cure from it. As a conclusion traditional methods can be considered as an effective alternative to synthetic medicines.

REFERENCE

1. Ahmed, S.A. (2012). Study the antibacterial activity of *Zingiberofficinale*roots against some of pathogenic bacteria. *Al-Mustansiriyah Journal of Science*, *23*(3),pp.63-70.
2. Al-Sum, B.A. and Al-Arfaj, A.A. (2013). Antimicrobial activity of the aqueous extract of mint plant. *Science*, *2*(3),pp.110-113.
3. Hindi, N.K.K. and Chabuck, Z.A.G. (2013). Antimicrobial activity of different aqueous lemon extracts. *Journal of Applied Pharmaceutical Science*, *3*(6),p.74.
4. Iwu,M.W.,Duncan,A.R.andOkunji,C.O. (1999).New antimicrobials of plant origin.
5. Jorgensen, J. H., &Pfaller, M. A. (2018). Nutrient Broth Specimen Collection and Handling: Warning and Precautions: Limitations:2–4.
6. Mehreen, A., Waheed, M., Liaqat, I. and Arshad, N. (2016). Phytochemical, antimicrobial, and toxicological evaluation of traditional herbs used to treat sore throat. *BioMed research international*, Volume 2016, 9 pageshttp://dx.doi.org/10.1155/2016/8503426.
7. Okiki Pius, A., Oluwadunsin, O. and Benjamin, O. (2015). Antibacterial activity of ginger (*Zingiberofficinale*) against isolated bacteria from the respiratory tract infections. *Journal of Biology*, *Agriculture and Healthcare* Vol.5, No.19,
8. Padmini, E., Valarmathi, A. and Rani, M.U. (2010). Comparative analysis of chemical composition and antibacterial activities of *Menthaspicata* and *Camellia sinensis*. *Asian J. Exp. Biol. Sci*, 1(4),pp.772-781.
9. Selvamohan, T., Parameswaran, N.K. and Subitha, H. (2016). Antimicrobial activity of various types of honey against throat infection. *Int J Adv Res Biol. Sci*, *3*,pp.136-41.

Online sources

10. Anderson, C. C. (n.d.). Salt Water Gargle for Cough - The Easiest Way to Treat _ How to Cure.https://www.webmd.com/cold-and-flu/features/does-gargling-wlth-salt-water-ease- a-sore-throat#1
11. https://healthhearty.com/bacterial-throat-infection
12. https://www.verywellhealth.com/antibiotics-for-bacterial-infection-1958992

ISSN 0975-8941

Haematological and Behavioural Responses of *Anabas testudineus* Exposed to the Herbicide, Glyphosate

Sneha T and Joe Prasad Mathew

Department of Zoology, St. Berchmans College, Changanacherry

Received: 5th March 2019 Accepted: 25th May 2019

ABSTRACT

The main source of fresh water pollution can be discharge of untreated waste, dumping of industrial effluent, pesticide and fertilizer run off from agricultural fields. Aquatic organisms especially fishes are very sensitive to environmental pollutions. Even though pesticide pollution problem is common for all aquatic ecosystem it is especially common in and around water bodies of agricultural fields. The present study aims to assess the fish behavioral, morphological and hematological parameters under the effect of Herbicide, Glyphosate (Round up) 41% for 96 hour duration at lethal and sub lethal concentrations. *Anabas testudineus*, a fresh water table fish which is common in paddy fields and has high environmental resistance is taken as the test material. The blood parameters (RBC, WBC, Hb) were studied at normal, lethal and sub lethal concentration of Glyphosphate. Higher concentration of Glyphosate caused adverse effect on the body colour and haematological parameters like TEC, TLC and Hb level in *Anabas testudineus.*

INTRODUCTION

In recent years pollution in general and fresh water in particular has become an important topic for national and international concern. The high rate of increase in human population and rapid pace of industrialization have created problem of disposal of waste waters.The domestic wastes and untreated or partially treated industrial effluents supplemented with pollutants like heavy metals,pesticides and many organic compounds have greatly changed the quality of water that affects the fish and other aquatic organisms.

Water pollution affects and kill all form of wild life. Most organism present in fresh water face not only nutritional hazards but also marked diurnal and seasonal oscillations as well as man made changes in the environment. The effect of increasing pollution stress upon fresh water environments have become a cause of concern to man due to feed back to our own health, economic welfare and degradation of recreational facilities.

Among aquatic organisms fishes are more prone to the changes in their microenvironment. They form the higher level of food chain and accumulation of contaminants in fish biomagnifies the toxicants from water and hence widely used to evaluate the health of aquatic systems (Kock *et.al*, 1996). Biological changes in fish due to the exposure of toxicants are called “biomarkers” and are used for environmental risk assessment (Ron Vander Oost *et.al*, 2003). Behavioural changes may be the first response of an organism to environmental changes (Slobodkin, 1968) and are the most sensitive measures of neuro toxicity (Kjell B.Døving, 1991).

Most studies reveal that specific environmental pollutants are toxic to various aquatic organisms and systems. The role played pesticides constitute the most widely distributed group of highly toxic, non-degradable stable substances and dominate among toxicants. Unfortunately many of these toxic chemicals are mutagenic, carcinogenic or teratogenic to human beings and hinder bionts of the biosphere. Hence new compounds of biogenic are used instead of synthetic chemical fertilizers to reduce the toxicity as well as residual effect leading to bioaccumulation and biomagnification.

Pesticides reach water either through direct application or indirectly from agricultural fields, spray drifts, rain water sewage and effluents from industries manufacturing pesticides or using them in their processes. Pesticides are also applied directly to water to eliminate the undesirable organisms in order to restock more desirable fish species and plant crops. In sub lethal concentrations living organisms survive for more hours with metabolic alterations but in acute toxicity organisms cannot survive for longer periods. Insecticides thus cause an imbalance of self-sustaining ecosystem and exert a great deal of stress on body growth, fertility and population size of fish and other organisms living there. It has been reported that the early symptom of any toxicity in aquatic organisms are respiratory diseases because gills are the primary tissue site of pollutant uptake from the surrounding water due to their large surface area and close proximity to the internal and external organ.

Lethal toxicity produces a stimulus which cause a severe and rapid damage mainly death to the organism by the fastest acting mechanism of poisoning usually within 4 days of exposure. In lethal toxicity of bioassays the median lethal concentrations of the toxicant is determined or which the notation LC_{50} is used in most fields of biological testing. In this bioassay a limited number of test animals are exposed continuously to different concentrations of the toxicant for a limited number of time usually 4 days or 96 hours or less .The highest concentrations of the toxicant which kills 50% of the test organism is denoted for different periods of exposure and it is the median lethal concentration or LC_{50} at the period. The concentration which causes 50% mortality of test animals after 48 hour exposure is known as 48 hour LC_{50} and the concentration causing mortality of 50 % of test animals after 96 hour exposure is known as 96 hour LC_{50}.The percentage of mortality is plotted against each concentration or dose and the dose response curve is interpolated for further calculation. Lethal concentration can be expressed in a variety of units; moles per litre of water, 1mg per litre or parts per million (ppm) or one pictogram per litre or parts per billion (ppb).Lethal toxicity studies are considered ecologically significant, most scientifically and legally defensible modest in predictive capacity, simple and less expensive and provides a basis for initial assessment of the likely hazards from a toxicant and the effect of various parameters on its toxicity.

The hematologic and plasma chemistry parameters in aquatic species can provide predictive information, although these parameters can be highly variable owing to the influence of various intrinsic and extrinsic factors (Joseph Groff and Joseph G. Zinkl, 1999). Haematological studies is important in toxicological research because a haematological alteration is a good method for rapid evaluation of the chronic toxicity of a compound. A thin epithelial membrane separates fish blood from the water and many unfavourable changes in the water body is reflected in the blood. The knowledge of haematological characteristics of fish is important in determining its health status. The use of clinical haematology in ichthyological research has a long tradition in many countries of the world. Many researches and scientists have reviewed the haematological problems in many fishes. Several authors have insisted the need for an indicator organism which could be used to monitor environmental contamination by pollutants. Climbing perch, *Anabas testidineus* is hardy, partially air breathing fish which can tolerate both well and poorely oxygenated waters. It is widely seen in paddy fields, ponds and inland water bodies of Kerala. It occupies

3rd trophic level in the food chain and can act as a bio indicator. Experimental studies in *Anabas*, especially haematology has a great importance in the present scenario which is not only for a specific organism but also for the whole environment. Hence a study was conducted to elucidate the effect of glyophosate (Round up), a commercial pesticide with *Anabas testidineus* as the experimental organism.

Herbicides are actively used in terrestrial and aquatic ecosystems to control unwanted weeds, and their use has generated serious concerns about the potential adverse effects of these chemicals on the environment and human health. The use of glyphosate (N-phosphoromethyl glycine) as an herbicide was first proposed by scientists at the Monsanto Company in 1970. Glyphosate expresses its herbicidal activity most efficiently through direct contact with leaves, followed by translocation to other organs. Absorption via roots is negligible. In ecological systems glyphosate is degraded mainly by bacteria, but plants do this to small extent (Karpouzas and Singh, 2006).

The Roundup formulation was proposed in 1974 and contained glyphosate as the active ingredient with polyethoxylene amine (POEA), a non-ionic surfactant, added to increase the efficiency of the active ingredients by promoting the penetration of the herbicide through plant cuticle (Brausch and Smith, 2007). The extensive use of Roundup on crops may cause environmental problems with a negative impact on wildlife.

The acute toxicity of Roundup (particularly glyphosate) is considered to be low, according to data from the World Health Organization (WHO, 1994). The toxicity and risk for humans, other mammals and birds was analyzed in detail by Williams *et al*., (2000) who concluded that "under present and expected conditions of use, Roundup herbicide does not pose a health risk for humans". However, the data appeared to show that aquatic organisms, particularly fish, could be more sensitive to glyphosate than mammals. For example, Grisolia (2002), using a micronucleus test, found that Roundup enhanced the frequency of appearance of micronuclei in erythrocytes of *Tilapia rendalii*, whereas the same dosages failed to affect mice.

Glyphosate products are effectively used in the management of weeds in the aquatic environments (Kilbride and Paveglio, 2001). The products contain approximately 50 – 70 % inert ingredients/surfactants (polyethoxemethyleneamine, POEA) that enhance the efficiency of the products (Hartzler, 2001). They provide different toxicological characteristics to the products making them more toxic (Servize *et.al*, 1987). Glyphosate products have been shown to be toxic to all life forms, producing various physiological alterations in exposed fish (El-Gendy*et.al*, 1998; Ma and Liang, 2001). Roundup, a glyphosate product is a systemic and selective herbicide used to kill broadleaved, grasses and sedge species (USEPA, 2000). Glyphosate itself is of moderate toxicity to fish. The 96-hour LC_{50} of technical grade glyphosatefor bluegill sunfish and rainbow trout are 120 mg/L and 86 mg/L, respectively. Fish exposed to 5mg/L of glyphosate for two weeks were found to have lung damage and liver damage (Neskovic et al. 1996). The technical grade of glyphosate is of moderate toxicity to aquatic species, and the toxicity of different glyphosate formulations can vary considerably. For example, Touchdown 4-LC® and Bronco® have low LC_{50}s for aquatic species (<13 mg/L), and are not registered for aquatic use. On the other hand, Rodeo® has relatively high LC_{50s} (>900 mg/L) for aquatic species and is permitted for use inaquatic systems. The surfactant in Roundup® formulations is toxic to fish.

As blood is the most important body fluid, its composition usually reflects the physiological conditions of body as it provides an ideal tool for toxicological studies (Johal and Grewal, 2004). Haematological tests are important diagnostic tools and recent findings have suggested that they may be equally valuable as indicators of disease or stress due to pollutants and environmental fluctations in fishes (Bhatkar and

Dhande, 2000).In toxicological experiments the blood often shows pathological changes before external signs of toxicity and so, haematological studies in fish form a promising tool for investigating physiological changes caused by environmental pollution.

MATERIALS AND METHODS

Test animal : The common fresh water table fish,climbing perch, *Anabas testudineus* (bloch) is selected as the test animal due to its hardness, air breathing ability and satisfying the qualities for experimental fish as suggested by Butler *et.al*., (1971). It is easily available in the fresh water ponds, rivers, estuaries and paddy fields and often migrate from ponds to ponds during summer seasons. They can live out of water even for six to seven hours due to the presence of accessory respiratory organs.

Collection and handling of animals: *Anabas testudineus* were collected from fresh water areas of Kuttanad, brought to the laboratory in plastic containers without much stress and any mechanical injury. They were kept in aquarium tanks of different sizes. The fishes were acclimatized to the laboratory conditions for more than 20 days before being used for the test. They were fed daily with conventional fish feed during these days. Food remains were siphoned out of the aquaria daily during each water exchange. A quarter of the water was exchanged at the 24th hr and half at the 48th hour and complete exchange was done on the third day. The aquaria were usually washed with a piece of foam, after which the water was removed and fresh water was replaced. Only healthy specimens of uniform size were maintained for experiments.

Pesticide: Round up with active ingredient: Glyphosate 41%, other ingredients are (59%) includes polyethoxethyleneamine (POEA) and isopropylamine. Glyphosate is an aminophosphonic analogue of the natural amino acid glycine, and the name is a contraction of gly(cine) phos(phon)ate. Glyphosate is an acid molecule, so it is formulated as salt for packaging and handling.

Preparation of toxicant: Using commercial grade of pesticide (Glyphosate-round up 41%) different stock solutions (250, 300 and 500 ppm) of the toxicant were prepared. 500 ppm is found to be more appropriate and from this the working solutions of the pesticide is prepared for the experiment. Working concentrations are expressed in ppm.

Experimental set up: The specimen of *Anabas testudineus* having average weight of 37.53 g and length of 13.9 cm. were acclimatized for more than 20 days before experimentation. They were fed daily with conventional fish feeds during these days.For the evaluation of toxicity the first part is to find the LC_{50} value for the toxicant. For this the first step is the range finding test. Different concentrations of the glyphosate round up were prepared from stock solution and 8 fishes were exposed for 24 hrs. The actual range for the LC_{50} calculation has been identified by using this procedure. The next step was the calculation of the LC_{50} by using the range which is already identified and here 8 fishes were exposed for 96 hrs. After identifying the LC_{50} value, the sub lethal concentration of the same pesticide is prepared and the fishes were exposed in that concentration also for 96 hrs. The fishes were kept in plastic tubs of 15 litres. In all cases a control was maintained by exposing fishes in normal well water.The blood samples were collected from control and the experimental cases (at LC_{50} and sublethal concentration). Behavioral changes, colour, movement pattern, mortality were also noted at different hours. The dead fishes were removed immediately after proper recording.

Haematological studies: Properly washed fishes were taken and blood was collected by cardiac puncture using heparinized needle and syringe. Haematological examinations were done by the techniques suggested by Lewis*et al.,* (2001).Different haematological parameters like total erythrocyte count (TEC),

total leukocyte count TLC), Haemoglobin (Hb) were estimated. Blood smear of control and treated were also prepared for the identification of morphological changes of blood cells.

Enumeration of RBC: Requirements: Haemocytometer, RBC pipette, RBC diluting fluid.

Procedure: Clean the counting chamber, slide and cover slip with pipette with distilled water and absolute alcohol. Dried the slide and kept under the microscope. Clean and dry the pipette. Blood is collected by cardiac puncture and blood is sucked in to the pipette up to 0.5 mark avoiding the entry of air bubbles in to the column of blood. Then blow the diluting fluid in to the same pipette up to the 11 mark. Held the pipette horizontally, rolled it in the arm for mixing. Then the dilution of the blood was about 1/ 200. The microscope was adjusted for a minimum light. Placed the cover slip on the counting chamber and the pipette was applied on the slide of the counting chamber. Focussed the microscope and counted the cells in the 16 smaller squares of one larger square. Thus the cells in the 5 larger squares were counted. Multiplied the total number of cells obtained with 10,000 to obtain the RBC per cubic millimeter of blood.

Enumeration of WBC: Requirements: Haemocytometer, WBC pipette, WBC diluting fluid

WBC pipette is marked 0.5,1,11.The base of stem is wide and bulb is small.The four large squares on the haemocytometer each with 16 small squares are used for counting.Each small square has an area of 1/ 16 square millimeter.

Procedure:Wash the haemocytometer and WBC pipette and dried. Blood was drawn in to the pipette up to the 0.5 mark and diluting fluid up to the mark 11.Thus made a dilution of 1:20.Rotated the pipette in the horizontal position for a few minutes to mix thoroughly.The counting chamber was charged with the diluted blood.Focussed the microscope and counted the WBC in all the 4 larger squares and expressed as total number of luecocytes per cubic millimeters of blood.

No.of WBC in 1 mm^3 of blood = No of cells counted x Dilution factor x volume factor

Area counted

Haemoglobin (Hb): Haemoglobin was determined by sahli'shaemoglobinometer acid haematin method. Fresh blood was used for haemoglobin estimation. Filled the diluting tube of haemocytometer with 1N Hcl.Transfer the blood gently in to the diluting tube. After 1 0r 2 minutes dilute the blood with Hcl and stir it constantly till the colour of the solution matches the standard tubes. Read the amount of haemoglobin directly as g/dl.

Blood smear preparation: Placed a drop of blood on the glass slide and hold a spreader slide just in front of the drop of blood and move spreader forward with uniform pressure and speed so as to make an even film. Place 5 drops of wright's stain to the smear and keep it for 1 minute.Then add twice the number of distilled water to the slide. Mix the stain and water by gentle shaking for 10 minutes. Then wash the stain in running tap water to remove excess stain and allow the slide to dry and examined under microscope. The data are presented as the Mean ± SE(Standard error).

The LC50 value was computed using Probit Analysis and the data is plotted in graph.

OBSERVATION AND RESULTS

Test animal, *Anabas testudinues* were exposed to different concentration of round up for 96 hours under laboratory conditions for haematological studies. Haemotological examinations were done to assess the toxicity of round up on test animal.

Range finding test: Range of toxicant was assessed first to conduct sublethal toxicity. Round up ranging from 218 ppm to 280 ppm such as 218 ppm, 220 ppm, 224 ppm, 226 ppm……. 280 ppm were

selected for range finding. Control was also maintained along with the experiment in identical condition for 96 hours. 75% mortality occurred in 280 ppm and from 218 ppm to 250 ppm no mortality was seen, 25% mortality reported in 260ppm. Hence the range of lethal concentration was found to be around 260ppm to 280ppm. Results of Range Finding Test are given in Table1.

Table 1. Range finding test- *Anabas testudineus* exposed to a range of Round up

S.No	Concentration (ppm)	No. of Fishes	Mortality	Percentage mortality
1	250 ppm	8	0	0
2	252 ppm	8	1	12.5%
3	260 ppm	8	2	25%
4	280 ppm	8	6	75%

Lethal bioassay: Based on the range of concentration obtained from range finding test, three concentration were selected such as 260 ppm, 270 ppm, 280 ppm and these were used for the bioassay. Observation was done at 24 hour and continued for a period of 96 hrs.Glyphosphate concentration for lethal exposure and percentage cumulative mortality was represented in Table 2.

Table 2: Cumulative mortality at 96 hours of *Anabas testudineus* to different concentrations of Glyphosphate

S.No	Concentration (ppm)	No. of Fishes	Mortality	% mortality
1	260 ppm	8	2	25%
2	270 ppm	8	4	50%
3	280 ppm	8	6	75%

Probit analysis: LC_{50} is the lethal concentration of toxic compound mixed in external medium. It refers to the dosage of Glyphosphate that kills half of the test animal, A*nabas testudineus* used. Probit Analysis is a specialized regression model of binomial response variables used to study LC_{50} values.

The Probit analysis is the most common method in finding LC_{50} value from the regression line relating the log dose to a transformed percentage response. In Probit analysis the dose levels are chosen first. The dose levels should range between a lowest range, to which virtually no subjects will respond, and a highest dose, to which virtually all subjects will respond. The proportion of subjects responding to each dose is observed. The estimation of empirical probits, expected probits and working probits should be done. The empirical probits are read directly from the tables. Using the relation between log-dose and empirical probits, the expected probits are obtained.

Both the parameters are statistically significant. The actual and fitted curves can be represented by the Graph (Figure-1).This means that starting from a concentration level of 218 ppm if the concentration level increases by one unit, the probability that the fish may die increases by 0.8%.It starts with a low probability and then shows a sharp increase as the concentration increases.

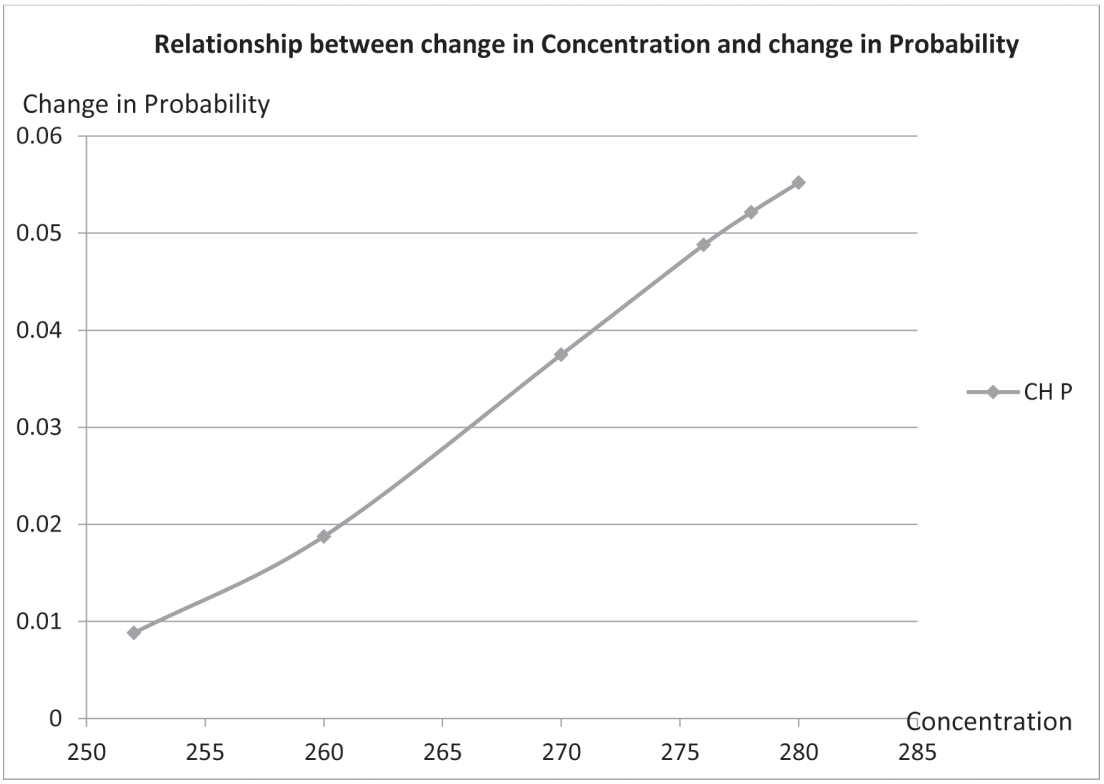


Figure 1: Graph showing probit analysis

Using the expected probits and mortality rates the working probits are determined. And fit a regression line using empirical probits and log-dose. Here the logical approach is to fit a regression of the response versus the concentration, or dose.The lethal concentration of Round up on *Anabas testudineus* is found to be 270 ppm from the probit analysis.

Ethological and morphological studies: The ethological and morphological responses of *Anabas testudineus* varied according to the test concentrations .The air gulping behaviour, swimming behaviour, resting behaviour, grouping behaviour etc. were found to be changed according to the concentration gradient. Air gulping behavior increased rapidly and tends to decrease after a short period of exposure. As the period of exposure and test concentrations increased, subsequently the activity becomes progressively, lethargic and in some cases death occurs.Similarly active swimming was reduced after an initial time of 2 hour. Grouping behaviour was found to be disturbed.

The morphological changes were found in the specimens of *A. testudineus* exposed to different concentration of Glyphosphate. When the fish is exposed at LC_{50}, 270 ppm the body colour changes to pale white. However at sub lethal concentration, the differential light and dark colouration were maintained at 96hrs. Abnormal posture, imbalance and sluggishness were observed at 48hrs in groups exposed to 270ppm.Normal dull black colour was maintained in control group.

Haematological Studies: Various haematological parameters like Total erythrocyte count(TEC), Total leukocyte count(TLC) and Haemoglobin(Hb) % were determined for both the control and treated fish.

Blood smear of control and treated fishes were analysed for determining the morphological changes in the blood cells. The blood cells show some non-distinct shapes and in some cases the cells show lysis (PLATE I). From the data of the blood parameters in lethal, sublethal and control it is clear that the Glyphosphate is moderately influencing the physiology of fish. The Total erythrocyte count and haemoglobin% is found to be decreasing from the normal control values and Total leukocyte count is increasing from the normal values. In sublethal concentration of Glyphosphate, the Hb %, total leukocyte and total erythrocyte counts is observed in between the control groups and the lethal concentration values.

Table 3. Table showing variation of blood parameters in control, sublethal and lethal concentration of Glyphosphate in *Anabas testidineus*

Dose	RBC (in Cu.mm.)	WBC (in Cu.mm.)	Hb %
LC_{50}	2.82±0.56	21.66±0.09044	5.07±0.465
Sublethal	4.62±1.306	19.67±0.62	6.17±0.454
Control (N)	6.32±0.722	19.64±1.06	12.2±0.359

DISCUSSION

Fish mortality due to pesticide exposure mainly depends upon its sensitivity to the toxicants, concentration and duration of exposure. The evaluation of LC_{50} concentration is an important step in toxicological studies. Different species respond differently to same type of toxicant. *Anabas*, being a hardy fish, can tolerate usual disturbances and contaminants in aquatic ecosystem. However, increased concentration of toxicants will make severe damages to different systems and finally leads to death of the organism. In the present study *Anabas testudineus* was exposed to different concentrations of Glyphosate (Round up) which is widely used food.

The disposal of industrial and agricultural waste, directly in to the aquatic medium burdened the ecosystem and alter the normal physiology and behaviour of organisms living there. Animal behavior is one of the important parameter in living organisms which is being influenced by minor changes in surrounding environment. Study on animal behaviour may provide a sensitive method for establishing sub-acute toxicity concentrations of various pesticides in aquatic ecosystem. Since behaviour is an integrated expression of a diversity of biochemical and physiological process, behavioural disability has been shown to arise from exposure of pollutants at concentration well below the lethal levels.

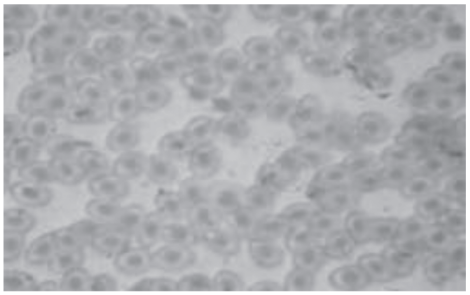
Pesticide pollution constitutes the most dangerous hazard besides creating adverse impact on the aquatic inhabitants. Fishes are edible and economically important organisms from aquatic ecosystem which are quite sensitive to a variety of toxicants and are sometimes considered as “bio indicator” of pollution (Wier and Hine, 1970). Pesticides and drugs used in agriculture and veterinary medicine may end up in aquatic environments and bioaccumulate in the food chain, thus causing serious problems for fauna and human health.The aquatic ecosystem is a highly complex environment and natural fluctuations in species abundance and distribution are a feature of the normal way of it functions.

The bio-assessment of toxicity of pesticides with reference to aquatic biota plays an important role in establishment of toxicity evaluation. When an organism is exposed to any toxicant of different concentration, due to stress the physiology get disturbed which in turn affect the metabolic pathway of the animals. The pesticides which are liberated into aquatic ecosystem have tremendous effect on all kind of population present in the aquatic ecosystem and thereby to man.

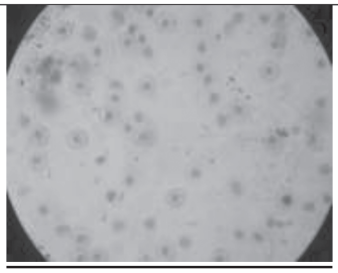
In assessing the safety level of any poisonous chemical for higher animals, the first task is to determine

ISSN 0975-8941

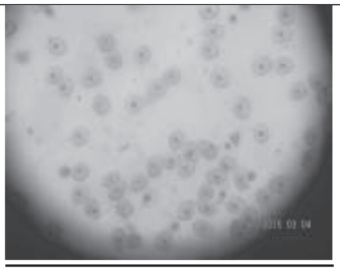
A. ***Anabas testidineus*** **showing change in body colour after exposure**



B. **Blood Smear of *Anabas testidineus* in control group**



C. **Blood Smear of *Anabas testidineus* in Sub Lethal Concentration**



D. **Blood Smear of *Anabas testidineus* in LC50**

PLATE I

the acute toxic LC_{50} value, a simple expression of the degree of toxicity that can be understood by toxicologists (Doubois and Geiling, 1959). The increasing awareness of aquatic pollution demands toxicity tests to assess the efficiency of the contaminants and to extrapolate their safe levels permissible in the environment. The median tolerance limit of any pollutant is meant as an elementary guide in the field of toxicology (Ward and Parrish, 1982). Without reference to the median tolerance limit, no information on sublethal effects can be deduced (Patin, 1982).

During the present study the LC_{50} values of Glyphosate (Round up) for 96 hrs in *Anabas* was observed as 270 ppm.The probit analysis shows that starting from a concentration level of 218 ppm if the concentration level increases by one unit, the probability that the fish may die increases by 0.8%,and as the concentration level increases the probability may also change. Air breathing fish have a higher LC_{50} value compared to other water-breathing fish (Dutta *et al*., 1993). *Anabas*, being an obligate air breathing fish takes only less toxicant through gills from the water and is highly tolerant to toxicants. Benoy *et. al*., (2005) studied the effect of methyl parathion (Metacid) on the behaviour of climbing perch, *Anabas testudineus* after exposure to 5 gm/l and suggested that, this organophosphorus pesticide interfere with several vital behavioural functions of the fish. It was clear that the sensitivity of a particular species itself varies with internal factors such as sex, age, size and external factors such as temperature, period of exposure, pH, hardness of water and dissolved content of the medium (Mc leese, 1974 and Brungs and Jones1977)

Anabas testudineus showed severe distortions in the air gulping behaviour, swimming behaviour, resting behaviour, grouping behaviour etc. Similar results were observed by Srivastava and Thakur(2007) when *Labeo rohita* and *Channa punctatus* exposed to paper mill effluent. These observations were more profound in fishes exposed to higher concentrationsthan lower which reveals the positive correlation between toxicant concentration and behavioural pattern. An earlier report shows that acute toxicity primarily damages the central nervous system which leads to breathing difficulties, instability and sluggishness (Holden, 1973). Similarhypoactive and lethargic conditions were observed also in fish *Labeorohita*and *Anabas testudineus*exposed to Malathion (Dutta *et al*.,1993), *Anabas testudineus* exposed to Monocrotophos (Santhakumar*et al.*,1999), and *Cirrihnus mrigala* exposed to Cypermethrin (Prasanth *et. al*., 2005).

In toxicological experiments the blood often shows pathological changes before external signs of toxicity and so, haematological studies in fish form a promising tool for investigating physiological changes caused by environmental pollution. Studies on the effect of pesticides in the haematology of fishes have been made by many workers (Dalela *et. al*., 1981; Sastry and Sharma, 1981; Dutta *et, al*., 1993; Shekar and Christy, 1996; Bhatia *et. al*., 2002; Johal and Grewal, 2004; Gauram and Suneel Kumar 2008).

The results for the toxicity impact on haemoglobin, RBC, WBC were shown in the Table 3. Significant decreases occurred in Hb levels after exposure to sub lethal dose and it seems to be in between the lethal and control cases. This may impair oxygen supply to various tissues, thus resulting in a slow metabolic rate and low energy production. The significant decrease in the Hb concentration may also be due to either an increase in the rate at which the Hb is destroyed or to a decrease in the rate of Hb synthesis. The decreased RBC count may be due to inhibited RBC production and or due to altered hemoglobin synthesis. WBC count increase, reflecting the occurrence of leukocytosis. This was perhaps, a typical defensive response of the fish against a toxic invasion. This is in agreement with the findings of Sampath *et. al.,*(2003) when they exposed the Nile tilapia, *O. niloticus* to a toxic environment. WBCs defend the body against toxic and foreign substances and produce antibodies.It is concluded that the decrease in fish hematological parameters such as Hb% and RBC denotes anemia conditions. The RBC's have undergone several morphological changes after exposure of the fish to the pesticide. Figar *et. al*. (1995) reported similar results in Chinese grass carp, *Ctenopharyngodon idella* exposed to danithol (fenproprathrin) a synthetic pyrethroid, with decreased RBCs and Hb. The cytoplasm remains with well-defined outline in the control case but no distinct outline is seen in the treated cases. Cell lysis can be observed in both lethal and sublethal concentrations.

Since our environment is constantly changing and due to continuous influx of waste materials a regular monitoring is necessary as to the effect of these on aquatic systems. This study clearly reveal the toxic nature of the herbicide Glyphosate (Round up-41%) on the haematology of the fish *Anabas testudineus*. As an herbicide, round up is available in the market and is widely used in agriculture to control a variety of agricultural weeds. The extensive use of Roundup on crops may cause environmental problems with a negative impact on wildlife. The acute toxicity of Roundup is considered to be low, according to data from the World Health Organization (WHO, 1994). Roundup herbicide does not pose a health risk for humans, wildlife or birds. However, the data appeared to show that aquatic organisms, particularly fish, could be more sensitive to glyphosate than mammals. In other words change in small concentrations of round up does not possess any remarkable change in the mortality of fishes and this investigation suggest that round up is moderately toxic to fishes and can be safely used in agricultural practices at the recommended low levels.

References

1. Bhatia SC (2002) Handbook of Industrial Pollution & Control: Air, Water, Wastes, & Pollution Control in Chemical Process and Allied Industries. CBS Publishers & Distributors, New Delhi. 9.
2. Bhatkar NV, Dhande RR (2000). Furadon induced haematological changes in the fresh water fish *Labeorohita*. *J. Ecotoxicol. Environ. Monit.* 10(3): 193-196.
3. Brausch J.M. and Smith P.N. (2007). Toxicity of Three PolyethoxylatedTallowamine Surfactant Formulations to Laboratory and Field Collected Fairy Shrimp, *Thamnocephalusplatyurus*. *Arch. Environ. Contam. Toxicol*. 52: 217–221.
4. Brungs, W. A., and B. R. Jones. (1977). Temperature criteria for freshwater fish: protocol and procedures. U.S. Environmental Protection Agency, EPA-600/ 3-77-061, Washington, D.C
5. Butler, P. A., L. Andren, G .J. Bonde, A. Jerenelov, and D.J. Resish, (1971). Monitoring organisms. In: F.A.Q Technical conference on Marine pollution and its Effects on Living Resources and Fishing, Rome, 1970.Supl.1: Methods of Detection, Measurements and Monitoring of pollutants in Envioronment. Ruvio M.(Ed.) pp 101-112.
6. Dalela RC, Rani S, Kumar V, Verma SR (1981). In vivo hematological alteration in a freshwater teleost *Mystusvittatus* following sub-acute exposure to pesticides and their combination. *J Environ Bio*l 2 : 79
7. Dubois, K.P and Geiling, E.M.K. (1959). Text book of Toxicology. Oxford University Press. Oxford. pp.302.
8. Dutta, H. M.,Adhikari, N. K., Singh, P. K., Munshi, J. S. (1993). Histopathological changes induced by Malathion in the liver of a fresh water catfish, *Heteropneustes fossilis* (Bloch). *B. Environ. Contam. Tox*. 51: 895-900.
9. El-Gendy, K.S., Aly, N. M., El-Sebae, A.H., (1998). Effects of edifenphos and glyphosate on the immune response and protein biosynthesis of bolti fish (*Tilapia nilotica*). *J. Environ. Sci. Heal. B* 33:135–149.
10. Figar A, Ali S.S., Shakoori A.K. (1995). Sublethal effect ofdanithol (fenproprathrin) A synthetic pyrethroid, on Chinese grass carp, (*Ctenopharyngodon idella*). *Folia Biol* 43:151-159
11. Grisolia C.K. (2002). A comparison between mouse and fish micronucleus test using cyclophosphamide, mitomycin C and various pesticides. *Mutation Research* 518: 145–150.
12. Hartzler B (2001). Glyphosate-a review, Iowa State University, Ames, IA
13. Holden AV (1973). Effects of pesticides on fish (In Environmental Pollution by Pesticides). Part of the Environ. Sci. Res. Book series ESRH Vol 3: 213-253..
14. Johal MS, Grewal H (2004). Toxicological study on the blood of *Channa punctatus* (Bloch) upon exposure to carbaryl. *Pollut. Res*. 23(1): 601- 606.
15. Joseph Groff and Joseph G. Zinkl (1999). Hematology and Clinical Chemistry of Cyprinid Fish: Common Carp and Goldfish, *Veterinary Clinics of North America Exotic Animal Practice* 2(3):741-76
16. Karpouzas D.G. and Singh B.K. (2006).Microbial Degradation of Organophosphorus Xenobiotics: Metabolic Pathways and Molecular Basis. *Advances in Microbial Physiology* 51: 119-185.
17. Kilbride, K.M., Paveglio, F.L. (2001). Long-term fate of glyphosate associated with repeated Rodeo applications to control smooth cordgrass (*Spartinaalterniflora*) in Willapa Bay. Washington. *Arch. Environ. Contam. Toxicol*. 40: 179–183.
18. Kjell B. Døving (1991). Assessment of animal behaviour as a method to indicate environmental

toxicity, Comparative Biochemistry and Physiology Part C: *Comparative Pharmacology* 100 (1–2): 247-252

19. Kock, G., Triendl, M., and Hofer, R., (1996). Seasonal patterns of metal accumulation in Arctic char (*Salvelinusalpinus*) from an oligotrophic Alpine lake related to temperature, *Can. J. Fish. Aquat. Sci.* 53:780–786
20. Lewis SM, Bain BJ, Bates I. Dacie and Lewis (2001). Practical Haematology. 9th edn. London: Churchill Livingstone.
21. MA, J. and LIANG, W. (2001). Acute toxicity of 12 herbicides to the green algae *Chlorella pyrenoidosa* and *Scenedemus obligus*. Bulletin of Environmental Contamination and Toxicology, 67(3): 347 – 351.
22. Mc leese, (1974).Toxicity of Phosphamidon to American Lobsters (*Homarus americanus*) Held at 4 and 12C. Journal of the Fisheries Research Board of Canada, 31(9): 1556-1558.
23. Neskovic´, N.K., Poleksic´, V., Elezovíc, I., Karan, V., Budimir, M., (1996). Biochemical and histopathological effects of glyphosate on carp, *Cyprinuscarpio* L. *Bull. Environ. Contam. Toxicol.* 56: 295–302.
24. Patin, S.A., (1982). Effect of pollutants on cultured unicellular marine algae. In: Pollution and the Biological Resources of the Oceans. (Ed. S.A.Patin), Butterworth Scientific Co., London. pp. 87.
25. Prashanth M.S., David M., Mathed S.G. (2005). Behavioural changes in freshwater fish, *Cirrhinusmrigala* (Hamilton) exposed to cypermethrin. *Journal of Environmental Biology,* 26: 141–144.
26. Ron van der Oost, Jonny Beyer, Nico P.E. Vermeulen (2003). Fish bioaccumulation and biomarkers in environmental risk assessment: a review. *Environmental Toxicology and Pharmacology* 13: 57-149
27. S. Srivastava, I. S. Thakur, (2007). Evaluation of biosorption potency of *Acinetobacte*r sp. for removal of hexavalent chromium from tannery effluent, *Biodegradation* 18: 637 – 646.
28. Sampath, K., James, R. and Velammal, S. (2003). Effect of methyl parathion on blood parameters and recovery in a cat fish *Mystuskeletius*. *Indian J. Fish*. 50: 191-197.
29. Santhakumar, M., Balaji, M. &Ramudu, K. (1999). Effect of Sublethal Concentrations of Monocrotophos on Erythropoietic Activity and Certain Hematological Parameters of Fish *Anabas testudineus* (Bloch). *Bull. Environ. Contam. Toxicol.* 63: 379–384.
30. Sastry, K. V., A.A Siddiqui and S. K. Singh (1982). Alterations in some biochemical and enzymological parameters in the snake head fish, *Channa punctatus* exposed clinically to quinalphos. *Chemosphere* 11:1211.
31. Sastry, K.V and K. Sharma (1981). Diazinon induced histopathogical and haematological alterations in a freshwater teleost, *Ophiocephalus punctatus*. *Ecotoxicology Environment Safety,* 5:329-340.
32. Servize, J. A., Gordon, R. W. and Martens, D. W. (1987). Acute toxicity of Gordon 4 and Roundup herbicides to salmon, daphnia and trout. *Bulletin of Environmental Contamination and Toxicology*, 39: 15 – 22.
33. Shekar, P. and Christy, I. (1996). Haemtological changes in the freshwater catfish *MystusVittatu*s, exposed to sub lethal concentration of phosphamidon. *J. Ecobiol*. 8(1): 25-28.
34. Slobodkin, L. B. (1968). Toward a predictive theory of evolution, p. 187-205. In R. C. Lewontin [ed.], Population biology and evolution. Syracuse Univ. Press, Syracuse, N.Y.
35. USEPA (2002). Details of the consultation for State Department on use of pesticide for coca

eradication in Columbia. Office of Pesticide Program. http//:www.- state.Gov./g/ine/r/st rpt/ aeicc

36. Ward, G.S. and Parrish, P.R. 1982. Manual of methods in Aquatic Environment Research. Part 6 Toxicity tests. FAO. Fish Tech. Pub., 185: 23.
37. WHO, (1994). Glyphosate. Environmental Health Criteria No. 159. World Health Organization, Geneva.
38. Wier P.A. and Hine C.H. (1970). Effects of various metals on behavior of conditioned goldfish. *Arch. Environ. Health*, 20: 45.
39. Williams G., Kroes R. and Munro I.C. (2000). Safety Evaluation and Risk Assessment of the Herbicide Roundup and Its Active Ingredient, Glyphosate, for Humans. *Regulatory Toxicology and Pharmacology* 31(2 Pt 1): 117-65.

ISSN 0975-8941

Interest-free Micro Financing - a Prospective Sector in Kerala.

Dr. Yaqoob. P.K.
Principal, MES T.O. Abdulla Memorial College,
Kunnukara, Aluva

Received: 5th June 2019 Accepted: 30th July 2019

ABSTRACT

The financial system is the central nervous system of an economy. Present world economic system is fully dependent on the conventional banking based on interest. In the day today economic activities the interest has got a great role to play. Importance of banks in the modern economy cannot be neglected. They occupy a very significant place in the field of commerce and industry. In addition to accepting deposits and advancing loans a modern bank performs a lot of other functions. These functions are of considerable utility to its customers. The banks facilitate the export and imports. Bills of exchange, letters of credit are the common tools used by banks for the transfer of money from one person to another and country to country. Facilities of cheques and drafts are also provided by banks for the easy mobilization of the funds.

Conventional banks are operated on the basis of interest. They fix a higher interest rate to the loans and a lower one to the deposits and make their profits from the difference between the two levels of interest. Neither the banks nor the depositors are participating in any real sense in the fortunes of the businesses they invest in. Indeed, the conventional banks, by acting merely as an intermediary between the depositors and loan recipients, have created a wall between the two.

In order to break this wall and to create connection between the savers and investors there emerged a new type of banking called as 'banking without interest'. There is a two - tier relation between savers, banks and investors. The first tier is between the savers and banks; the second tier between the banks and investors. This is called as participatory financing based on Profit Loss Sharing (PLS). The outcome of the financing is known to each and every party. The profits are shared between the investors, banks and savers. This type of financing can eliminate the element of interest.

Islamic religion prohibits interest in all transactions. Accordingly, money on its own may not generate profit; it may earn profit only if it is combined with the sort of risk inherent in business enterprise. Hence, lending money should be rewarded based on its productivity. When a fixed return is guaranteed irrespective of the productivity of capital, viz; charging interest for simply lending money is an injustice. It neglects the very important aspect of money which is used as capital for the purpose of asset creation.

The paper 'Interest-free Micro Financing - a Prospective Sector in Kerala' is research oriented article which deals with the informal functioning of interest-free institutions in Kerala in unorganized sector. It explains how these institutions help the common lay men to escape from the exploitation of indigenous money lenders to some extent. The article brings forth the concept of Profit Loss Sharing (PLS) and how

it replaces interest. The potential prospects in Indian economy especially in Kerala and the Global relevance of interest-free financing are the other areas which are elaborated in the article. By concluding the article it is observed that the interest free financing has bright future in Kerala and the favorable initiatives taken by the Govt. is a good sign for its implementation at least in a mild way. If they are organized in a better way (similar to cooperative credit societies) it can achieve easy credit dispensation among the rural folk. While the 'Gramin banking' in Bangladesh has a real success story evenby charging 16 to 20% interest for the loans it advanced, the IF financing can produce marvelous results in meeting the micro financial needs of rural masses.

INTRODUCTION

The existence of a sound financial system is inevitable for mobilizing resources into productive investments. It is widely presumed that interest is an essential element of modern finance without which economic activities would no longer take place. Of course, the conventional banks based on interest are highly significant in modern economy as they act as an intermediary between the depositors and investors of finance. In this type of conventional financing neither banks nor do depositors participate in any real sense in the fortunes of the business they invest in. In fact, interest-free banks have changed the very nature of the relationship between bank and depositors. The conventional relationship based on a lending contract has given way to 'participatory financing'.

A banking system devoid of interest seems to be a myth in the modern economic scenario and it cannot even be imagined. But, Interest Free Banking is a reality. The claim that banking is not possible without interest has been proved to be baseless. Money as a medium of exchange and store of value cannot be treated as an instrument which give birth more money. Hence lending money should be rewarded based on its productivity. Charging a fixed percentage of interest for the advances irrespective of the outcome of the investment creates many evils in the society and nation such as the occurrence of uneven business cycles, inequalities in the distribution of wealth, continuous indebtedness of the society and debt trap of nations. Capital is the produced means of production used for further production and it should be rewarded based on its outcome and the rewards are determined through the system of Profit Loss Sharing (PLS) which is called as Interest-free financing.

Profit Loss Sharing (PLS)

The system of PLS enables a two tier relationship between depositors, bank and investors. The first tier is between the bank and the depositors who agree to deposit their savings in the bank and share profits/ losses between them. The second tier is between the bank and entrepreneurs/ partners who seek funds for their business and the outcome is shared. In the end of the year the net profit, in turn, is shared between the bank and depositors. The sharing ratios in both the cases are predetermined bi-laterally or unilaterally by the bank. The commercial banking organized in the above principle shall be more stable, more growth oriented and more equitable and called as 'investment banking'. The Banks can shift from acting merely as interest earning bodies to profit sharing and dividend distributing bodies.

Interest-free financing advances no cost loans to small farmers, entrepreneurs, producers and needy consumers to relieve them from the exploitation of indigenous money lenders and conventional banks.

This is called as 'Benevolent Loans'. A stipulated part of the total profit of the bank is ear marked for this purpose.

Global Relevance:

During the preceding decades, Interest-free financing has achieved rapid growth at global level. Around 60 countries in the world practiceinterest-free financing in one way or the other. They include interest-free advancing, depositing, non-banking functions, mutual funds, venture capital, leasing, mark-up sale, *manufacture* contracting *etc.* Several western banking institutions have opened interest-free windows in the conventional banks. The unorganized units which offer micro finance and benevolent loans have increased manifold.Several countries, like Egypt, Sudan, Dubai, Iran, Pakistan, Kuwait, Malaysia etc started Interest Free Banking Institutions during the closing decades of the 20th century. Though nearly all of the Interest Free Banks are in Muslim Countries, there are some in Western Europe as well; such banks were started in Denmark, Luxemburg, Switzerland and UK during 1983 and 1984. In most countries, the establishments of interest-free banks were primarily on private initiative;however in Iran and Pakistan they were established in Government sector.

Indian scenario

Inspired by the successful operations of the Interest-free Financial Institutions (IFFIs) in different parts of the world and the strongest religious ban on interest, a few philanthropists in India have entered into the challenging task of starting similar institutions in various parts of the country. Since there is no source of investment on interest free basis, rich people of the community used to deposit their idle savings in conventional banks by submitting the willingness for not to credit interest in their accounts. At the same time a lot of people in the lower strata of the society are vehemently exploited by the indigenous money lenders and conventional banks. In this context a large number of IFFIs have sprung up in various parts of India; most of them unorganized. They cater the tiny financial requirements of poor traders, merchants and agriculturists. Majority of such institutions are working on service basis. In India about 600 financial institutions are functioning on interest-free basis, primarily on private initiative, a few among them are promoted by non-Muslims.

In India majority of IFFIs are concentrated in Kerala and are in unorganised sector offering micro financing to down trodden. Many units are registered either under charitable societies, Co-op. societies, Trusts or Company's Act. A few of them in the organised sector operate as Non Banking Financial Company (NBFC). The institutions registered as NBFCs areAlternative Investments and Credits Limited (AICL), functioning in Kerala with its head quarters at Ernakulam and a branch at Calicut. Others are Baithul Nasr and Barakat Investments in Maharashtra, Al- Baraka in Karnataka and Muslim Fund Najidabad in UP. But due to the stringent policies of RBI many of them are closed recentlyalong with the closure of some other interest based NBFCs.

As per the available information the IFFIs functioning in Kerala are shown in *Table below.* It reveals that there are 220 interest-free institutions working in Kerala spread over 12 of the 14 districts. Of them 212 are run by Interest-Free Establishment Co-ordination Committee (INFECC), Calicut and the remaining eight, by other independent trusts.

Table 1: IFFIs working in Kerala

Sl. No.	Districts	No of IFFIs in unorganized sector	IFFIs in organized sector	Total
1	Kasargodu	4		4
2	Kannur	17		17
3	Wyanad	2		2
4	Calicut	56	1*	57
5	Malappuram	84		84
6	Palakkad	6		6
7	Trissur	15		15
8	Ernakulam	16	1	17
9	Alappuzha	4		4
10	Kottayam	5		5
11	Kollam	3		3
12	Trivandrum	6		6
	Total	**218**	**2**	**220**

* Branch of Ernakulam unit. (*Survey Data*)

Apart from the above, many institutions are functioning informally in the unorganized sector without any title name and office set up. They function either in the mosques or under the responsibility of individuals who are entrusted by their organizations. It is observed that there are about 500 interest free institutions operating in Kerala itself of them 360 are functioning exclusively under INFECC.

Details of interest-free micro-finances availed by beneficiaries:

The beneficiaries of interest-free loans are from down trodden classes who consider IFFIs as a source of great relief for their financial needs. The purpose of loans and other details are given in *Table2.*

For the purpose of house construction majority of respondents (39/56) depend on IFFIs. In the case of 18 loans for marriage purposes, 9 are advanced by IFFIs. Of the 35 loans for the other purposes like consumption, fishingetc; 31 are from IFFIs. Thus majority of respondents avail their tiny financial needs from IFFIs,consequently they are saved from the exploitation of money lenders and conventional banks to some extent.

A Prospective Sector in Kerala:

IFFIs have a bright future in India especially in Kerala where a large proportion of people are depending on indigenous money lenders for their financial needs. The organized money markets are non- accessible to common mass. India being the world's second most populous country accommodating second most populous Muslims in the world; the prospects of interest-free banking is very high. A large number of Indian Muslims working Middle East have opened NRI accounts in the conventional banks not for gaining any return but for the purpose of smooth transaction of their funds. These people are very keen to find an alternative to invest their savings which offer interest-free solutions. According to

ISSN 0975-8941

Table2. Dependence of down trodden classes on IFFIs

Purpose/ Source	Coop: bank	Comm: bank	Private Banks	Money Lenders	IFFIs	Others
Trade/ commerce	4 (12.5%)	1 (7.7%)	1 (33.3%)	2 (28.6%)	42 (10.8%)	2 (66.7%)
Farming	2 (6.3%)	0	0	0	1 (0.3%)	0
Agrl/trade inputs	1 (3.1%)	4 (30.8%)	1 (33.3%)	0	7 (1.8%)	0
Construction	1 (3.1%)	1 (7.7%)	0	1 (14.3%)	6 (1.5%)	0
Sanitation	0	0	0	0	2 (0.5%)	0
House constr:&maint:	11 (34.4%)	3 (23.1%)	1 (33.3%)	2 (28.6%)	39 (10.1%)	0
Education	1 (3.1%)	0	0	0	30 (7.7%)	0
Medical	0	0	0	0	112 (28.9%)	0
Living exp.	0	0	0	1 (14.3%)	67 (17.3%)	0
Marriage	6 (18.8%)	1 (7.7%)	0	1 (14.3%)	9 (2.3%)	1 (33.3%)
Employment abroad	4 (12.5%)	0	0	0	0	0
Repayment of old loan	0	1 (7.7%)	0	0	42 (10.8%)	0
Others	2 (6.2%)	2 (15.4%)	0	0	31 (8%)	0
Total	32	13	3	7	388	3

Source:- Survey Data

P.Ibrahim, former Professor of the Department of Economics, Pondicherry University, Mahe Centre, the magnitude of deposits in the nationalized bank branches of Kerala, for which interest was not received by depositors was reported to be of the order of Rs. 10 crore in the mid eighties. It is reported that in India, thousands of crores of rupees earned in interest is kept in suspended accounts, as believers do not claim it. The assets controlled by Muslims are estimated to be $1.5 trillion and growing at 15% a year.

In Kerala alone, it is reported that this money could be above Rs. 40,000 crores. Research reveals that a handsome bulk of money in India owned by the believers is lying idle, which if invested in profit sharing basis and utilized properly, can have a major impact on the Indian Economy.

In Kerala the only institution working in the organized sector is Alternative Investment and Credit Limited (AICL), Cochin. It has received large scale acceptance among the public and its clients. It has expanded its function by starting a branch at Calicut. Even though the dividend received is lower compared to the rate of interest (AICL is able to pay a dividend of 6% or 5.5% per year) the investors are happy since they co-operate for a noble cause. They know that the actual Return on Investment (ROI) is12% in average which higher than the prevailing rate of interest earned from fixed deposits. The dividend is distributed after making deductions at source for items like tax on profit, Statutory Reserve Requirements of RBI, the Zakath (compulsory charity) etc: Recently, the NBFC registration of AICL has been withdrawn by RBI and the matter is under litigation in the Hon'bleHigh Court, Mumbay.

Initiatives taken by the Govt:

The government of India is very enthusiastic in introducing interest-free financing in Indian context while a few others are very skeptical. A couple of years back, RBI has constituted a committee to study on the feasibility of interest-free banking. The committee was chaired by Mr.Ananth Sharma, the Chief Manager, Banking Operations of RBI. Officials consisting of SBI and other foreign banks were the members of the committee. But the committee expressed its anxiety in implementing interest-free banking in India and recommended to keep the matter pending for the time being. It is reported that, "Interest-free banking cannot be offered by banks in India as well as overseas branches of local banks under the present legal frame work. Except a basic offering like current account, almost no other banking product in India can be modified to meet the conditions of Islamic banking" (Ghosh)[1]

Government of Kerala has constituted a company under the Kerala State Industrial Development Corporation (KSIDC) to be registered as NBFC. Acommittee consisting of eminent NRIs, business magnets, IAS officials and other notable personalities was formed for the purpose. Initiatives are on the way to tap the potential savings of lacs of Indian Muslims both internal and external and toutilize the fund for equity investments on the basis of PLS. However, this has become a futile effort since the matter is stayed by the Hon'ble High Court of Kerala.

A change in the attitude of government may provide encouragement for interest-free financing in India. Government should make necessary amendments in the taxation law so as tohelp the institutions working in the organized sector. All the regulations of the country like Reserve Bank of India Act of 1934, Banking Regulations Act of 1949 etc do not allow the banks to invest the funds on PLS basis. The regulations of RBI like fixing the Cash Reserve Ratio (CRR), Statutory Liquidity Ratio (SLR) and the provision of Deposit Guarantee Schemes etc. makes the equity based banking an unviable option. At a time when many of the nations in the world including the western countries like Great Britain are operating interest-free banking in a successful manner; India is showing a negative attitude towards it. Prof. K. Ramachandran Nair former HOD of the Department of Economics, University of Kerala opinioned that "Britain which pioneered in implementing the modern banking has opened the doors for interest-free banking. Almost all countries in the world have imitated the banking laws from Britain to start the same in their own countries. The Bank of England which was our own Central Bank before 1935 is regarded as the mother of all central banks in the world." However it is high time for Indian planners to change the attitude and have rethink and implement the interest-free banking step- by- step.

CONCLUSION

The secular arguments from different corners may deter the implementation of IF financing in India, since it is connected with a religion.However on economic point of view it has been welcomed throughout the globe as a sensible mode of financing.As it is aptly remarked by Viju V. Nair, "Islamic economics is something which has acquired special attention from different corners. People wanted trustworthiness and transparency especially in a situation where nobody can trust anybody Basic principle underlying Islamic Economics is its clarity and sensibility"

In conclusion it can be stated that the IFFIs are of a great helpto the rural people in meeting their short-term financial needs and saving them from the exploitation by money lenders. If they are organized in a better way (similar to cooperative credit societies) it can achieve easy credit dispensation amongthe rural folk.While the 'Gramin banking' in Bangladesh has a real success story evenby charging 16 to 20% interest for the loans it advanced, the IF financing can produce marvelous results in meeting the micro financial needs of rural masses.

To overcome many of the hurdles confronted with the working of IFFIs they can be brought under SHGs so that the present set up would be streamlined in a better way. In the present scenario of global recession, interest-free financing has great significance as it promotes equity and asset creation. To implement IF financing, the regulatory frame work of RBI need to bechanged similarto those of other countries including Great Britain.The government of India can take initiative by opening interest-free windows in thepublic sector banks and this may help to try the concept at least on an experimentalbasis. The initiative taken by Government of Kerala to form a company under KSIDC for equity financing may also be encouraged.

REFERENCES

1. Yaqoob P.K. (2014). Islamic Finance, Progress & Constraints, A profile of Interest Free Financial Institutions In Kerala – ISBN 978-81- 924709-0-1, Published by the Department of Languages, MES College, Nedumkandam.
2. Yaqoob P.K. (2009).Case for Interest-free Financial Institutions in Kerala, Degree of Doctor of Philosophy, awarded by MG University, Kottayam.
3. Bindu Vasu(2005).*Islamic Banking, Banking for a Change*, Indian Express, Oct 20
4. Sugatha Ghosh (2006).*Islamic Banking,* Economic Times, Mumbai, Oct 16.
5. Viju V. Nair(2008).*E-Banking*, Madyamam Daily, Oct 26.

ISSN 0975-8941

A Study on the Customer Satisfaction on the Services of Kochi Metro

Anu Tressa Jose and Sherin Cyriac
Department of Commerce, Deva Matha College, Kuravilangad

Received: 26th August 2019 Accepted: 15th October 2019

ABSTRACT

Transport sector of Kerala has undergone various changes during the previous years. One such advancement was the introduction of Metro trains, also called light rail in the Kerala's digital capital, Kochi. Services quality and customer satisfaction have been two important topics for the academic world as well as for the researches in the field of marketing. The attention directed to these two concepts-services quality and customer satisfaction is mainly due to the competition in the market. The pressure of political factors and the population over organizations in the field of public administration is the reason for the competition. To what extend the plan of government to introduce metro trains is beneficial to people, particularly passengers? How far are the passengers of Kochi Metro satisfied on the services provided? How far has Kochi Metro improved the socio economic efficiency of people there? What are the problems faced by them? The study throws light on the above questions.

INTRODUCTION

Kochi metro is a metro system serving the city of Kochi. It was opened to public within four years of starting the construction. The Kochi Metro project is the first metro which connects rail, road and water transport facilities. Former Prime Minister Dr. Manmohan Singh laid the foundation stone was in 2012.Construction work started in June 2013 and a 13.4km section of the line from Aluva to Palarivattom was opened to passengers on 17 June, 2017.A second 5km section from Palarivattom to Maharajas College Stadium was inaugurated on October 3, 2017. Kochi Metro also includes the technology for driverless trains and is hoping to implement this in future.

Kochi Metro was lauded for this decision to employ Kudumdasree workers and also the members from transgender community. Kochi Metro is also involved in sustainable initiatives with the introduction of non-motorized transport corridors in the city, installation of solar panels for power and vertical garden on every sixth Metro pillar. Apart from the regular tickets, it has also adopted a single card, single time table and a singular command and control. This debit card along with the Kochi One Metro App will allow passengers to access all modes of public transportation as well as be utilised for mercantile and internet transactions and will introduce the 'click and collect' feature in the near future where goods ordered online can be collected in the Metro stations. Every Kochi Metro station is designed on a specific theme around Kerala culture and geography.Kochi Metro is a sustainable approach towards integrated transport system. It plays a major role in greening Kochi. It leads to integrated transport, reviving water transport, transit oriented development. It has a 25km elevated metro line from north to south axis, 22 metro stations & one depot, three coach train, most modern signalling system (CBTC), automatic Train Operation compatible to UTO and a capital cost of 51817.9 M INR

Kochi Metro is a sustainable approach towards integrated transport system. It plays a major role in greening Kochi. It leads to integrated transport, reviving water transport, transit oriented development. It has a 25km elevated metro line from north to south axis, 22 metro stations & one depot, three coach train, most modern signalling system (CBTC), automatic Train Operation compatible to UTO and a capital cost of 51817.9 M INR

Significance of the Study

The strategic goal of Kochi Metro is to introduce a world class metro system in Cochin to enhance the quality of life for the Greater Cochin Metro area by improving regional connections and to reduce overcrowding, traffic, transit time, air and noise pollution which have become an unavoidable part of the life of people in Kochi. The opportunity for introduction of Metro rails is to make Kochi a more liveable and pleasant city for residents and visitors alike, where public transportation would be used by all-connecting people and places safely, seamlessly, reliably and comfortably. According to the Senior Town Planner of the Greater Cochin Development Authority (GCDA) V. Gopalakrishna Pillai, "The Metro is a good means of mass rapid transport. Business activity in many parts of the city would be wound up in the absence of a good mode of public transport".

After opening two sections of the Kochi Metro to passengers, it becomes necessary to understand whether the metro has brought about desired changes as expected. So, a study is necessary to understand the customer satisfaction of the passengers of Kochi Metro.

Objectives of the study

The objectives of the study are:-

1. To identify the most influencing factor for using metro rail.
2. To study the service quality attributes of Kochi Metro.
3. To find out the role of Kochi Metro in the socio-economic efficiency of people.
4. To understand the level of customer satisfaction towards Kochi Metro.
5. To understand the problems faced by the customers of Kochi Metro.

Scope of the Study

The study is an attempt to understand the satisfaction level of passengers availing the services of Kochi Metro. The scope of the study is limited to the geographical area of **Kochi** and the improvements **till date.** This study tries to find out the extend of socio-economic efficiency brought to people and also the benefits or utilities derived by them. The service quality attributes i.e. reliability, responsiveness, assurance, empathy and tangibles are under the purview of the study. This study also tries to find out the factors influencing their usage and the level of customer satisfaction.

RESEARCH METHODOLOGY

Research Design

The research design adopted for the study is both descriptive and analytical in nature. In pursuance of objectives, the following methodology was adopted.

Sample Design

The population of the study was identified as the total number of persons who have travelled in Kochi Metro. From these 80 respondents were selected on the basis of convenience sampling method.

Sources of Data

Both primary and secondary data were used for this study. Primary data was collected with the help of a pre-structured interview schedule. Secondary data was collected from books, journals and websites.

Tools for Analysis

The data collected has been classified and tabulated. Tables and graphs have been used to present the data. Simple statistical tools like ratios, percentages were also applied wherever appropriate. Scaling technique has been applied to study the behaviour and level of satisfaction. Mean values were also computed to find out the average response.

Period of the Study

The study was conducted during the period from August 2017 to March 2018.

Limitations of the Study

- Sample size selected for the study was comparatively small. Therefore scope for generalisation is limited.
- Lack of co-operation on the part of respondents was a limitation but maximum effort has been taken to ensure accuracy of data.
- The inherent limitations of sampling are likely to be affected.
- Time and resources available for the study was also limited.

The purpose of the study was to know and understand about the satisfaction of the customers of Kochi Metro. The data was collected using a pre-structured interview schedule from 80 respondents who were the passengers of Kochi Metro. After analysing the data collected, the study presents the following findings.

Summary of Findings

I. Profile of respondents

1. Majority of the respondents are male (65 percent).
2. 58.75 percent of the respondents belong to the age group of 20-40 and 37.5 percent belong to the category of 40-60.
3. 48.75 percent are post graduates and 27.5 percent are graduates.
4. 26.25 percent of the respondents are private sector employees and 23.75 percent are engaged in business.
5. 61.25 percent of the respondents have a monthly income ranging between Rs. 20000 and Rs. 40000 and the income of 18.75 percent is between Rs. 40000 and Rs. 60000.

II. Period of usage

57.5 percent have been using Metro for more than 3 months and 33.75 percent have been the passengers of Metro for 1-3 months.

III.Frequency of usage

43.75 percent uses Metro occasionally and 37.5 percent of the respondents travel in Metro on a weekly basis.

ISSN 0975-8941

IV. Satisfaction level

1. The users are highly satisfied with the physical conditions like lighting, air conditioning and space allocation.
2. The users are highly satisfied with the cleanliness at ticket counters, station, platforms and inside the train coaches.
3. The users are highly satisfied with the technical factors like safe escalators, automatic doors and other security equipments. The users are satisfied with other technical factors like announcements, token/ smart card and fare collection counters.
4. The users are highly satisfied with the convenience of seating and standing arrangements and comfortable boards. They are satisfied with the comfortable boarding and deboarding and the convenient placement of stations. The users are dissatisfied with bus services to Metro.
5. The users are highly satisfied with the safety at platforms and train coaches. The users are satisfied with the safety at parking area.

V. Service Quality Attributes

1. The quality of the tangibles like physical facilities, equipments, personnel and communication materials are high.
2. The quality in performing the promised services is high.
3. The quality of services like willingness to help passengers and providing prompt services are of high quality.
4. The knowledge and courtesy of employees and ability to convey trust and confidence is high.
5. The quality of services provided in improving public health and caring is of high quality.
6. The quality in providing individualised attention is of low quality.

VI. Influencing Factor

The most influencing factor for using Metro is time saving and the least influencing factor is cost saving.

VII. Socio-economic Efficiency

1. The users strongly agree that Kochi Metro bring savings in time and reduction in accidents and pollution.
2. The users neither agree nor disagree that Kochi Metro reduced traffic congestion.
3. The users agree that Kochi Metro brings cost savings, savings to passenger cars and reduced stress.

VIII. Problems Faced

- The incomplete Metro network is the biggest problem faced by the users with a composite score of 541 and the least affecting problem is delay of trains with a composite score of 152.

IX. Suggestion to Others

- 83.75 percent of the respondents will suggest Kochi Metro to others whereas 16.25 percent won't suggest Kochi Metro to others.

Suggestions

1. Bus services to Metro must be improved. Steps must be taken to see that the buses run in time and to avoid rush in buses.

2. The Kochi Metro must employ steps to provide more attention to the passengers so that they feel more safe while travelling
3. The purpose behind the establishment of Metro was to reduce traffic congestion. But the respondents did not find any reduction in traffic congestion. Steps must be ensured to see that there is considerable reduction in traffic blocks
4. The biggest problem affecting the passengers is incomplete Metro network. New blocks must be completed within the estimated time so that the passengers can make better use of Metro and reach the places they need.

CONCLUSION

The study enabled in knowing the customer satisfaction of Kochi Metro. They are satisfied with the physical conditions, cleanliness, technical factors, convenience and safety. The service quality attributes like tangibles, reliability, responsiveness, assurance and empathy fetch a high quality. Time saving influences the customers to use the services of Metro. The Metro brings savings in time, cost, accidents, passenger cars, pollution and also reduces worries about parking. But the customers are dissatisfied with the bus services to Metro and the individual attention provided to them. They suffer because of the in completed Metro network. The customers did not feel any reduction in traffic.

Transport sector of Kerala is facing competition from various sectors. Kochi has water transport, airport facility, railways, bus services, uber taxies and various other means of transport. Together with this, Light Rail or Metro was established to make Kerala or particularly Kochi to meet the global standards of transportation. Through this study, it is understood that Kochi Metro is an effective mechanism to reduce traffic and to bring other economic and social benefits if implemented in full.

REFERENCES

1. Bismi P.J, M. K. (2016). METRO: An ideal solution for traffic. *International Journal of Innovative Research in Computer Engineering and Communication engineering* , 20741-20745.
2. Chugh, N. (2017). Customer Satisfaction towards Delhi Metro Rail Corporation. *XVIII Annual International Conference Proceedings*, (pp. 264-276).
3. Customer satisfaction survey results. (2012, 12 06). *Customer service and operations committee Information Item IV C* . Washington: Washington Metropolitan Area Transport Authority.
4. *Kochi Metro Green Mass Rapid Transit System.* Kochi: egis (2017).
5. Nadarajan, S. (2017). *Kochi Metro Towards sustainability.* Kochi.
6. Paul, S. (2017). Service quality attributes affecting the metro passengers of Kolkata, West Bengal, India. *International Journal of Current Research* , 50035-50042.
7. Shah, M. N. (2016). Measuring customer satisfaction using service quality parameters in Mumbai Metro Transport Service. *Research Gate*, (pp. 1-20).
8. Singh, B. (2014). Customer Satisfaction Analysis on Services of Delhi Metro. *Asian journal of multidisciplinary studies*, 124-130.
9. Sm, S. (2013). Feasibility Study of Metro Transport: Case Study Madurai. *International journal of civil engineering and technology*, 72-83.

10. Sudin Bag, S. S. (2012). Kolkata Metro Railway and customer satisfaction: An empirical study. *International Journal of Multidisciplinary Research* , 165-176.

11. https://en.m.wikipedia.org/wiki/Urban_rail_transit_in_India#Metro_transit

12. https://kochimetro.org/

13. https://en.m.wikipedia.org/wiki/Kochi_Metro

14. http://blog.kochimetro.org/2015/05/11/kochi-metro-reduce-stress-and-save-money

15. https://www.metrorailnews.in/mass-transit-system-impacts-advantages-disadvantages

ISSN 0975-8941

Fabricating Femininity: Social Scripting and Strategies of Legitimizing Patriarchy in India

Jais Jose
St. Thomas College of Teacher Education, Pala

Received: 5th November 2019 Accepted: 15th December 2019

ABSTRACT

In this new phase of globalization,the progressive thoughts and developmental attitudes owing to modern education, scientific and technological advancements, urbanization,women-friendly policies etc., could bring about only subtle transformations in the masculine-feminine equations in the Indian society. In spite of their surface-level impact, the towering figure of gender-engendered power is seen to be operating freely in the Indian society influencing the structure of its political and social institutions. All agents of socialization including the family, religion, the legal, economic and political systems, literature, system of educational and the media persistently transform themselves into agents of surveillance of women.The stereotype of woman as the muted and subjugated subject is propagated by them.Women's labour power, reproduction, sexuality, mobility and agency are implicitly brought under the control and regulation of the patriarchal 'eye of power' of the panoptic Indian society. Therefore, even as the dominant and visible sections of the Indian society move forward to an egalitarian society, social evils like female foeticide and infanticide, high levels of domestic violence, dowry deaths, trafficking and sexual harassment are still part of the Indian reality.

A hierarchical social order on the basis of class, caste and gender has traditionally been the characteristic of Indian society. A number of social forces and various political systems exercising power hierarchy are found to be interlocked in the making of the national imagery that makes an Indian qualify, in Louis Dumont's phrase, as the original "homo hierarchicus" (qtd. in Kakar 14). One of the most pervasive of social systems in India marked by this exercise of power and hegemony is the institution of patriarchy. It has assumed its iron grip not only within the confines of domestic sphere, but at various levels – political, economic, social, and cultural. The ideologies propagated through various myths, orature, textual scriptures as well as social and political institutions like family, religion, law, mass media, history and tradition etc often serve as vital instruments which strengthen the iniquitous power relations between men and women. They propagate the idea that the very nature of women demands that they be controlled and disciplined by men. They collectively manoeuvre to legitimize and guarantee a dominant position for men and the subordination for women in the society. They all underscore the tyranny of patriarchal thinking and the power of patriarchal culture to dominate, regulate and effect its surveillance upon women.

In a patriarchal society, the standard of womanhood is set by men. Far from being regarded as an individual with distinct rights, a woman is always 'dictated' to by man. Her individual identity is seldom reckoned with and she is more than often identified and recognised in relation to her male counterparts. In patricentric societies like that of India, women are traditionally assigned the role of disciplined daughter, dutiful wife and self-effacing mother. The whole code of morality for a woman is laid down by men in the

form of ideologies, beliefs and traditions that are reinforced in scriptures and religious writings.

Manu, the prominent ideologue of Brahminical system does express some noble sentiments about women when he comments, "where females are honoured, there the deities are pleased; but where they are dishonoured, there all religious acts become fruitless" (68). But most explicitly he argued that women must be closely guarded day and night regardless of their age. He contends that only by carefully guarding the wife, a man preserves the purity of his offspring, his family, himself and his means of acquiring merit. He believes that it is women's nature, allotted to them at the moment of their creation that requires them to be thoroughly restrained. Manu asserts, "[k]nowing their disposition, which the Lord of creatures laid on them at creation (i.e., their reproductive power, their sexuality, their essential nature), every man should most strenuously exert himself to guard them" (qtd. in Geetha 12).This philosophical indoctrination and acceptance of patriarchy reinforces the idea of the need to constantly keep the women under male surveillance. It highlights the power of the patriarchal eye of the panoptic Indian society.

The patriarchal system makes it certain that the men gain a dividend in terms of honour, prestige and the privilege to supervise women apart from the material benefits like the right to own land and property. State power is also mostly held by them. The means of violence as well as surveillance are often appropriated by the heteronormative male. It justifies the objectification of women and the male gaze and women being perceived as instruments of male gratification. Several social and cultural restraints have been imposed upon her so that she is forced to live an oppressed, exploited and victimised life.

The various social institutions prevailing in the Indian society contributes to the means of surveillance deployed by the patriarchal structure. Women's lives are shaped by customs that are centuries old and they are perpetuated by the strong patriarchal traditions persisting in many different societal parts. They work together and constitute the surveilling eyes of the panoptic disciplinary society.

The family as the basic unit of the society ensures that all its members are experientially schooled in the art of patriarchy. Kakar rightly observes that "[t]he deeply internalized hierarchical principle, the lens through which men and women in India view their social world, has its origins in the earliest years of a child's life in the family" (8). In an Indian patriarchal family, the birth of a male child is preferred to that of a female. The former is considered as the inheritor of the family while the latter is considered as 'parayadhan', other's property (Uberoi 2005). The reinforcement of this indoctrination and acceptance of patriarchy is often meted out by the use of surveillance and at times, violence upon women. The women are always kept a watch both by the male members as well as the elder female members of the family so as to ensure that the predetermined, gendered script is internalized and observed by them. They are constantly schooled about how they should look, what they should wear, where they should go etc based on the patriarchal values and beliefs about gender. The notion that "[m]en are granted the power to define, interpret, judge and represent the world on their own terms, while women are to be defined, interpreted, judged and represented by men" (Geetha 12) are inculcated by the family right from the childhood. These notions are so internalized so that they are reflected and manifested in most of the rituals, customs and traditions.

The institution of marriage is also appropriated as a means of disciplining womenin the patriarchal Indiansociety. It allows the power and freedom of the father to dominate, supervise and discipline his daughter to be ceremoniously transferred to another man who tries to frame her within the traditional behavioural patterns he believes in. The women are considered possessionsrather than partners and are often relegated to mere instruments for procreation. Men naturally begin to exercise a greater control over their women folk through marriage which further deteriorates their position. Education was denied

to women and they were married off at very young ages, thereby making the emancipation of the agency of Indian woman and womanhood, an uphill task.

The male dominated society has unleashed innumerable oppressive measures and strategies to keep women in their perpetual subordination. As G. Lakshmi observes,

A process of perpetrating social differentiation and elevating masculinity and degrading femininity has been going through cultural, ideological, mythological, literatureal, social, psychological, educational, political, economical and legal oppression of women. (575)

All agents of socialization process such as the family, religion, the legal system, the economic system and political system, literature, educational system and the media act as the pillars of a patriarchal system and structure. The stereotype of woman as the muted and subjugated subject is disseminated and propagated by them.

They reiterate the historical subjugation of women through patriarchal dominance and most effectively reproduce the traditional gender role images of women as passive, subordinate, and submissive as is envisaged by the heteronormative male. V. Geetha's observations in her essay "God Made You Different, Nature Made Us Different" are particularly noteworthy in this context. She unravels the hypocrisy inherent in the contemporary media messages.

They grudgingly accept that the world is a changed place, and women are increasingly visible in positions of power and responsibility. Yet, time and again, we are told –through the worn-out clichés of film scripts –that a woman may be a district collector, a police officer, a scientist, but she cannot afford to forget that she is essentially and fundamentally a mother. Advertisements are as retrograde as films in this respect. Images of working women are used to reinforce what is seen as their primary vocation –they must look beautiful, earn an income and yet be nurturing and home-loving. The ideal woman is one who works at home, at her profession and yet finds time to keep a good house, attend to her husband and children's needs, all of which she manages without appearing ruffled or tired. (23)

She also highlights how they are manipulated in favour of man and manhood. Men are presented as "travelling, handling sophisticated machines, making decisions". She concludes that, "everything a man does, even if it is not conventionally considered a masculine activity, adds to his power and prestige, or as a well-known advertisement byline goes, he becomes a 'complete man'" (Geetha 24). So, as Abeda Sultana contends, "the norms and practices that define women as inferior to men, impose controls on-them, are present everywhere in our families, social relations, religious, laws, schools, textbooks, media, factories, offices".And she calls patriarchy "the sum of the kind of male domination we see around women all the time" (Sultana 8). They make the social script thrust with images that are carefully designed to ensurethat the woman does not cross the disciplinary circle of patriarchal surveillance. Their collective influence upon the men and women alike further cements the patriarchal structure of ancient Indian society and reinforces the prevailing patrilineal, patrifocal, and patricist hegemony.

There have been agitations in the past for higher education of women, widow re-marriage, abolition of child marriage, equal opportunities for employment with equal pay and a revised Hindu Code etc.Laws have been enacted to protect women and there have been efforts to put an end to practiceslikesati,childmarriageandmaltreatmentofwidows. However, the subordinated and subjugated condition of women remains practically the same. Social evils like female foeticide and infanticide, high levels of domestic violence, dowry deaths, trafficking and sexual harassment are still part of the Indian reality.

In this new phase of globalization, even as dominant and visible sections of the Indian society move

forward to an egalitarian society, patriarchy remains deeply entrenched in India, influencing the structure of its political and social institutions.Modern education, scientific and technological advancements, urbanization etc. could not bring about much of a change and they have only added to the reconsolidation of the status quo, thereby restoring the 'natural' social order.Women have been held back and their opportunities taken away from them by the social and ideological construct of the patriarchal panopticon. These progressive developments only re-imposes masculinity and femininity character stereotypes in society and have resulted in what Partha Chatterjee calls a new patriarchy that binds women to a "new, yet entirely legitimate subordination" (130). As Preeti S Rawatconcludes,

Organizations may introduce women-friendly policies like flexi-time, second career, removing the glass-ceiling, and reservation for women. But in the current scenario, when the society is driven by patriarchal values, the effort towards changing the condition of women will have only surface-level impact. Deep-level impact will take place only when the concept of patriarchy is shaken and conditions supporting eve empowerment are created for women to experience psychological empowerment (50).

In these democratic times in spite of the subtle transformations that have been brought about in the masculine-feminine equations by the progressive thoughts and developmental attitudes, the towering figure of gender-engendered power can be seen to be operating freely in the Indian society. It is constantly assisted by the agents of socialization which persistently transform themselves into agents of surveillance of women. Thereby women's labour power, women's reproduction, women's sexuality, women's mobility and women's agency are implicitly brought under the control and regulation of the patriarchal 'eye of power' of the panoptic Indian society.

REFERENCES

1. Geetha, V. (2002). "God Made You Different, Nature made Us Different".*Gender*. Calcutta: Stree, Print.
2. Kakar, Sudhir, and Katharina Kakar (2007). *The Indians: Portrait of a People*. New Delhi: Penguin Books, Print.
3. Lakshmi,G. (2006). "Gender Prejudice, Policy and Law-An Etiology."*The Indian Journal of Political Science* 67.3 : 573-578. Web. 7 April 2017.
4. Manu (1825). *Manava Dharma Sastra*. Ed. Graves Chamney Haughton. London, *Google Book Search*. Web. 15 April 2017.
5. Rawat, Preeti S. (2014). "Patriarchal Beliefs, Women's Empowerment and General Well-Being." *Vikalpa* 39.2 : 43-55. *JSTOR*. Web. 10 March 2017.
6. Sultana,Abeda. (2011). "Patriarchy and Women's Subordination: A Theoretical Analysis". *The Arts Faculty Journal* 1-18. *JSTOR*. Web. 30 March 2017.
7. Uberoi, P. (2005). "The family in India beyond the nuclear versus joint debate". *Writing the Women's Movement.* Ed. M. Khullar. New Delhi: Zubaan, Print.

ISSN 0975-8941

Traces of Highbrowed innuendo from the epic: a Kaleidoscopic reading of antedated scientific truths in The Mahabharata

Meera Prasannan,
Department of English, NSS Hindu College, Changanacherry

Received: 11th June 2019 Accepted: 15th August 2019

ABSTRACT

The characters in *Mahabharata* represent men of all kinds. The universality of emotions and life events that can be found in *Mahabharata* is unique and unparalleled. This paper tries to explore *Mahabharata* in all its hues of intertextuality and influences on myriad tangents of life, culture, literature and revolutionary vistas of technology. Vyasa exhibits amazing degree of scientific acumen by transcending the boundaries of sociology, philosophy, culture and language. The "doom's day epic," *Mahabharata* can be the substantially viewed as the cradle of numerous technologies discovered until the present era. Veda Vyasa's imagination metamorphoses into profuse wisdom which enabled him to forecast such revolutionary notions like artificial fertilization, transgender, nuclear weapons, aircrafts and the like in an era, centuries ago.

To be an Indian or simply to live in India at any period in her recorded history, is to open oneself to the benign moral influence of the two epics- the *Ramayana* and *Mahabharata*. Caste, creed, colour do not matter here, what matters is the degree, range and subtlety of exposure, which in turn determines the quality of the affected person's "indianness"(iv). This "large word" (iv) certainly means the very opposite of cultural myopia and has no connection with any kind of hypersensitive social inwardness. "The *Mahabharata* is the content of Indian collective consciousness" (iii), said the late V S Shuthankar, a famous Indologist and Sanskrit scholar in a lecture made in 1943.

The "eternal epic" (4), Mahabharata which describes the story of about two fifty years after Shanthanu's reign consists of about one lakh twenty five thousand narratives. These mutually linked stories give clues about science and technology which were practiced at that time, in the present and yet to be invented. Medical science was practiced as a profession in those days. References regarding various aspects ofmeditative cure can be found in four Vedas of India. Events describing the roles of surgeons and physicians are there in the epic. Unlike ancient medical science which explored the pure consciousness of men, *Mahabharata* implies technologies like cloning, artificial fertilization etc.

Bhishma in his last hours asks Sanjaya to dismiss all the physicians and surgeons after giving proper honours since he takes dignity to die in a battle field lying upon a bed of arrows. This event in *Bhishmaparva* vividly states that numerous doctors were there during the times of Kuru dynasty, who were adept in plucking arrows out and healing wounds. The quotes from *Udyogaparva* and *Shantiparva* also assert the presence of physicians in those ages. "Yudhishtira marched talking with surgeons and physicians… and there assembled hundreds upon hundreds of skilled mechanics in receipt of regular wages and surgeons and physicians well versed in their own science" (279). As said in *Shantiparva*, "a wounded opponent should have his wounds attended to by skillful surgeons" (104).

ISSN 0975-8941

Aspects of modern embryological studies are revealed in the conversation between Vidura and Dhritharashtra as mentioned in the initial pages of *Sthreeparva*. Vidhura explains to Dhritharashtra about the complete life stages of an embryo within the womb. Te possibility of this is striking since that was a time before the invention of scanning. "The life activities of a foetus start at the same moment, when '*Virya'* and '*Rajas'* fuse together in the uterus. Later, by the fifth month, embryo develops all the organs. Later, the foetus takes a posture where the head points to the vagina and the legs upwards" (479).

Abhimanyu, the son of Arjuna, better called as the "warrior of the womb," learns the secret of entering into Chakravyuh when he was in Subhadra's womb. But since she fell asleep when Arjuna taught her to escape Chakravyuh, Abhimanyu in her womb also lost the lesson. This resulted in the pathetic and tragic death of Abhimanyu, the young prince in the battlefield of Kurukshetra. Reading this in turn with the 'Right Brain Education Theory' of Dr. Makota Shichida, a Japanese physician, it is proven that an embryo has extrasensory perception to identify and comprehend what happens outside the womb aided by his right brain and certain cells which are extremely sensitive to the external world.

Novel technique of in-virto fertilization is mentioned in the *Adiparva* in relation to the birth of Kauravas. "Gandhari told Vyasa about the piece of flesh that she carried for two years and delivered. Vyasa took the flesh and cut it into a hundred pieces. After sprinkling water on them, he kept them in specially designed containers full of ghee. In the course of time, the pots broke open and hundred babies were born" (40).

The exotic birth of Kauravas is similar to in-virto fertilization where sex cells of parents are brought together under prescribed conditions, eventually giving birth to embryos. This narrative also implies the stem cell discoveries through which a single cell multiplies to become an organ or even an organism. The heavenly imagination of Vyasa lightens the scope of technology to make foetus grow outside the human body which is still a future prospect of science. The method of generating more than one clone from a single embryo is also a research area from *Mahabharata*.

Modern researches have revealed that sexual orgasm can control the lifespan and youthfulness of living creatures. Scientific studies say that the levels of various body fluids like '*Vatha*,' '*Pitha*,' and '*Kapha'* can be regulated through regular sex and thus account for regular liveliness. In sexual relationship, the female partner enjoys greater orgasm compared to the male. These concepts proposed by science have been already mentioned in the '*Anusasanaparva*.' The same idea is suggested by Vidura in '*UdyogaParva'* that sexual orgasm is a stress buster, which increases pain tolerance and provides better cardiovascular system, better skin and immunity. The absence of sexual life makes man old, physically and mentally at an early age. "Continuous rain destroys the strength of mountains. Sharp words hurt the minds and life without sexual relationship makes women older" (241).

Human quest for immortality is as old as the genesis of life. Man is in search of a method or panacea to get victory over death. Even though he hasn't succeeded in this effort yet, many age defying medicines have been invented by human researches. Aging is a collection of cumulative changes to the molecular and cellular structure of an adult organism which increasingly disrupt metabolism resulting in pathology and death. The concept of '*mrutasanjeevani'* medicine called '*amruthu'* is disclosed in *Mahabharata*. *Devas* and *Asuras* were engaged in the task of extracting this holy medicine from the ocean of milk termed as '*Palazhi'*. The modern age defying medicines are in a way similar to the *amrutha* for which *Asuras* and *Devas* fought each other. The event of extracting the elixir of life from *Palazhi* is recorded in *Adiparva* of *Mahabharata*.

Revolutionary changes are brought in the realms of physical and psychological orientation aided by science. Modern man is capable of abandoning the permanence of sex and consequences of gender through

the execution of transgender surgeries. The complex as well as revolutionary notion of transgender operations is vividly mentioned in *Mahabharata*. It is marvelous to notice that Veda Vyasa has imagined about such a possibility even before hundreds of decades. Traces of transgender existence can be *Udyogaparva* regarding the birth and life of Shikhandi.

Shikhandi, a girl child was born to Drupada after long years of meditation to please Lord Shiva. At the time of her birth, the oracle said that she shall become a man in the future. Anticipating this, Shikhandi married the daughter of Hiranyavama. Since the prophesy was not fulfilled even after a long time, her marital relationship turned to be a disaster. In deep sorrow over this, Shikhandi left the palace and went to a forest. She sat and wept there. Daksha saw her and agreed to exchange his sex with her. Thus Shikhandi became a man. The same notion can be seen in Arjuna's life when the *Apsara* named Urvasi curses him that he will become a woman.

Primitive forms of bio-shield and advanced plastic surgeries can be excavated from the yielding soil of *Mahabharata*. The idea of the modification of DNA to suit the living conditions gave rise to the technology of plastic surgery. Karna, the son of God Surya is born with a shield that guards him from weapons. This may be an Avatar by that particular alien by modifying his own DNA biomechanically to win his foe. It may be a biological similarity to incredibly strong exoskeletons attached to the body of amphibians like tortoise. Unlike artificial exoskeleton used by humans, Karna's '*kavachakundalas*' were blended to his body.

The technologies impregnated in the field of medical science are revolutionary as well as unfathomable nowadays. Reproduction and childbirth is an area where perennial studies are in vogue. Ectopic pregnancies and inter species pregnancies have captured the attention of the whole world especially the scientific arena. Lucid sketches of these state of the art technologies can be observed in the complex terrain of the greater Sanskrit epic.

Ectopic pregnancy simple means male pregnancy by having an embryo implanted in the abdomen of a man. Even though the ovum fertilizes in the female womb, it grows in the paternal abdomen. The narrative in *Vanaparva* about the birth of Mandhathav from the king Yuvanaswa carries traces of this scientific innovation. Unlike ectopic implantation, inter species pregnancy enabled the production of genetically hybridized organisms. In this technique, male and female sex cells of different species are fused artificially and give birth to a new creature carrying the traits of both species. Veda Vyasa in *Bhishmaparva* informs the king Janameya about the exotic events that would happen in their country using his prophetic faculties. As the omen for an imminent jeopardy Vyasa foretells that, "Donkey will take birth from cows and cows will be born from horses in the near future. Man will bear the child and gods shall carry foxes. Tornadoes will strike the face of earth… and oceans will over cede their boundaries destructively" (527). Interspecies experimentations of modern scientists have resulted in the generation of Mule and Hinny, different varieties of organisms which are produced in this way.

The cosmos is composed of innumerable organisms, both visible and invisible to the naked eyes. The presence of microorganisms which can't be sensed by human eyes was detected after the invention of microscope by Robert Hook in 1600. But in the pages of this very ancient epic we encounter the possibilities for the existence of microscopic organisms. "I do not behold any creature in this world that supports life without doing any act of injury to others. Animals live upon animals. This mobile and immobile universe is food for living creatures…there are many creatures that are so minute that their existence can only be inferred" (277). These quotes of Arjuna from *Shanthiparva* clearly imply the persistence of minute organisms that lives by consuming other organisms or matters.

Modern science clearly states the limitation of human eye. The eye has limited size and therefore limited sight gathering power. Ophthalmologists claim that since human eye has limited frequency, it can only see things in visible wave lengths. We see not what exists but only what we are capable to see. IBM Research Lab has developed Refractive Laser Eye technology which enables man to see things in non visible wave lengths also, by exposing laser rays into the eyes without damaging the living tissues. In all episodes of Mahabharata where Lord Krishna discloses his '*viswaroopa'* to Narada, Bhishma, Arjuna, Drona and Sanjaya, he sends very intense rays like lightning and light from stars to enable them with special vision, so as to witness the all powerful figure of the Lord. Concluding, the light rays which Lord Krishna sent resemble to the modern laser eye technology.

Kurukshetra war otherwise known as "*Dharmayudha*"(15) was staged in the soil of kurukshetra in Haryana most probably in 3067 BC and lasted for a span of 18 days. Historical studies reveal that innumerable weapons of severe magnitude were frequently used in the war. 'Asthras' (missiles) and 'Dhanush' (launcher) were specially designed tools which were strong enough to hurt or even kill men. All these weapons require extremely refined technologies for their manufacture. So these tools might not have been made in this planet, but gifted by aliens. There were also catastrophic instruments like Karna's '*nagasthra'* and Vishnu's '*sudarshanachakra'* which will return to the launcher after completing the purpose of launch. These kinds of 'asthras' resemble the modern reusable missiles launched especially for aerospace studies. As encapsulated in the *Aswamedhikaparva*, rays from the weapons penetrated human bodies and took the lives away. This alludes to the gamma rays emitting weapons sought by nations for defense now.

The death toll of this great war of 18 days is apparently 1.6 billion as estimated in *Musalaparva* and *Sthreeparva*. Usual *asthras* or missiles cannot consume such a great magnitude of populace within a short time period. There must have been more catastrophic weapons which could wipe away thousands in a single swoop. The archaeological excavations at Mohanjadaro unfold the occurrence of an atomic destruction which dates back to 2000 BC- 3000 BC. The nuclear debris found there must be the remains of the great *dharmayudha*, as scientists and historians conclude. The extract taken from *musalaparva* validates this archaeological assumption. Myriad number of nuclear weapons which explodes by emitting heat and light were present in the eras of Kuru dynasty. The greater jeopardy that was staged in Kurukshethra was purely a consequent of this.

The use of aircraft in the ancient times is validated by some evidences found in the Mahabharata. Even though the credit for the invention of the aircrafts is ascribed to the Wright brothers who lived in the 20th century, mentions about '*vimanas'* (aeroplanes) can be viewed in the extensive sphere of Mahabharata. As described in the *Dronaparva*, vimanas were shaped like spheres and can move in the air at great speed. *Vanaparva* avouches Arjuna's sight of vimanas in the city of Indra, 'Amaravathi', and the journey of Draupadi, Yudhishtira, Nakula and Sahadeva with Khatolkacha, the son of Bhima to the ashram of Badarika through air. 'Tripura vimana' and Mahendra's vimana are often mentioned in the pages of *Mahabharata*.

Being a folk epic narrated in the third century BC, the *Mahabharata* unfolds unfathomable vistas of science and technology implicitly and explicitly. The *Mahabharata* is an epitome of the timelessness of art. It is impregnated with notions which still hold good and relevant. This "*dharmagrandha*" addresses everything that regards the living organisms, the non living materials and the spiritual consequences of life.

References

1. Dhawan, R. K. (2013). "The Case for Comparative Literature." *Between the Lines: A Textbook of Comparative Literature.* Ed. K. M Krishnan. Thrissur: Current Books, 54. Print.
2. Lal, Purushottama (1980). Preface. *P Lal Edition of Mahabharata*byLal. Michigan UP, i-ix. Print.
3. Rameshwar Rao, Ranishanta (1997). *Mahabharata*. New Delhi: Orient P, Print.
4. Doyle, Christopher. C. (2010). "Science and Technology in Mahabharata." N.p Web. 20 Jan. 2015. http://www.christophercdoyle.com/tag/science-in-the-mahabharata
5. Sensarma, Priyadarsan (1975). *KurukshetraWar*: A Military Study. Ganganagar: D. Roy, Web. 20 Dec 2014. https://scholar.google.co.in

ISSN 0975-8941
82 June-December 2019 (Vol. XII No. 1&2) Research Lines

'ചെമ്മീനി'ലെ പുരാവൃത്തവും ആദർശസ്ത്രീനിർമ്മിതിയും

ധന്യ പി.ഡി.
ഗവേഷക, മലയാളവിഭാഗം
ശ്രീ ശങ്കരാചാര്യ സംസ്കൃത സർവകലാശാല, കാലടി

Received: 10th October 2019 Accepted: 30th November 2019

പ്രബന്ധസംഗ്രഹം

സാമൂഹികവും സാംസ്കാരികവും രാഷ്ട്രീയവുമായ പുത്തൻ അവബോധങ്ങൾ കേരളീയ പൊതുമണ്ഡലത്തിൽ സ്വാധീനം ചെലുത്തിയ ഇരുപതാം നൂറ്റാണ്ടിന്റെ ആദ്യ പകുതിയിലാണ് ചരിത്രത്തിന്റെ മുന്നേറ്റങ്ങളിൽ നിശബ്ദരാക്കപ്പെട്ട കീഴാളരെക്കൂടി സാമൂഹിക ഘടനയിൽ ഉൾക്കൊള്ളിച്ചുകൊണ്ടുള്ള പ്രവർത്തനങ്ങൾ വിഭാവനം ചെയ്യപ്പെട്ടത്. ഇതിന്റെ ഭാഗമായി രൂപംകൊണ്ട പുരോഗമന സാഹിത്യത്തിന്റെ പ്രധാന വക്താക്കളിൽ ഒരാളായിരുന്നു തകഴി ശിവശങ്കരപിള്ള. കീഴാളരുടെ ഉന്നമനം ലക്ഷ്യം വെച്ച് കീഴാള പക്ഷത്തുനിന്ന് എഴുതപ്പെട്ടവയെന്ന് വാഴ്ത്തപ്പെട്ട തകഴിക്കൃതികളിലെ ജാതി-വർഗ്ഗ-ലിംഗക്കോയ്മകളെ പ്രശ്നവത്ക്കരിക്കുന്ന പഠനങ്ങൾ ആധുനികാനന്തര കാലത്ത് നടക്കുന്നുണ്ട്. ചെമ്മീനിലെ സ്ത്രീയുടെ പാതിവ്രത്യത്തെക്കുറിച്ചുള്ള പുരാവൃത്തത്തെ പുനർവായനയ്ക്ക് വിധേയമാക്കുകയാണ് ഈ ലേഖനത്തിൽ. ആധുനികമായ ലോകബോധത്തിലേക്ക് പരിണമിച്ചെത്തുന്ന, സ്വകാര്യ സ്വത്തിൽ അധിഷ്ഠിതമായ ഒരു കുടുംബക്രമത്തിന് സ്വീകാര്യമായ ആദർശസ്ത്രീമാതൃക സൃഷ്ടിക്കുകയാണ് ചെമ്മീനിലൂടെ തകഴിചെയ്തത്. സ്ത്രീ ലൈംഗികത കുടുംബത്തിനകത്ത് നിക്ഷിപ്തമാക്കുകയെന്ന ചരിത്രപരമായ പ്രക്രിയയാണ് ഈ നോവൽ നിർവഹിക്കുന്നത്.

ആമുഖം

ഫ്യൂഡൽ സാമൂഹികക്രമങ്ങളെ എതിർക്കുകയും അവയോട് ആശയപരമായ വിയോജിപ്പുകൾ കാത്തുസൂക്ഷിക്കുകയും ചെയ്യുന്ന സാഹിത്യമാണ് നവോത്ഥാന സാഹിത്യമെന്ന് വ്യവഹരിക്കപ്പെട്ടത്. തകഴിയുടെ കൃതികൾ ഫ്യൂഡൽ വ്യവസ്ഥയുടെ വിച്ഛേദവും, കീഴാളജനതയുടെ നവോത്ഥാനവും ലക്ഷ്യമാക്കിയവയായിരുന്നു. ഇക്കാരണത്താൽ കൊണ്ടുതന്നെ ഇവയെല്ലാം പുരോഗമനാശയങ്ങൾ പങ്കുവയ്ക്കുന്ന സാഹിത്യമായി വാഴ്ത്തപ്പെട്ടു. ലാവണ്യാധിഷ്ഠിതമായി മാത്രം സാഹിത്യമെന്ന വ്യവഹാരത്തെ സമീപിക്കുന്ന രീതി പുരോഗമനസാഹിത്യത്തിന്റെ വരവോടെ പൊളിച്ചെഴുതപ്പെട്ടു. സമൂഹത്തിനും മനുഷ്യനും ഗുണകരമായ ചിന്തകളിൽ കേന്ദ്രീകരിച്ചുകൊണ്ടുള്ള പുരോഗമന സാഹിത്യത്തിൽ, ചരിത്രത്തിന്റെ മുന്നേറ്റങ്ങളിൽ കീഴാളരെക്കൂടി ഉൾപ്പെടുത്തിക്കൊണ്ടുള്ള സമീപനം വിഭാവനം ചെയ്യപ്പെട്ടു. ഈ പ്രസ്ഥാനത്തിൽപ്പെട്ട എഴുത്തുകാരിൽ പ്രധാനിയായിരുന്നു തകഴി ശിവശങ്കരപ്പിള്ള സാഹിത്യത്തിന്റെ വരേണ്യ നിർമ്മിത വ്യവഹാര പരിസരങ്ങളെ തകർത്തു കൊണ്ട് കീഴാള ജീവിതങ്ങളുടെ ഉണർത്തും വിപ്ലവാഭിമുഖ്യവും തകഴി കഥാവിഷയങ്ങളാക്കി. യഥാതഥമായ ആഖ്യാന സമ്പ്രദായം തകഴികൃതികളുടെ സവിശേഷതയായി പരക്കെ അംഗീകരിക്കപ്പെട്ടു. തെണ്ടിവർഗ്ഗം, തോട്ടിയുടെ മകൻ, രണ്ടിടങ്ങഴി തുടങ്ങിയ നോവലുകളുടെയെല്ലാം പ്രധാന ഊന്നൽ കീഴാള ജീവിതങ്ങളെ അഭിസംബോധന ചെയ്യുക എന്നതിലായിരുന്നു. തകഴിയുടെ കൃതികൾ ഉൾവഹിക്കുന്ന ജാതി- വർഗ്ഗ

ലിംഗക്കോയ്മകളെ പ്രശ്നവൽക്കരിക്കുന്ന രീതിശാസ്ത്രപദ്ധതികൾ സമീപകാലത്ത് രൂപമെടുത്തിട്ടുണ്ട്. കീഴാള ജീവിതങ്ങളെ അഭിസംബോധന ചെയ്യുകയും പുരോഗമനപരമായ ജീവിതരീതികളിലേക്ക് അവരെ പരിവർത്തിപ്പിക്കാൻ ശ്രമിക്കുകയും ചെയ്യുന്ന രണ്ടിടങ്ങഴി, തോട്ടിയുടെ മകൻ തുടങ്ങിയ കൃതികളെല്ലാം ആധുനികാനന്തര കാലത്ത് നിശിതമായ പുനർവായനക്കാർക്ക് വിധേയമായി.

ചെമ്മീൻ തകഴിയുടെ രചനാശൈലിയിൽ കൃത്യമായൊരു ഭാവുകത്വ വിച്ഛേദം സാധ്യമാക്കിയ നോവലായിരുന്നു തന്റെ മറ്റു കൃതികളിലെന്നപോലെ ചെമ്മീനിനും തകഴി പശ്ചാത്തലമാക്കിയത് അധ:സ്ഥിത ജനവിഭാഗങ്ങളുടെ ജീവിതമായിരുന്നു. എന്നാൽ വൈയക്തികമായ കാല്പനിക പ്രണയത്താൽ കെട്ടപ്പെട്ട ഇതിവൃത്തഘടനയായിരുന്നു ആ കൃതിയെ വ്യതിരിക്തമാക്കിയത്. കാല്പനികതയുടെ അംശങ്ങൾ തകഴിയുടെ ആദ്യകാല രചനകൾ മുതൽ തന്നെ സൂക്ഷ്മമായി കാണാനാവുമെങ്കിലും അത് വളരെ പ്രകടമായി വെളിവായ രചനയായിരുന്നു ചെമ്മീൻ. ചെമ്മീനിൽ ഉൾച്ചേർന്നിരിക്കുന്ന പുരാവൃത്തത്തിന്റെ ലൈംഗിക രാഷ്ട്രീയവും കീഴാള സ്ത്രീകളോട് പുലർത്തുന്ന സമീപന രീതികളും പ്രശ്നവല്ക്കരിക്കുകയാണ് ഈ പഠനത്തിൽ ചെയ്യുന്നത്.

സമത്വയാഥാർത്ഥ്യവാദ രചനയുടെ എതിർനിലം

പൊതുസമൂഹത്തിന്റെ രാഷ്ട്രീയവും ഭരണപരവുമായ പ്രത്യയശാസ്ത്രാവബോധങ്ങൾ എഴുത്തിനെയും സ്വാധീനിക്കുന്നു. കേരള ചരിത്രത്തിലെ ഒരു സവിശേഷ കാലഘട്ടത്തിൽ നിന്നുകൊണ്ട് നവോത്ഥാന സങ്കല്പങ്ങളും കമ്മ്യൂണിസ്റ്റ് ആശയങ്ങൾ സൃഷ്ടിച്ച മൂല്യബോധവും ഉൾച്ചേർത്തുകൊണ്ടാണ് തകഴി തന്റെ കൃതികളുടെ ആഖ്യാന പരിസരം രൂപപ്പെടുത്തിയത്. കേരളത്തിന്റെ സാമൂഹിക ചരിത്രത്തിൽ സ്വാധീനം ചെലുത്തിയ നവോത്ഥാനാശയങ്ങൾ തകഴിയും തന്റെ കൃതികളിൽ ആവിഷ്ക്കരിച്ചുവെങ്കിലും ചെമ്മീൻ ഉയർത്തുന്ന ആശയങ്ങളുടെയും സാമൂഹികക്രമങ്ങളുടെയും രാഷ്ട്രീയ വിവക്ഷകൾ എന്തെല്ലാമെന്ന ചോദ്യം പ്രസക്തമാണ്.

തകഴികൃതികളുടെ മുഖ്യ സവിശേഷതയായി വാഴ്ത്തപ്പെട്ട സമത്വ യാഥാർത്ഥ്യവാദ രചനാസങ്കേതങ്ങളിൽ നിന്നുള്ള വഴിമാറി നടപ്പായിരുന്നു ചെമ്മീൻ.എന്റെ ചെമ്മീനിന്റെ കഥ എന്ന ലേഖനത്തിൽ തകഴി തന്നെ ഇക്കാര്യം സൂചിപ്പിച്ചിട്ടുണ്ട്. "മത്സ്യത്തൊഴിലാളി സംഘടിക്കുകയും വർഗ്ഗസമരത്തിന്റെ ചൂടിളകിത്തുടങ്ങുകയും ഒക്കെ പ്രതിപാദ്യമാകാവുന്ന ഒരു നോവലാണെന്ന് കുറെ സുഹൃത്തുക്കൾ ധരിച്ചു. ആ കൂട്ടത്തിൽ എന്റെ ജ്യേഷ്ഠ സഹോദരസ്ഥാനീയമനായ മുണ്ടശ്ശേരി മാസ്റ്ററുമുണ്ടായിരുന്നു. അന്നോളം എന്റെ സാഹിത്യ ജീവിതത്തിന്റെ വികാസപരിണാമങ്ങൾ ശ്രദ്ധിച്ചിട്ടുള്ളവർക്ക് അങ്ങനെയേ തോന്നൂ. ഞാൻ അതുവരെ എഴുതിയതെല്ലാം തൊഴിലാളിവർഗ സംഘടനയെ മുൻനിർത്തി ആണെന്നല്ല. പക്ഷേ അടിയൊഴുക്ക് അതായിരുന്നു" (2011:9). പുരോഗമന സാഹിത്യ പ്രസ്ഥാനത്തിലെ എഴുത്തുകാർ നിശിത വിമർശനങ്ങൾക്ക് വിധേയമായിക്കൊണ്ടിരിക്കുന്ന കാലഘട്ടത്തിൽ, താൻ ചെണ്ട കൊട്ടു കൊണ്ടു മറുകണ്ടം ചാടിയതാണെന്ന് തകഴി തുടർന്നെഴുതുന്നുണ്ട്. ആ മറുകണ്ടം ചാടലാണ് പ്രത്യയശാസ്ത്രപരമായി ചെമ്മീനെ വ്യത്യസ്തമാക്കുന്ന ഘടകം. കാല്പനികത തകഴിയുടെ ആദ്യകാല രചനകൾ മുതല്ക്കേ പ്രവർത്തിച്ചിരുന്നു. എന്നാൽ അക്കാലത്തെല്ലാം തകഴിയിൽ ആധിപത്യം പുലർത്തിയത് മാർക്സിയൻ ചിന്തകളും ഫ്രോയിഡിയൻ ആശയങ്ങളുമായിരുന്നു. ഇത്തരം സിദ്ധാന്തങ്ങളിൽ നിന്ന് വിമുക്തനായ ശേഷം മാത്രമേ തകഴിക്ക് ഒരു കാല്പനിക കാവ്യം എഴുതാനാവൂ എന്ന് കേസരി നിരീക്ഷിച്ചിരുന്നു. ഇതിനെ സാധൂകരിക്കുന്ന തരത്തിലാണ് തകഴി തന്റെ നാല്പത്തിനാലാം വയസ്സിൽ ചെമ്മീൻ എഴുതുന്നത്.

ചെമ്മീൻ എഴുതുമ്പോൾ വർഗ്ഗസമരവും തൊഴിലാളി പ്രശ്നങ്ങളുമൊന്നും തകഴിയെ സ്വാധീനിച്ചില്ല. രാഷ്ട്രീയ സിദ്ധാന്തങ്ങളുടെ പിടിയിൽ നിന്നും വിമുക്തനായ, അഥവാ സിദ്ധാന്തങ്ങളിൽ നിന്നും നിസ്സംഗതയോടെ മാറി നില്ക്കുന്ന ഒരു ഘട്ടം ആരംഭിക്കുന്നത് ചെമ്മീനിലാണ്. അദ്ദേഹം മിത്തിനോട് ക്രിയാത്മകമായി ആഭിമുഖ്യം പുലർത്തിയ നോവലാണത്. നേരത്തെയുള്ള ജീവിത

ISSN 0975-8941

ബന്ധത്തെപ്പറ്റിയുള്ള സിദ്ധാന്ത പ്രമാണങ്ങൾക്കു മുൻകൈ കിട്ടിയിരുന്നുവെങ്കിൽ ഈ മിത്തിനെത്തന്നെ അദ്ദേഹം ചോദ്യം ചെയ്തേനെ എന്ന് കാവാലം നാരായണപ്പണിക്കർ നിരീക്ഷിക്കുന്നുണ്ട് (1997:7) കാല്പനികതയിൽ അധിഷ്ഠിതമായ ഒരു പ്രേമകാവ്യമെഴുതാനാണ് തകഴി തുനിഞ്ഞത്. കീഴാളരുടെ ഉന്മനമോ വർഗ്ഗസമരമോ ഒന്നും ചെമ്മീൻ രചനയുടെ ഒരു ഘട്ടത്തിലും തകഴിയുടെ പ്രധാന പരിഗണനാ വിഷയമായിരുന്നില്ല. അത്തരം സാധ്യതകളിലേക്കുള്ള സൂചനകളെപ്പോലും നോവൽ സമർത്ഥമായി അടച്ചിരിക്കുന്നു. അടുത്ത തുറയിൽ ഉള്ള കണക്കനുസരിച്ച് പങ്ക് കണക്കു പറഞ്ഞു മേടിക്കാൻ കറുത്തമ്മ പളനിയെ ഉപദേശിക്കുന്നുണ്ട്. എന്നാൽ ഇവാടെ അങ്ങനോന്നും നടന്നില്ല എന്ന ഒറ്റ വാചകം കൊണ്ട് നോവലിസ്റ്റ് അത്തരമൊരു സംഘടനയുടെ സാധ്യതയെ അവഗണിക്കുന്നു. അധീശ വ്യവഹാരങ്ങൾക്കെതിരെ ഉയർന്നുവരുന്ന ശബ്ദങ്ങളെ അമർച്ച ചെയ്തു കൊണ്ടാണ് നോവൽ അതിന്റെ കഥാഗതി വികസിപ്പിക്കുന്നത്. ജനങ്ങളുടെ മേലുള്ള തുറയിലരയന്റെ അധികാരം ചോദ്യം ചെയ്യാനാവാത്ത, സ്റ്റേറ്റിന്റെ അധികാരങ്ങൾ പോലും തുറയിലരയന് കീഴ്പ്പെടുന്ന ഒരു കാലഘട്ടമാണ്. നോവലിസ്റ്റ് വിഭാവനം ചെയ്യുന്നത്.

വ്യവസ്ഥിതിക്കെതിരെ പ്രതികരിക്കാൻ കഴിവില്ലാത്ത മുക്കുവ സമുദായാംഗങ്ങളെയാണ് തകഴി ഈ നോവലിൽ സൃഷ്ടിച്ചിരിക്കുന്നത്. ''ചെമ്മീൻ എഴുതിയ കാലത്ത് സൈമണാശാന്റെ നേതൃത്വത്തിൽ ആലപ്പുഴയുടെ തീരപ്രദേശങ്ങളിൽ അരയന്മാർ സംഘടിച്ചു തുടങ്ങിയിരുന്നു. എന്നിട്ടും തോട്ടിയുടെ മകനും രണ്ടിടങ്ങഴിയും തലയോടുമെഴുതിയ തകഴിയുടെ ചെമ്മീനിൽ തൊഴിലാളി നേതാവില്ല. ഇങ്കിലാബുവിളിക്കുന്നില്ല.സംഘടിത തൊഴിലാളി വർഗ്ഗ സങ്കല്പ മില്ല" (പി. വേണുഗോപാലൻ, 1997:68).വ്യവസ്ഥിതിയോടുള്ള പ്രതിഷേധവും സാമൂഹിക നവീകരണവുമൊന്നും ഈ നോവൽ രചനയിൽ തകഴിയുടെ പരിഗണനാവിഷയങ്ങളായിരുന്നില്ല. പ്രാകൃതമായ ഗോത്ര വ്യവസ്ഥയാൽ കെട്ടപ്പെട്ട (തുറയിലരയന്റെ കീഴിലുള്ള അധികാരശ്രേണി ബന്ധങ്ങൾ പ്രാകൃത ഗോത്ര വ്യവസ്ഥയെ കുറിച്ചുള്ള സൂചനകളാണ്) അരയ സമുദായത്തിന്റെ ജീവിതരീതികളിലൂന്നി നിന്നുകൊണ്ട് പുരാവൃത്തത്തിന്റെ സവിശേഷമായ പ്രക്ഷേപണമാണ് തകഴി ഈ നോവലിലൂടെ നിർവഹിക്കുന്നതെന്നു കാണാം. സാമൂഹിക ചൂഷണത്തിന്റെ അംശങ്ങൾക്ക് പ്രാധാന്യമില്ലാത്ത പ്രണയദുരന്തകഥയായി ചെമ്മീൻ മാറ്റപ്പെട്ടതിനു പിന്നിലെ യുക്തികളെ പുരാവൃത്തത്തിന്റെ സവിശേഷ വായനകളിലൂടെ പ്രശ്നവല്ക്കരിക്കുമ്പോഴേ ചെമ്മീനിലെ സൂക്ഷ്മ ലൈംഗിക രാഷ്ട്രീയം വ്യക്തമാകൂ.

പുരാവൃത്തത്തിന്റെ സവിശേഷമാനങ്ങൾ

ചെമ്മീൻ എന്ന നോവലിന്റെ ഇതിവൃത്തഘടനയെ മുന്നോട്ടു നയിക്കുന്നത് അരയസ്ത്രീകളുടെ ജീവിതത്തിനുണ്ടായിരിക്കേണ്ടതെന്ന് നിഷ്ക്കർഷിക്കപ്പെടുന്ന ഒരു പുരാവൃത്തമാണ്. നോവലിന്റെ ഗതിയാകെ നിയന്ത്രിക്കുന്നതും ഈ പുരാവൃത്തമാണ് തിരകൾക്കും ഒഴുക്കിനും എതിരായി മല്ലിടിച്ച് ഒരു തടിക്കഷ്ണത്തിൽ ചക്രവാളത്തിനപ്പുറത്തേക്കുപോയ ആദ്യത്തെ മുക്കുവന്റെ ഭാര്യ വ്രതനിഷ്ഠയോടെ കടപ്പുറത്തു പടിഞ്ഞാറേക്കു നോക്കി നിന്നു തപസ്സു ചെയ്യുകയായിരുന്നു. കടലിൽ കോളിളകി. തിമിംഗലങ്ങൾ വായ്പൊളിച്ചു കൊണ്ടടുത്തു. ശ്രാവുകൾ വാലുകൊണ്ടു വള്ളത്തിലടിച്ചു. ഒഴുക്ക് വള്ളത്തെ ഒരു വലിയ ചുഴിയിലേക്കു വലിച്ചു കൊണ്ടുപോയി. എല്ലാ അപടകടങ്ങളിൽ നിന്നും അയാൾ അത്ഭുതകരമായി രക്ഷപ്പെട്ടു. എന്നല്ല ഒരു വലിയ മീനുമായി അയാൾ കരയ്ക്കു വന്നു. എങ്ങനെ ആ കൊടുങ്കാറ്റിൽ നിന്നും അയാൾ രക്ഷപെട്ടു. എന്തുകൊണ്ടു തിമിംഗലം വിഴുങ്ങിയില്ല? ശ്രാവിന്റടി ഏറ്റിട്ടു വള്ളത്തിന് ഒരു കേടും സംഭവിച്ചില്ല. ചുഴി ഒഴിഞ്ഞു വള്ളം പോയി. എങ്ങനെ അതെല്ലാം സംഭവിച്ചു? ആ പതിവ്രത കടപ്പുറത്തു തപസ്സു ചെയ്യുകയായിരുന്നു. (തകഴി 2011:18) കടപ്പുറം നിവാസികളായ അരയ സ്ത്രീകൾ ഈ ജീവിത നിഷ്ഠയാണ് ശീലിച്ചതെന്ന് നോവലിസ്റ്റ് ആദ്യമേ തന്നെ പറഞ്ഞു വയ്ക്കുന്നുണ്ട്. നോവലിലെ പിന്നീടുള്ള ഓരോ സംഭവങ്ങളും ഈ പുരാവൃത്തത്തെ ന്യായീകരിക്കുന്ന തരത്തിലുള്ളവയാണ്.

ISSN 0975-8941

"നാടു മാറുമ്പോൾ കടലും മാറുന്നു എന്ന് തിരിച്ചറിയുന്ന നോവൽ സ്ഥലകാല ബദ്ധമല്ലാത്ത തത്ത്വശാസ്ത്രത്തെ കൂടെ കൂട്ടുന്നു. കാലം മാറുന്നതനുസരിച്ച് മാറ്റമില്ലാത്തത് പരമ്പരയായി ലഭിച്ച ഈ തത്ത്വശാസ്ത്രം മാത്രമാണ്. മുക്കുവന്റെ ഭാര്യയുടെ വ്രതനിഷ്ഠയോടെയുള്ള തപസ്സ്. ആ തപശ്ചര്യയുടെ പില്ക്കാലം എന്നിവയെ കേന്ദ്രമാക്കിയാണ് നോവലാഖ്യാനം. അഥവാ അതുതന്നെയും അതുമാത്രവുമാണ് നോവലിന്റെ ഓരോ വരിയേയും നിർണ്ണയിക്കുന്നത്" (എം.ആർ.മഹേഷ്, 2012:103) ഈ പുരാവൃത്തമാണ് നോവലിലെ ഇതിവൃത്തത്തെ ഘടിക്കുന്നത്. പുരാവൃത്തത്തിന്റെ ന്യായീകരണമോ വ്യവസ്ഥപ്പെടുത്തലോ ആയിട്ടാണ് നോവലിലെ പില്ക്കാല സംഭവങ്ങളെല്ലാം വികസിക്കുന്നത്.

നോവലിലെ എല്ലാ കഥാപാത്രങ്ങളുടെയും ജീവിതഗതിയെ നിയന്ത്രിക്കുന്നത് പുരാവൃത്തമാണ്. കറുത്തമ്മയാണ് ഈ പുരാവൃത്തത്തിന്റെ ഏറ്റവും വലിയ ഇര. സദാചാര സങ്കല്പങ്ങളുടെ കണ്ണികളാൽ ബന്ധിക്കപ്പെടുന്ന കറുത്തമ്മയുടെ ജീവിതത്തെ നിയന്ത്രിക്കുന്നതും നിർണ്ണയിക്കുന്നതും പുരാവൃത്തമാണ്. പുരാവൃത്തത്തിലുൾച്ചേർന്നിരിക്കുന്ന നിയമം പാലിക്കാൻ കറുത്തമ്മ നടത്തുന്ന ശ്രമങ്ങളാണ് അവളുടെ ജീവിതദുരന്തത്തിന് ഹേതുവായി ഭവിക്കുന്നത്. മേത്തനെ സ്നേഹിച്ച കുറ്റത്തിന്റെ പാപം അവളിൽ വന്ന് വീഴാതിരിക്കാൻ അതുവഴി കടപ്പുറം മുടിയാതിരിക്കാൻ അവൾക്ക് യൗവ്വനത്തെയും കാമനയെയും കടിഞ്ഞാണിട്ടു നിർത്തേണ്ടി വന്നു. പക്ഷേ അപ്പോഴും അവളുടെ മനസ്സിൽ പരീക്കുട്ടിയോടുള്ള സ്നേഹം മായാതെ നിന്നു. കറുത്തമ്മ ശരീരം കൊണ്ടു മാത്രമാണ് പരീക്കുട്ടിയിൽ നിന്ന് അകന്നു നില്ക്കുന്നത്. അതിനവളെ പ്രേരിപ്പിക്കുന്നത് പുരാവൃത്തമാണ്.

ശരീരം ശുദ്ധമായതുകൊണ്ടുതന്നെ പുരാവൃത്തത്തിന്റെ ശാപം തന്നിലേക്ക് പതിക്കില്ലെന്ന് കറുത്തമ്മ കണക്കുകൂട്ടി. പുരാവൃത്തമനുശാസിക്കുന്ന ശുദ്ധി സ്ത്രീ ശരീരവുമായി ബന്ധപ്പെട്ടാണ് നില്ക്കുന്നത്. പെണ്ണിന്റെ ശരീരത്തിന് അമിത പ്രാധാന്യം നല്കുന്ന രീതി പുരുഷയുക്തിയുടെ ഭാഗം തന്നെയാണ്. മനസ്സിനെ ശരീരത്തിൽ നിന്ന് വേർപെടുത്തി കാണുകയും ശരീരശുദ്ധിയെക്കുറിച്ചോർത്ത് ആവലാതിപ്പെടുകയും ചെയ്യുന്നതിലൂടെ കറുത്തമ്മയും ഈ യുക്തി ക്രമീകരണത്തിന്റെ ഭാഗമാകുകയാണ്. മനസ്സ് പരീക്കുട്ടിയുടെ സാമീപ്യം ആഗ്രഹിക്കുമ്പോഴും ശരീരം അവൾ പുരാവൃത്തത്തിന്റെ നിയന്ത്രണത്തിന് വിട്ടു നൽകി. താൻ തെറ്റൊന്നും ചെയ്തില്ലെന്ന് അവൾ പലപ്പോഴും ആണയിടുമ്പോൾ ശരീരം കൊണ്ട് പാപം ചെയ്തില്ലെന്നാണ് അവൾ വിവക്ഷിക്കുന്നത്. "ഇല്ലാമ്മാച്ചി, ഞാൻ ചീത്തയായില്ല, ഞാനു നെറീം മൊറേം വിടാത്തില്ല", എന്നെല്ലാം കറുത്തമ്മ ആവർത്തിച്ച് ആണയിടുന്നുണ്ട്. ശരീരത്തെ പുരാവൃത്തത്തിന്റെ വരുതിയിൽ നിറുത്താനുള്ള ശ്രമങ്ങളുടെ ഭാഗമാണ് ഇത്തരം വാക്കുകൾ.

പുരാവൃത്തം അതിന്റെ നിയമങ്ങൾ അനുസരിക്കാൻ നിർബന്ധിതയാക്കുന്നുണ്ടെങ്കിലും എപ്പോഴെങ്കിലും ആ കെട്ടുപാടുകളെ താൻ ഭേദിക്കുമോയെന്ന ഭയം അവലെ നിരന്തരം വേട്ടയാടുന്നു. തനിക്കുണ്ടായതുപോലൊരു പ്രണയം മറ്റാർക്കും അനുഭവപ്പെട്ടിട്ടുണ്ടാകില്ലേയെന്ന് കറുത്തമ്മ സംശയിക്കുന്നുണ്ട്. പുരാവൃത്തം തെറ്റിച്ച സ്ത്രീകളെക്കുറിച്ചുള്ള പല കഥകളും കടപ്പുറംകാരുടെ വഴക്കിനിടയിൽ കറുത്തമ്മ കേട്ടിട്ടുണ്ട്. അന്നൊന്നും കടൽ മുടിഞ്ഞില്ലല്ലോയെന്ന് അവൾ അത്ഭുതപ്പെടുന്നു. നീർക്കുന്നത്തു മാത്രമല്ല തൃക്കുന്നപ്പുഴയിലും അവൾ ഇത്തരത്തിലുള്ള പല കഥകളും കേൾക്കുന്നു. എന്നാൽ അത്തരം സൂചനകളെയൊന്നും വികസിപ്പിക്കാതെ, പുരാവൃത്തത്തിനകത്തു തന്നെ നോവൽ ഘടനയെ തളച്ചിടാനാണ് നോവലിസ്റ്റ് ശ്രമിക്കുന്നത്.

പെണ്ണിന്റെ ചാരിത്ര്യശുദ്ധിയുമായി ബന്ധപ്പെട്ട ഒരു പുരാവൃത്തത്തെ സവിശേഷമായി നിർമ്മിച്ചവതരിപ്പിക്കുന്ന ചെമ്മീനിൽ കടലിന്റെ മക്കളുടെ ജീവിതരീതികളുമായി ബന്ധപ്പെട്ട മറ്റു തത്ത്വശാസ്ത്രങ്ങളും നിമയസംഹിതകളും നിലനിൽക്കുന്നുണ്ട്. എന്നാൽ അവയൊന്നും മുക്കുവ സ്ത്രീയുടെ പാതിവ്രത്യശുദ്ധിയുമായി ബന്ധപ്പെട്ട പുരാവൃത്തത്തോളം പ്രാമുഖ്യം നേടുന്നില്ല. കാലം മാറുന്നതിനോടൊപ്പം പല ആചാരങ്ങൾക്കും നോവലിൽ മാറ്റം സംഭവിക്കുന്നു. എന്നാൽ

ISSN 0975-8941

സ്ത്രീയുമായി ബന്ധപ്പെട്ട പുരാവൃത്തത്തെ പരിഷ്ക്കരിക്കുന്ന കാര്യത്തിൽ മാത്രം നോവൽ പുറംതിരിഞ്ഞു നില്ക്കുന്നുവെന്നത്, ആധുനിക ലോകബോധത്തിനനുഗുണയായ ഒരു സ്ത്രീ മാതൃകയെയും അവളുടെ ചാരിത്ര്യശുദ്ധിയിലധിഷ്ഠിതമായ മൂല്യബോധത്തെയും സവർണ്ണ പുരുഷന്റെ കാഴ്ചപ്പാടിനനുഗുണമായി വളർത്തിയെടുക്കുന്നതിന്റെ ഭാഗമാണ്.

ചെമ്മീനിലെ ലൈംഗിക രാഷ്ട്രീയവും ആദർശസ്ത്രീ നിർമ്മിതിയും

സ്ത്രീ ശരീരവുമായും ലൈംഗികതയുമായും ബന്ധമുള്ള ഒരു പുരാവൃത്തം അവസാനം വരെ നിലനിർത്തുകയും അതിന്റെ ലംഘനത്തിലൂടെ വന്നുചേരുന്ന ദുരന്തത്തെ അനുഭവപരമായി അവതരിപ്പിക്കുകയും ചെയ്യുക എന്നത് ചെമ്മീനിന്റെ രചനാ ലക്ഷ്യം വെളിവാക്കുന്നുണ്ട്. സാന്മാർഗ്ഗികതയുടെയും പാതിവ്രത്യത്തിന്റെയും കാവൽ മാലാഖമാരായി സ്ത്രീകളെ കല്പിക്കുന്ന ഈ ഗൂഢപദ്ധതി, ദേശീയ സാമൂഹിക വ്യവസ്ഥിതിയിൽ ഉൾപ്പെട്ടുകൊണ്ട് നവീകരിക്കപ്പെട്ടേക്കാവുന്ന ഒരു സ്വാതന്ത്ര സ്വത്വത്തിൽ നിന്ന് അവളെ വിലക്കുകയാണ്. ഇരുപതാം നൂറ്റാണ്ടിന്റെ മധ്യകാലത്ത് കേരളത്തിൽ വേരോടിയിരുന്ന സാമൂഹിക പരിഷ്ക്കരണസംബന്ധിയായ വിഷയങ്ങളെക്കുറിച്ചുള്ള അർത്ഥഗർഭമായ മൗനമാണ് ചെമ്മീൻ പുലർത്തുന്നത്. നിലനില്ക്കുന്ന വ്യവഹാരങ്ങളെ പലതരത്തിലും പുരുഷൻ റദ്ദുചെയ്യുകയും പുതിയവ സൃഷ്ടിക്കുകയും ചെയ്യുമ്പോഴും പെണ്ണിന് അതൊന്നും സാധ്യമല്ലാതെ വരുന്നു. സ്ത്രീ വിഷയകമായ പ്രശ്നത്തിൽ നോവൽ സ്വീകരിക്കുന്ന നിലപാടുകൾ അതിന്റെ രാഷ്ട്രീയം വ്യക്തമാക്കുന്നുണ്ട്. കുടുംബമെന്ന സ്ഥാപനത്തിലൂടെ മാത്രം സാധ്യമാകുന്ന ലൈംഗികതയേ സ്ത്രീക്ക് വിധിച്ചിട്ടുള്ളൂവെന്നും അതിനു പുറത്തുള്ള വ്യവഹാരങ്ങൾ നാടുമുടിക്കുമെന്നും സ്ഥാപിക്കുന്നതിലൂടെ പുരുഷാധിപത്യ ധാരണകൾ തന്നെയാണ് ഉറപ്പിക്കപ്പെടുന്നത്.

സമൂഹത്തിന്റെ എല്ലാ തുറകളിലും പഴമയെ/ പാരമ്പര്യത്തെ മുറുകെ പിടിക്കുകയല്ല നോവൽ ചെയ്യുന്നതെന്നത് ശ്രദ്ധേയമാണ്. മറ്റെല്ലാ തലത്തിലും പാരമ്പര്യത്തെ കാലാനുസൃതമായി പുതുക്കാൻ നോവൽ തയ്യാറാവുന്നുണ്ട്. വള്ളവും വലയും മേടിക്കാൻ അർഹതയില്ലാത്ത ചെമ്പൻകുഞ്ഞ് അവ സ്വന്തമാക്കുന്നതും, സ്വന്തക്കാരില്ലാത്ത പളനിക്ക് മകളെ വിവാഹം ചെയ്ത് കൊടുക്കുന്നതും, സമ്പാദിക്കാൻ അർഹതയില്ലാത്ത മരക്കാൻ സമ്പാദിക്കുന്നതുമെല്ലാം നോവലിലെ പാരമ്പര്യവിശ്വാസങ്ങൾക്ക് എതിരാണ്. എന്നാൽ അവിടെയെല്ലാം പുതുക്കപ്പെടുന്നത് അല്ലെങ്കിൽ ആധുനിക ലോകബോധത്തിലേക്ക് പരിണമിച്ചെത്തുന്നത് പുരുഷനുമായി ബന്ധപ്പെട്ട വ്യവഹാരങ്ങളാണെന്നു കാണാം. പ്രാകൃതമായ ഒരു നിയമവ്യവസ്ഥ പുലരുന്ന കടപ്പുറം അതിന്റെ തനതായ മൂല്യ സങ്കല്പങ്ങളെയുപേക്ഷിച്ച് കേരളീയ മുഖ്യധാരാ സാമൂഹിക ശ്രേണിയിലേക്ക് പരുവപ്പെടുന്നു. പക്ഷേ അപ്പോഴും ലൈംഗിക സദാചാരത്തെയും ശുദ്ധിയേയും പറ്റി കല്പിച്ച പുരാവൃത്തം പുതുക്കപ്പെടുന്നില്ല. ഇതെല്ലാം ആധുനികമായൊരു കുടുംബവ്യവസ്ഥ സൃഷ്ടിച്ചെടുക്കുന്നതിൽ നോവൽ പുലർത്തുന്ന നിതാന്ത ജാഗ്രതയുടെ ഫലമാണെന്നു കാണാം. "വയറ്റിലുണ്ടാകുന്നതും പെറുന്നതും പെണ്ണിന്റെ ശരീരമാണെന്നു കണ്ട് ഈ കാലുഷ്യത്തെ ചെറുക്കാൻ അവളെ സദാചാര നിയമങ്ങളുടെ തടവിലിട്ടു. സങ്കരയിനങ്ങളിൽ സ്വത്തു ചിതറിപ്പോകാതിരിക്കാൻ ശരീരത്തിന് സ്വത്തിനേക്കാൾ സാധ്യതയുള്ളതുകൊണ്ട് മനുഷ്യപരിണാമചരിത്രം ഈ സങ്കര ഭീതിയുടെ തുടർച്ചകളും ഇടർച്ചകളുമാണ്. ഈ സങ്കര ഭീതിയാണ് തകഴിയുടെ ചെമ്മീനിനുമുള്ളത്" (പി.ഗീത 2010:65) ജാതി ബന്ധങ്ങൾക്കതീതമായ മാനുഷീക ബന്ധങ്ങളെ കല്പിക്കാൻ നോവലിന് സാധിക്കാത്ത് സ്വകാര്യ സ്വത്തിലധിഷ്ഠിതമായ ഒരു ആധുനിക കുടുംബ വ്യവസ്ഥയുടെ പ്രതിഷ്ഠാപനത്തിനു വേണ്ടിയാണെന്ന് വ്യക്തം. എന്തും സഹിച്ചു ജീവിതമവസാനിപ്പിച്ച അനന്തശതം അരയത്തികളിൽ ഒരുവൾ മാത്രമായാൽ മതി അവൾക്ക്. അവളുടെ ജീവിതത്തിൽ ഒരു പ്രത്യേകതയും സംഭവിക്കാതിരുന്നാൽ മതി. ഒരു സാധാരണ അരയത്തിയായി ജീവിതം അവസാനിപ്പിക്കണം (2011:116) എന്ന് കറുത്തമ്മ ചിന്തിക്കുന്നു. തന്റെ ഇച്ഛകളെ നിർബന്ധപൂർവ്വം ഒതുക്കി. സമൂഹം അനുഭവിക്കുന്ന

സ്ത്രീസ്വത്വത്തിലേക്ക് മാത്രം ചേർന്നു നില്ക്കാനുള്ള വ്യഗ്രതയാണ് ഇവിടെ പ്രവർത്തിക്കുന്നത്. ആധുനികമായ കുടുംബഘടനയെ സ്ഥാപിക്കുന്നതിനുള്ള ചരിത്രപരമായ ഒരു നിയോഗത്തിൽ കണ്ണി ചേർക്കപ്പെടുകയാണ് ഈ നോവലും.

ചെമ്മീനിലേതിൽ നിന്ന് വ്യത്യസ്തമായ, കൂടുതൽ ക്രിയാത്മകമായ ഒരു സാമൂഹിക ഭൂമികയാണ് 1948ൽ രചിക്കപ്പെട്ട രണ്ടിടങ്ങഴിയിൽ ഉള്ളത്. സമൂഹത്തിന്റെ താഴേത്തട്ടിലുള്ള ജനങ്ങൾ വർഗ്ഗസമരത്തിന്റെയും ജനാധിപത്യ മൂല്യങ്ങളുടെയും പ്രാധാന്യം തിരിച്ചറിയുന്നതും അതുവഴി സാധ്യമാകുന്ന കീഴാളനവോത്ഥാനവുമാണ് സ്ഥൂലമായ അർത്ഥത്തിൽ ഈ കൃതിയുടെ പ്രമേയം. സ്ഥൂലമായ ഈ രാഷ്ട്രീയ പശ്ചാത്തലത്തിനപ്പുറം രണ്ടിടങ്ങഴിയിൽ ഉൾച്ചേർന്നിരിക്കുന്ന ലൈംഗിക രാഷ്ട്രീയം ഏറെയൊന്നും ചർച്ച ചെയ്യപ്പെട്ടിട്ടില്ല. പില്ക്കാലകൃതിയായ ചെമ്മീനിൽ ശക്തി പ്രാപിക്കുന്ന കാല്പനികതയുടെ അംശങ്ങൾ രണ്ടിടങ്ങഴിയിലും കണ്ടെത്താനാവും. എന്നാൽ രണ്ടിടങ്ങഴിയിലെ ചിരുത തന്റെ യൗവ്വന സഹജമായ കാമനകളെ അടിച്ചമർത്തി ജീവിച്ചതിനാൽ അവൾ ആദർശസ്ത്രീരത്നമാവുകയും കറുത്തമ്മ പെഴച്ചവളും ഭർത്തൃ ഘാതകിയും ആവുകയും ചെയ്തു. മനുഷ്യന്റെ അടിസ്ഥാന വാസനയായ ലൈംഗികത പാപമോ അശുദ്ധമോ ഒക്കെയായി മാറുന്ന കാഴ്ച രണ്ടിടങ്ങഴിയിലും ചെമ്മീനിലും കാണാം. സ്ത്രീ സാമീപ്യം പുരുഷന്മാർക്ക് ദുരിത ഹേതുവാകുന്നുവെന്ന് തകഴി പറഞ്ഞു വയ്ക്കുന്നു. കോരനായാലും പളനിയായാലും അതിന്റെ തിക്തഫലങ്ങൾ അനുഭവിച്ചവരാണ്. ശാരീരിക വേഴ്ചക്കുശേഷം ശുദ്ധോം വൃത്തീം ഇല്ലാതെ കടലിലും പാടത്തും ഇറങ്ങരുതെന്ന് രണ്ട് നോവലും നിഷ്ക്കർഷിക്കുന്നുണ്ട്. കടലീപ്പോണോർക്കു ശുദ്ധോം വൃത്തീം വേണം എന്ന് ചെമ്മീനിൽ പരാമർശമുണ്ട് (2011:43) രണ്ടിടങ്ങഴിയിൽ തറയിൽ ചെന്ന് ചിരുതയുമായി നടത്തുന്ന സംസർഗ്ഗഫലമായാണ് പാടത്ത് മട വീണതെന്ന പഴി കോരനിൽ വന്നു വീഴുന്നു. ഇവിടെയെല്ലാം ലൈംഗികതയെ പാപബോധവുമായി ബന്ധപ്പെടുത്തിയാണ് വിശകലനം ചെയ്യുന്നത്. തകഴിയുടെ വെളുത്ത കുഞ്ഞ് എന്ന കഥയിലും സ്ത്രീയുടെ ചാരിത്ര്യശുദ്ധിയുമായി ബന്ധപ്പെട്ട മിത്ത് പ്രവർത്തിക്കുന്നുണ്ട്.

രണ്ടിടങ്ങഴിയിൽ നിന്ന് വ്യത്യസ്തമായി ചെമ്മീനിലും വെളുത്ത കുഞ്ഞിലും പുരാവൃത്തത്തെ ലംഘിക്കുന്നതിലൂടെ വന്നു ചേരുന്ന ദുരന്തമാണ് കഥാസന്ദർഭങ്ങളെ സംഘർഷാത്മകമാക്കുന്നത്. എന്നാൽ ഈ കൃതികളിലെല്ലാം ചാരിത്രമൂല്യത്തിന്റെ കാവലാളുകളാകാൻ തകഴി തെരഞ്ഞെടുത്തത് കീഴാള സ്ത്രീകളെയാണ് എന്നതിനു പിന്നിലെ യുക്തി അത്രത്തോളം നിഷ്ക്കളങ്കമല്ല. പാതിവ്രത്യമൂല്യത്തിന്റെ ലംഘനം ഭൗതികമായി സ്ഥാപിക്കപ്പെടുന്നത് കീഴാള ജീവിതങ്ങളിലാണ് എന്നതിൽ നിന്ന് തകഴിക്കൃതികളുടെ ലൈംഗിക രാഷ്ട്രീയം ഒട്ടൊക്കെ വ്യക്തമാകുന്നുണ്ട്, ഈ കൃതികളിലെല്ലാം പെണ്ണിന്റെ ദൗത്യമെന്നത് സമൂഹം അംഗീകരിക്കുന്ന കുടുംബ വ്യവസ്ഥയിലേക്ക് ഒതുങ്ങുക എന്നതു മാത്രമാണ് കീഴാളനായ പുരുഷൻ ആധുനികനാവുമ്പോഴും ആധുനിക പുരുഷ രൂപീകരണത്തിനിടയിൽ കീഴാളസ്ത്രീ പഴയവളായി തന്നെ നില്ക്കാൻ നിർബന്ധിക്കപ്പെടുന്നു. സ്വകാര്യസ്വത്തിലും പുരുഷാധിപത്യ കുടുംബവ്യവസ്ഥയിലുമൂന്നുന്ന ഒരാധുനികതയ്ക്ക് എത്താനാകുന്ന പരിധിയാണിത്. സ്ത്രീയുടെ നിശ്ശബ്ദതയാണ് പുരുഷന്റെ പ്രകാശനത്തിന്റെ പരഭാഗ ശോഭ എന്ന് വരുന്നു. (പി.പവിത്രൻ 2012:85). സ്ത്രീയെ നിശബ്ദയാക്കാനായി പുരുഷനുപയോഗിക്കുന്ന ആയുധം സ്ത്രീശരീരത്തെ, ലൈംഗികതയെ ഒക്കെ ആദർശവല്ക്കരിക്കുക എന്നതാണ്. ശരീരത്തിന്റെ ശുദ്ധിയെന്ന സങ്കല്പത്തിലൂടെ സ്ത്രീ കാമനകളെ നിരന്തരമായി അടിച്ചമർത്തുന്നു, സ്ത്രീ ശരീരമെന്നത് വസ്തുവല്ക്കരിക്കപ്പെട്ട ഒരു ചരക്കാണെന്നും അതിന്റെ ഉടമസ്ഥാവകാശം ഭർത്താവിനു മാത്രമാണെന്നും സ്ഥാപിച്ചെടുക്കുകയാണ് തകഴിക്കൃതികൾ സ്വീകരിക്കുന്ന പൊതു തന്ത്രം. മനസ്സിന്റെ ഇച്ഛയ്ക്കൊത്ത് ജീവിക്കുന്നതിൽ നിന്ന് ശരീരത്തെക്കുറിച്ചുള്ള ബോധം തകഴിയുടെ സ്ത്രീ കഥാപാത്രങ്ങളെ വിലക്കുന്നു. പെണ്ണിന്റെ മനസ്സിനെയും ശരീരത്തെയും രണ്ടായി പിരിക്കുകയും പെൺ ശരീരത്തിന് അമിത പ്രാധാന്യം നല്ക്കുകയും ചെയ്യുന്നു. പുരുഷന്റെ സുഖമെന്നത് സ്ത്രീ ശരീരവുമായി ബന്ധപ്പെട്ടിരിക്കുന്ന അവസ്ഥാവിശേഷമാണ് തകഴിയുടെ കൃതികളിലുടനീളമുള്ളത്.

ISSN 0975-8941

ഉപസംഹാരം

ആധുനിക ലോകബോധത്തിനനുഗുണമായ ഒരു സ്ത്രീ മാതൃകയെയും അവളുടെ ചാരിത്ര ശുദ്ധിയിലധിഷ്ഠിതമായ മൂല്യബോധത്തെയും സവർണ്ണ പുരുഷന്റെ കാഴ്ചപ്പാടിനൊപ്പിച്ച് വളർത്തി യെടുക്കുകയാണ് ചെമ്മീൻ ചെയ്തത്. ആധുനികമായ കുടുംബമെന്ന സ്ഥാപനത്തിന്റെ നിർമ്മിതി ചെമ്മീനിന്റെ രചനയ്ക്കു പിന്നിലെ സജീവതയാണ്. ചെമ്മീൻ നോവലിനും സിനിമയ്ക്കും ലഭിച്ച വമ്പിച്ച ജനപ്രീതി പുരുഷാധിപത്യ മൂല്യങ്ങളോട് സന്ധിചെയ്യുന്ന സമൂഹ മനസ്സാണ് വെളി വാക്കുന്നത്. പുരുഷ നിർമ്മിത സദാചാര മൂല്യങ്ങളുടെ കാല്പനികമായ ആദർശവൽക്കരണമാണ് ഈ ജനപ്രിയതയ്ക്കു പിന്നിൽ.

അരയ സമുദായമെന്നാൽ തകഴി സൃഷ്ടിച്ച മിത്തും ചെമ്മീനിലെ ജീവിതവുമാണെന്ന ധാരണ പൊതു സമൂഹത്തിൽ ഇന്നും നിലനിൽക്കുന്നുണ്ട്. സ്ത്രീയെ നിർവചിക്കുന്ന മൂല്യമായി ചാരിത്ര്യത്തെ മാറ്റിത്തീർത്തുകൊണ്ട് അരയ സമുദായത്തിലെ സ്ത്രീകളിൽ അത് ആരോപിക്കുന്നതിന് ചരിത്രപരമായ ലക്ഷ്യങ്ങളുണ്ട്. വലിയൊരു വിഭാഗം അരയ സ്ത്രീകളും പൊതുമണ്ഡലത്തിലേക്കിറങ്ങി തൊഴിലെടുക്കുന്നവരാണ് എന്നതാണ് ഇതിനു കാരണം. തൊഴിലിലൂടെ സ്ത്രീ നേടിയെടുക്കുന്ന സ്വാശ്രയത്വത്തെ പുരുഷസമൂഹം ഭയപ്പെട്ടിരുന്നു. തൊഴിൽ ചെയ്യുന്ന സ്ത്രീ, പുരുഷ നിർമ്മിത പ്രത്യയശാസ്ത്രങ്ങളെ പിൻപറ്റി സമൂഹഘടനയിൽ ഓരപ്പെട്ട് നിൽക്കുകയില്ലെന്നും മുഖ്യധാരയെത്തന്നെ നിർവചിക്കാൻ അവൾക്ക് കഴിയുമെന്നുമുള്ള ഭീതി പുരുഷനെ വലച്ചിരുന്നു.

സ്ത്രീകളെ കുടുംബത്തിനകത്തേക്ക് തളച്ചിടാനുള്ള നീക്കങ്ങൾ, ചെമ്മീനിൽ വ്യക്തമാണ്. കറുത്തമ്മ മീൻ വിൽക്കാൻ പോകുന്നത് കടപ്പുറത്ത് വലിയ എതിർപ്പാണ് ഉണ്ടാക്കുന്നത്. പാതിവ്രത്യത്തെ സംശയിച്ചുള്ള പരാമർശങ്ങൾ ഉണ്ടാകുന്നതോടെ പിന്നീട് അവൾ ജോലിക്കു പോകുന്നില്ല. പെണ്ണ വേല ചെയ്യുന്നതിനായി പൊതുവിടത്തിലേക്ക് പ്രവേശിക്കുകയെന്നത് അവളുടെ ലൈഗിക കാമനകളെ സ്വതന്ത്രമാക്കി വിടുന്നതിനു തുല്യമാണെന്നും അത് അടിച്ചമർത്തപ്പെടേണ്ടതാണെന്നും നോവൽ സ്ഥാപിക്കുകയാണ് ചെയ്യുന്നത്. പൊതുമണ്ഡലം പുരുഷനൊപ്പം തന്നെ സ്ത്രീയുടെയും കർമ്മമേഖലയാകുന്നതിനെ എതിർക്കുന്ന പുരുഷ യുക്തിയാണ് ഇവിടെയെല്ലാം പ്രവർത്തിക്കുന്നത്. സ്ത്രീകളെ അരങ്ങിൽ നിന്ന് അടുക്കളയിലേക്ക് തളച്ച് സാന്മാർഗ്ഗികതയുടെയും പാതിവ്രത്യത്തിന്റെയും കാത്തുസൂക്ഷിപ്പുകാരെന്ന നിലയിലുള്ള സാമൂഹിക പ്രാധാന്യത്തെ ഉറപ്പിക്കുന്നതിൽ ചെമ്മീൻ കാണിക്കുന്ന വ്യഗ്രത സമൂഹത്തിൽ നിലനിൽക്കുന്ന ആൺകോയ്മയെ പിൻപറ്റുന്നതിലൂടെ വന്നുചേരുന്നതാണ്.

ഗ്രന്ഥസൂചി

1. ഗീത പി. (2010). അതിർത്തികളിലെ അശരീരികൾ സമയം പബ്ലിക്കേഷൻസ് കണ്ണൂർ.
2. നാരായണപ്പണിക്കർ, കാവാലം , 1997, തകഴി വഴി (എഡി. വേണുഗോപാലൻ പി) കേരളഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്, തിരുവനന്തപുരം.
3. പവിത്രൻ പി. (2012). ചിരുതയുടെ പ്രാന്തും കോരന്റെ ചിരിയും തകഴി കാലഭൂപടങ്ങൾ (എഡി. ഷാജി ജേക്കബ്) കൈരളി ബുക്സ്, കണ്ണൂർ.
4. മഹേഷ്, എം.ആർ. (2012). ചെമ്മീൻ, ദേശവും നോവലും തകഴി കാലഭൂപടങ്ങൾ (ഡി. ഷാജി ജേക്കബ്) കൈരളി ബുക്സ്, കണ്ണൂർ.
5. വേണുഗോപാലൻ പി. (1997). തകഴിവഴി കേരളഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്, തിരുവനന്തപുരം.
6. ശിവശങ്കരപിള്ള, തകഴി 2005 (1949). രണ്ടിടങ്ങഴി, ഡി.സി ബുക്സ്, കോട്ടയം.
7. ശിവശങ്കരപിള്ള, തകഴി 2011 (1956). ചെമ്മീൻ, ഡി.സി ബുക്സ്, കോട്ടയം.

ISSN 0975-8941
Research Lines **(Vol. XII No. 1&2)** **June-December 2019** **89**

നെഗ്രിറ്റ്യൂഡ് ദലിത് എഴുത്തുകളുടെ സാംസ്കാരിക സമാനതകൾ

Ambily Mereena Kurian
Post-doctoral fellow, Department of Malayalam
University of Kerala, Karyavattom campus, Thiruvanathapuram

Received: 28th March 2019 Accepted: 30th May 2019

സവർണ്ണ മുഖ്യധാരാസമൂഹങ്ങൾ നിശ്ശബ്ദമാക്കിക്കളഞ്ഞ കീഴാളജീവിതങ്ങൾ പൊതുസമൂഹത്തിന്റെ സാംസ്ക്കാരികമൂലധനമായി മാറുകയും, പുതിയ ജ്ഞാനസൗന്ദര്യവ്യവഹാരങ്ങളുപയോഗിച്ച് അവരുടെ ജീവിതവും എഴുത്തുകളും പുനർവായനകൾക്ക് വിധേയമാകുകയും ചെയ്യുന്ന കാലഘട്ടമാണിത്. കാലങ്ങൾ നീണ്ട അടിച്ചമർത്തലും അജ്ഞതയും അതിജീവിച്ച്, സ്വയം പ്രഖ്യാപിച്ചവ്യക്തിത്വം നേടിയെടുക്കാൻ നിതാന്ത പരിശ്രമം നടത്തിയ ജനസമൂഹങ്ങളുടെചരിത്രവും എഴുത്തുകളും, എക്കാലത്തും കൗതുകമസ്തമിക്കാത്ത അന്വേഷണഭൂമികയാണ്.

പീഡിതന്റെ ആത്മബോധത്തെ കീഴാളന്റെ ഉയിർത്തെഴുന്നേൽപ്പായി പരിവർത്തിപ്പിച്ചുകൊണ്ടാണ് ആഫ്രിക്കൻ, ദലിത് ജനസമൂഹങ്ങൾ ചരിത്രത്തിലിടംനേടുന്നത്. വ്യവസായവത്ക്കരണം വ്യാപകമാവുകയും സാമ്രാജ്യത്വവും വംശീയതയും കൂടുതൽ ശക്തമായ രൂപങ്ങൾ കൈവരിക്കുകയും ചെയ്ത ഇരുപതാംനൂറ്റാണ്ടാണ് നീഗ്രോ ശാക്തീകരണത്തിന്റെ ഭാഗമായ നെഗ്രിറ്റ്യൂഡ് പ്രസ്ഥാനത്തിന്റെയും ഭാരതത്തിലെ ദലിത് നവോത്ഥാനത്തിന്റെയും കാലം. നെഗ്രിറ്റ്യൂഡ്പ്രസ്ഥാനവും കേരളത്തിലെ ദലിത് നവോത്ഥാനവും അതതുകാവ്യസാഹിത്യത്തിൽ പ്രതിഫലിക്കുന്നതെങ്ങനെയെന്ന അന്വേഷണമാണ് ഈ ലേഖനം.ആഫ്രിക്കയുടെ ലോഹസമൃദ്ധിയിലും മനുഷ്യശേഷിയിലും കണ്ണുവച്ചെത്തിയ മുതലാളിത്തസ്വഭാവമുള്ള പാശ്ചത്യമനസ്സ്, അവർക്കുമേൽ കൊടുംക്രൂരതകളാണ് അഴിച്ചുവിട്ടത്. കാടുകൾ അരിഞ്ഞുവീഴ്ത്തി, മേടുകൾ നിരപ്പാക്കി,ആഫ്രിക്കക്കാരന്റെ ആത്മാവുസ്പന്ദിക്കുന്ന പ്രകൃതിയെ നശിപ്പിച്ച അവർ, പവിത്രമായ അദ്ധ്വാനത്തെ വിലയില്ലാതാക്കിക്കൊണ്ട് അസംഖ്യം ആഫ്രിക്കക്കാരെ ഗോത്രത്തലവന്മാരിൽ നിന്നും വിലയ്ക്ക് വാങ്ങി, മനുഷ്യപ്രയത്നം ആവശ്യമായിരുന്ന പാശ്ചാത്യനാടുകളിലേയ്ക്ക് കൊണ്ടുപോയി. കൂട്ടത്തോടെയുള്ള ഈ നിർബന്ധിത കുടിയേറ്റം, ലോകചരിത്രത്തിൽ മുൻപുണ്ടായിട്ടില്ലാത്തവിധം ഭയാനകമായിരുന്നു. പത്തൊമ്പതാം നൂറ്റാണ്ടോടെ അടിമത്തവും അടിമവ്യാപാരവും നിർത്തലാക്കുകയും ആഫ്രിക്കക്കാർക്ക് തങ്ങളുടെ നാട്ടിലേയ്ക്ക് മടങ്ങിയെത്താൻ അവസരമൊരുങ്ങുകയും ചെയ്തുവെങ്കിലും കോളനീകരണമെന്ന അപരനാമത്തിൽ, അധികം വൈകാതെ യൂറോപ്പിന്റെ അധീശത്വശ്രമങ്ങൾ വീണ്ടും ആഫ്രിക്കയെ കീഴടക്കി.

സർവ്വസമ്പന്നമായ സിന്ധുനദീതട സംസ്കാരത്തിലേക്ക് അധിനിവേശമോഹങ്ങളുമായി കടന്നുവന്ന ആര്യസമൂഹവും ചൂഷണത്തിന്റെ അനന്തസാധ്യതകൾ തിരിച്ചറിഞ്ഞവരായിരുന്നു. ഇരുമ്പായുധങ്ങളുടെ മറവിൽ വലിയൊരു ചൂഷണപദ്ധതിയാണ് തദ്ദേശീയ ദ്രാവിഡജനതയ്ക്കുമേൽ അവർ പ്രയോഗിച്ചത്. ഇന്ത്യൻ ജനതയെ ദലിതരും ആദിവാസികളുമാക്കിത്തീർത്ത ആര്യാധിനിവേശവും ചരിത്രത്തെ പിന്നോട്ടടിക്കുന്നതായിരുന്നു.

സ്വയംപര്യാപ്തരും മഹത്തായ സംസ്കാരത്തിനുടമകളുമായിരുന്ന ആഫ്രിക്കൻ, ദലിത് ജനതകൾ,അപരിഷ്കൃതരും അശുദ്ധരുമെന്ന് മുദ്രകുത്തപ്പെട്ടു. അവരെസംസ്കാരമുള്ളവരാക്കുകയെന്ന ദൗത്യമാണ് തങ്ങൾ ഏറ്റെടുത്തിരിക്കുന്നതെന്ന് അധിനിവേശസമൂഹം ന്യായീകരിക്കുകയും ചെയ്തു. അവരുടെ ഉപബോധമനസ്സിൽ അപകർഷതയുണ്ടാക്കുന്ന കെട്ടുകഥകൾ നിറച്ച്, കഴിവുകളെയും രൂപഭാവങ്ങളെയും സാംസ്കാരികനേട്ടങ്ങളെയുംകുറിച്ച് അഭിമാനമില്ലാത്തവരാക്കുകയായിരുന്നു

ISSN 0975-8941

യഥാർത്ഥത്തിൽ അവർ ചെയ്തത്.

അടിച്ചമർത്തപ്പെട്ടവർ തങ്ങളുടെ സ്വത്വം തിരിച്ചറിയാനും എഴുത്തിലൂടെ അവയെ ആവിഷ്കരിക്കാനും തുടങ്ങിയപ്പോൾ, പാർശ്വവത്കരിക്കപ്പെട്ടവന്റെ ഉയിർത്തെഴുന്നേൽപ്പായി അതിനെ ലോകം കണ്ടു. അവഗണിതന്റെ ആത്മനൊമ്പരങ്ങളും, തനിമയും പാരമ്പര്യവും നഷ്ടപ്പെട്ടവന്റെ പ്രതിഷേധവും, സാംസ്ക്കാരികമൂല്യങ്ങളിലേക്കുള്ള മടങ്ങിപ്പോക്കുമൊക്കെ അവരുടെ എഴുത്തുകളിൽ ആവർത്തിക്കുന്ന പ്രമേയമായി. നിലനിന്ന സാഹിത്യാസ്വാദത്തിന് ഇവ പുതിയഉൾക്കാഴ്ചയുടെ കരുത്തു നൽകുകയും ചെയ്തു.

ഫ്രഞ്ചാഫ്രിക്കൻ കോളനികൾ മുന്നോട്ടുവച്ച നവോത്ഥാന ആശയമായിരുന്നു നെഗ്രിറ്റ്യൂഡ്. നിഗ്രോയുടെ കറുത്ത തൊലിക്കും ചുരുണ്ട തലമുടിക്കും കരുത്തുറ്റ മാംസപേശികൾക്കും ഓട്ടത്തിന്റെ വേഗതയ്ക്കുമപ്പുറം അവന്റെ സ്വത്വത്തിന്റെ അഥവാ ഉണ്മയുടെ അന്വേഷണമായിരുന്നു ഇത്. നെഗ്രിറ്റ്യൂഡ് എന്നത് ആഫ്രിക്കൻ വംശീയ ഉണർവിനെ സൂചിപ്പിക്കുന്ന പദമായി നീഗ്രോ ഏറ്റെടുത്തു. തങ്ങളുടെ കറുത്ത പൈതൃകത്തിലും സംസ്കാരത്തിലും ആഫ്രിക്കൻ ജനതയ്ക്കുണ്ടായ വർദ്ധിച്ച അഭിമാനത്തിന്റെ വെളിപ്പെടുത്തൽ കൂടിയായിരുന്നു ഇത്. സ്വന്തം വ്യക്തിത്വം ആരാഞ്ഞറിയുവാനും അത് സ്ഥാപിച്ചെടുക്കുവാനും നെഗ്രിറ്റ്യൂഡ് പ്രേരണ നൽകി.

പാരിസിൽ ഉപരിപഠനാർത്ഥം എത്തിയ കറുത്ത വിദ്യാർത്ഥികളുടെ ബൗദ്ധിക പ്രവർത്തനങ്ങളോട് ബന്ധപ്പെട്ടാണ് ഈ ആശയം ഉയർന്നുവന്നത്. മാർട്ടിനീക്കൻ കവിയും രാഷ്ട്രതന്ത്രജ്ഞനുമായ അയ്മെ സെസെയർ (Aime Cesaire), സെനഗളിന്റെ രാഷ്ട്രപതിയും തത്വചിന്തകനും കവിയുമായ ലിയോപോൾഡ് സെദാർ സെംഘോർ, ലിയോൺ ദാമാസ് (Leon Damas) എന്നിവരുടെ കവിതകൾ നെഗ്രിറ്റ്യൂഡിന്റെ അവതരണമാധ്യമങ്ങളായി. ആയിരത്തിത്തൊള്ളായിരത്തി അൻപത്തിയാറിൽ സെസയറിന്റെ ജന്മനാട്ടിലേക്ക് മടക്കം (Note book of return to the Native Land) എന്ന ആദ്യകൃതി പുറത്തുവന്നതോടെ, ഫ്രാൻസിനകത്തും പുറത്തും ഇതൊരു ചർച്ചാവിഷയമായി മാറി. കല, സാഹിത്യം,തത്വചിന്ത, ആഖ്യാനശാസ്ത്രം തുടങ്ങിയവയിലെല്ലാം നെഗ്രിറ്റ്യൂഡിന്റെ സ്വാധീനംകാണാം.

ദലിത് ഉയിർത്തെഴുന്നേൽപ്പിന്റെ സ്വരം ആദ്യം കേൾപ്പിച്ചത് മറാത്തി എഴുത്തുകാരാണ്. കേരളത്തിൽ, പൊയ്കയിൽ യോഹന്നാൻ എന്ന സാമൂഹികപരിഷ്കർത്താവിന്റെ പാട്ടുകൾ ദലിത് പ്രതിഷേധങ്ങളെ ഛന്ദോ ന്ധമായി അവതരിപ്പിച്ചു. എന്നാൽ അംഗീകരിക്കപ്പെട്ട കവിതയുടെ കെട്ടിലും മട്ടിലുമുള്ള പ്രതിഷേധങ്ങൾ പണ്ഡിറ്റ് കറുപ്പനിൽ തുടങ്ങുന്നു. 'ജാതിക്കുമ്മി' എന്ന കൃതി മുന്നോട്ടുവയ്ക്കുന്ന, സാമൂഹിക സാംസ്കാരിക തത്വചിന്താപരമായ പ്രതിഷേധധാരകൾ, കേരളത്തിലെ ബ്രാഹ്മണാധിപത്യത്തെ നേരിട്ടാക്രമിക്കാൻ പര്യാപ്തമായിരുന്നു. ഇതേത്തുടർന്ന് ധാരാളം പേർ കവിതാവഴികളിൽ തങ്ങളുടെ പ്രതിരോധങ്ങൾക്ക് ആവിഷ്കാരം നൽകി.

സ്ത്രീ-പരിസ്ഥിതി പ്രശ്നങ്ങൾ ഉയർത്തിപ്പിടിച്ച ആധുനികോത്തരതയിലെ ബഹുസ്വരതയുടെ അന്തരീക്ഷമാണ് മലയാള ദലിത്സാഹിത്യത്തെവളർത്തിയത്. ഇന്ന് മലയാള സാഹിത്യത്തിലെ, ഏറ്റവും ശ്രദ്ധേയമായസാന്നിധ്യമാണ് ദലിത് എഴുത്തുകൾ. തങ്ങൾ കറുത്തവരും അസ്പൃശ്യരും നികൃഷ്ടരുമാണെന്ന അപമാനബോധത്തിൽ നിന്ന്,ആത്മാഭിമാനമുള്ള ദലിതനിലേയ്ക്കവർ ഉയിർത്തെഴുന്നേൽക്കുന്നത് ഇക്കാലഘട്ടത്തിലാണ്. ദലിതന്റെ ജീവിതാനുഭവങ്ങളും ദാരിദ്ര്യവും ദു:ഖവും ഏകാന്തതയും പ്രണയവുമെല്ലാം കരളുറപ്പുള്ള ഭാഷയിൽ ആവിഷ്ക്കരിക്കപ്പെട്ടു. അവരുടെ ജീവിതരീതികളും ആചാരാനുഷ്ഠാനങ്ങളും കലയും എഴുത്തുകളും തികച്ചും സവർണ്ണേതരമായ പുതിയൊരു ഭാവുകത്വപരിണാമത്തിനു കാരണമാവുകയും ചെയ്തു.

ഫ്രഞ്ചാഫ്രിക്കൻ നെഗ്രിറ്റ്യൂഡിന്റെ ശക്തമായ അലകൾ ആയിരത്തിത്തൊള്ളായിരത്തി എൺപതുകളോടെ അടങ്ങിയെങ്കിലും സ്വത്വംതേടുന്ന ആഫ്രിക്കക്കാരന്റെ തൃഷ്ണ ഇന്നും അടങ്ങിയിട്ടില്ല. ആഫ്രിക്കയുടെ ചെറിയ വിസ്തീർണ്ണതയിൽ നിന്ന് വിശാലമായ കീഴാളസ്വത്വപരിസരത്തേക്ക് മാറ്റിപ്രതിഷ്ഠിക്കുമ്പോൾ, നെഗ്രിറ്റ്യൂഡിന് സാർവദേശീയവും സാർവകാലികവുമായ മാനം കൈവരുന്നു. 'കറുത്തവന്റെ സാംസ്കാരികമൂല്യങ്ങളുടെ ആകെത്തുകയെന്ന് നെഗ്രിറ്റ്യൂഡിനെ നിർവചിക്കുമ്പോൾ,

ISSN 0975-8941

ലോകം മുഴുവനുമുള്ള കറുത്ത വർഗ്ഗത്തെ സെംഘോർ മനസ്സിൽ കാണുന്നുണ്ട്. 'നെഗ്രിറ്റ്യൂഡ് ഒരു തുടക്കമാണ്. താൻ കറുത്തവനാണെന്ന അഭിമാനബോധത്തിന്റെ ആവർത്തിച്ചുറപ്പിക്കലാണിത്. അതുകൊണ്ടുതന്നെ ലോകം മുഴുവനുമുള്ള കറുത്തവർഗ്ഗക്കാരുമായി ഞങ്ങൾ ഐക്യമത്യംപ്രാപിക്കുന്നു. കാരണം, ദേശകാലങ്ങൾക്കിടയിൽ ഞങ്ങളെല്ലാവരും ഒരേലക്ഷ്യത്തിനുവേണ്ടി നിലകൊള്ളുന്നവരാകുന്നു എന്ന സെസയറിന്റെ വിശദീകരണത്തിലും, വർണ്ണ-വർഗ്ഗ-സംസ്ക്കാരഭേദമെന്യേ സർവ്വ ആകാശങ്ങൾക്കും സർവ്വനിർജ്ജീവതകൾക്കും സർവ്വസഹനത്തിനും മീതെ തുളഞ്ഞുകയറുന്ന ഒരു നെഗ്രിറ്റ്യൂഡ് സങ്കൽപ്പം കാണാം.

'സാർവ്വലൗകികമായ വിശപ്പിന്
സാർവ്വലൗകികമായ ദാഹത്തിന്
മറുപടി പറയാനാണ് ഞാനാഗ്രഹിക്കുന്നത്.'

എന്നും അദ്ദേഹം പറഞ്ഞിട്ടുണ്ട്. ലോകമെമ്പാടുമുള്ള അടിച്ചമർത്തപ്പെട്ടവരുടെവികാര വിചാരങ്ങളും ഉയിർത്തെഴുന്നേൽപ്പിനുള്ള വാഞ്ഛയും ഒന്നാണെന്ന ഇത്തരം നിരീക്ഷണങ്ങളുടെ പശ്ചാത്തലത്തിലാണ് നെഗ്രിറ്റ്യൂഡ് എഴുത്തുകളുംമലയാള ദലിത് എഴുത്തുകളും താരതമ്യത്തിന് വിധേയമാക്കുന്നത്.

ആഫ്രിക്കൻ-ദലിത് സാമൂഹികവ്യവസ്ഥകൾ വിഭിന്നമാണെങ്കിലും രണ്ടുസാഹചര്യങ്ങളിലും ജീവിക്കുന്നവരുടെ ജീവിതാവസ്ഥകൾ സമാനമാണ്. നീഗ്രോകൾ വെള്ളക്കാർക്കു മുൻപേ സംസ്ക്കാരം സ്ഥാപിച്ചവരായിരുന്നു.ബ്രാഹ്മണ സംസ്കാരം ഇന്ത്യയെ കീഴടക്കുന്നതിനു മുൻപ് ഇവിടെ തദ്ദേശീയദലിത് സംസ്കാരം നിലനിന്നിരുന്നു. അവയെ ചോദ്യം ചെയ്തുകൊണ്ട്, ചൂഷണത്തിലൂടെയാണ് അധീശവർക്ഷം (വെള്ളക്കാർ/ ആര്യന്മാർ) അധികാരം സ്ഥാപിച്ചത്. ഇതിൽ മുഖ്യം മതപരമായ ചൂഷണമായിരുന്നു. ആഫ്രിക്കൻ അടിമത്വത്തിൽ, ക്രിസ്തുമതത്തിന്റെയും, ദലിത് അടിമത്തത്തിൽ ഹിന്ദുമതത്തിന്റെയും പങ്ക് ചെറുതായിരുന്നില്ല. വിഭവശേഷിയുടെയും സമ്പത്തിന്റെയും ചൂഷണം അവരെ പരിപൂർണ്ണ അടിമത്തത്തിലേയ്ക്ക് കൂപ്പുകുത്തിക്കുകയും ചെയ്തു. ആഫ്രിക്കക്കാരനെ മനുഷ്യന്റെ പരിണാമഘട്ടങ്ങളിൽ ഏറ്റവും താഴെനിൽക്കുന്ന ജനവിഭാഗം എന്ന നിലയിലാണ് വെള്ളക്കാരൻ കണ്ടത്. സ്വാഭാവികമായും സാംസ്ക്കാരികതലത്തിലും അവർ താഴെത്തട്ടിൽ നിൽക്കുന്നവരാണെന്നധാരണ വെള്ളക്കാരനുണ്ടായിരുന്നു. ദലിതർ പൂർവ്വജന്മകർമഫലമായി ഹീനജാതിയിൽ പിറവികൊള്ളേണ്ടി വന്നവരാണെന്ന് സവർണ്ണവിശ്വാസസംഹിതകളുംസ്ഥാപിച്ചു. അവരുടെ കാഴ്ചയും സ്പർശവും പോലും അശുദ്ധിയ്ക്ക് കാരണമാകുമെന്നും കരുതപ്പെട്ടിരുന്നു.രണ്ടും ജനനത്തിന്റെ അടിസ്ഥാനത്തിൽ നിർണ്ണയിക്കപ്പെട്ടതും, നിരവധിയായ ആചാരവിശ്വാസങ്ങളുടെ അടിസ്ഥാനത്തിൽ നിലനിന്നു പോന്നതുമായിരുന്നു. ചൂഷണത്തിനുള്ള സാധ്യതകൾ ഇരു സംസ്കാരങ്ങളിലും ഉണ്ടായിരുന്നു. സാംസ്കാരിക ശ്രേണിയിലെ അടിസ്ഥാനവിഭാഗങ്ങളെന്നൊക്കെ മുദ്രകുത്തപ്പെട്ടിരുന്നു. തങ്ങൾ നിലനിന്ന സമൂഹങ്ങൾ പുരോഗതി പ്രാപിച്ചതായിരുന്നുവെങ്കിലും അവരിൽ ഭൂരിഭാഗത്തിനും നല്ല വിദ്യാഭ്യാസമോ, ഉയർന്നതൊഴിൽ സാധ്യതകളോ ഉണ്ടായിരുന്നില്ല. തുച്ഛമായ വരുമാനം മാത്രമായിരുന്നു ജീവിതമാർഗം. 'സമത്വം', 'സാഹോദര്യം' തുടങ്ങിയവ അവരെ സംബന്ധിച്ച് ആദർശങ്ങൾ മാത്രമായി. വോട്ടവകാശം ലഭിച്ചതിനു ശേഷമുള്ള ദലിതന്റെ അവസ്ഥയും ഇതിൽനിന്ന് വ്യത്യസ്തമായിരുന്നില്ല.

ആദിമ ഗോത്രസമൂഹങ്ങളുടെ പിന്തുടർച്ചയാണ് ആഫ്രിക്കൻ, ദലിത് സമൂഹങ്ങൾ. ചില പാരമ്പര്യ വിശ്വാസങ്ങൾ ഒഴിച്ചു നിർത്തിയാൽ അവരുടെ ജീവിതക്രമങ്ങൾ സമാനവുമാണ്. അവരുടെ എഴുത്തുകളിലെ പ്രമേയസമാനത ഇത് തെളിയിക്കുന്നുമുണ്ട്. ഇരു ജനവിഭാഗങ്ങളും ചരിത്രത്തിൽ നിന്ന് അദൃശ്യരും ശബ്ദമില്ലാത്തവരും ആയിരുന്നു. അതുകൊണ്ടുതന്നെ തങ്ങളുടെ നഷ്ടപ്പെട്ട വ്യക്തിത്വം വീണ്ടെടുക്കാനുള്ള ആഗ്രഹം അവർക്ക് തീവ്രമായുണ്ടായിരുന്നു. ഇത് നെഗ്രിറ്റ്യൂഡ്-ദലിത് എഴുത്തുകാർ സമർത്ഥമായി ആവിഷ്ക്കരിക്കുകയും ചെയ്തു.

സാമൂഹിക-സാംസ്കാരിക-സാമ്പത്തിക അസമത്വമാണീ എഴുത്തുകളുടെ അടിത്തറ. കാലങ്ങ

ISSN 0975-8941

ളായി അടിച്ചമർത്തലിനു വിധേയരായവർക്ക് നഷ്ടപ്പെട്ട സ്വത്വംവീണ്ടെടുത്ത് കൊടുക്കുന്നതോടൊപ്പം അധീശസമൂഹങ്ങൾക്ക്, ഇവരുടെ അവകാശങ്ങളെക്കുറിച്ചുള്ള ശരിയായ ധാരയുണ്ടാക്കിക്കൊടുക്കാനും നെഗ്രിറ്റ്യൂഡ്,ദലിതെഴുത്തുകാർ ശ്രദ്ധവെച്ചു. അതിനാൽ തന്നെ പുതുകാലത്തിന്റെ ഉണർത്തുപാട്ടുകളാണ് ആ എഴുത്തുകൾ. ചരിത്രം കറുപ്പിലെഴുതുകയായിരുന്നു അവരുടെലക്ഷ്യം. ചരിത്രത്തിന്റെ ദുന്തമാണ് ഇരു കവിതകളും കാണിച്ചുതരുന്നത്.നിശബ്ദരാക്കപ്പെട്ട സഹജീവികളുടെ വേദനകളാണിത് തിരയുന്നത്. ആത്മവീര്യം വീണ്ടെടുക്കാനുള്ള ആഹ്വാനമാണ് ഇത് നടത്തുന്നത്. അവർ സംസാരിക്കുന്ന സാഹിത്യവും അവർക്കുവേണ്ടി സംസാരിക്കുന്ന സാഹിത്യവുമുണ്ട്. ആരെഴുന്നു എന്നതിനെക്കാൾ എന്ത്, എങ്ങനെ എഴുതുന്നു എന്നതാണ് പാർശ്വവത്കരിക്കപ്പെട്ടവരുടെ സാഹിത്യത്തെ സംബന്ധിച്ച് പ്രധാനം. ജീവിതഗന്ധിയായ ഈ സാഹിത്യങ്ങളുടെ അടിസ്ഥാനം സാമൂഹിക പ്രതിബദ്ധതയായിരുന്നു. സാംസ്ക്കാരിക വിപ്ലവമായിരുന്നു ഇതിന്റെ ലക്ഷ്യം. പുതിയ സാംസ്ക്കാരിക മൂല്യസങ്കൽപ്പങ്ങളാണിത് തിരയുന്നത്. സമത്വവും സ്വാതന്ത്ര്യവും സാമൂഹികനീതിയും പുലരുന്നൊരു ലോകക്രമത്തിനു വേണ്ടിയുള്ള സ്വപ്നങ്ങളാണ് ഈ എഴുത്തുകൾ പങ്കിടുന്നത്.

വേദനയും യാതനയും നിലനിൽക്കുന്ന സാമൂഹികവ്യവസ്ഥകളോടുള്ളഎതിർപ്പും, വ്യക്തിത്വം നേടിയെടുക്കാനുള്ള ദാഹവും, തനിമയിലേക്കും പാരമ്പര്യത്തിലേക്കും മടങ്ങിപ്പോകാനുള്ള വാഞ്ഛയും, നല്ല നാളെയെക്കുറിച്ചുള്ള പ്രതീക്ഷകളുമെല്ലാം അവരുടെ കവിതകളുടെ പൊതുപ്രമേയമാണ്. അധിനിവേശചൂഷണവും അടിച്ചമർത്തലും,നാടുകടത്തലിന്റെ വേദനയും, പ്രതിരോധവുംപ്രതിഷേധവും ഉയിർത്തെഴുന്നേൽപ്പും,സ്വത്വം പാരമ്പര്യം തനതു സംസ്ക്കാരം വംശബോധം തുടങ്ങിയവ ആവർത്തിച്ചുറപ്പിക്കാനുള്ള ശ്രമങ്ങളും,പ്രകൃതി-സ്ത്രീ ജീവിതങ്ങളുടെ സവിശേഷതകളും നെഗ്രിറ്റ്യൂഡ്-ദലിത് എഴുത്തുകൾക്ക് പൊതുപ്രമേയമാകുമ്പോൾ, ആഫ്രിക്കൻ-ദലിത് സംസ്ക്കാരങ്ങളുടെ സാമൂഹിക സാംസ്കാരിക സമാനതകൾ നാം തിരിച്ചറിയുന്നുണ്ട്.

അധീശവർക്ഷം ഇകഴ്ത്തിക്കാട്ടാനുപയോഗിച്ചവയെല്ലാം ശക്തിയുടെയുംസൗന്ദര്യത്തിന്റെയും ബിംബങ്ങളായി പുനരവതരിപ്പിക്കുന്ന പ്രതിരോധതന്ത്രം ഇരുഎഴുത്തുകളിലും കാണാം. കറുപ്പിന്റെ മഹത്വവത്കരണം ഇതിനു തെളിവാണ്. നിറത്തിന്റെ പേരിൽ തങ്ങൾക്ക് പതിത്വം കൽപ്പിച്ചവരോട് 'കറുപ്പ് സുന്ദര'മാണെന്നവർ ആവർത്തിച്ചു പറഞ്ഞു. ദൈവങ്ങളുടെ കറുപ്പും മുടിക്കറുപ്പും മൃഗക്കറുപ്പും മോഹിപ്പിക്കുന്നതാണെന്നിരിക്കെ, ഒരു പ്രത്യേക ജനതയുടെ നിറമായി വരുമ്പോൾ മാത്രം കറുപ്പ് അപമാനചിഹ്നമാകുന്നതിനെ ദലിത് എഴുത്തുകളും പ്രശ്നവത്കരിച്ചു.

ഉപസംഹാരം

വിശാലമായൊരു ഭൂഖണ്ഡത്തിൽ, അതിജീവനമെന്ന ലക്ഷ്യത്തോടെ, ശക്തനായൊരു എതിരാളിയോട് പ്രതിരോധത്തിലേർപ്പെടാൻ രൂപപ്പെടുത്തിയ സാഹിത്യശാഖയെ, കേരളം പോലെ താരതമ്യേന ചെറിയൊരു പ്രദേശത്ത്, ആത്മാവിഷ്ക്കാരമെന്ന നിലയിൽ മാത്രം എഴുതപ്പെട്ട കവിതകളുമായി താരതമ്യം ചെയ്യുന്നതിന്റെ സാധുത ചോദ്യം ചെയ്യപ്പെട്ടേക്കാം.രണ്ടു കാലഘട്ടങ്ങളിൽ രൂപപ്പെട്ട എഴുത്തുകളെന്ന നിലയിലും അവ തമ്മിലുള്ള അകലം കൂടുന്നുണ്ടാവാം. എന്നാൽ അവ മുന്നോട്ട് വെയ്ക്കുന്ന സാമൂഹിക ഇകഴ്ത്തലുകളുടെയും അടിച്ചമർത്തലിന്റെയും വ്യക്തിത്വനഷ്ടത്തിന്റെയും അനുഭവലോകങ്ങളും, അവയിൽനിന്ന് സ്വയം പ്രഖ്യാപിച്ച വ്യക്തിത്വത്തിലേക്കുള്ള വളർച്ചയും സമാനമാണ്. വ്യക്തിത്വനഷ്ടം സംഭവിക്കുന്ന ഏതു പരിതോവസ്ഥകളോടും ഈ കവിതകൾ സംവദിക്കുന്നുണ്ട്. അവയിൽ നിന്നുയിർത്തെഴുന്നേൽക്കാനുള്ള ആത്മവീര്യം പകരുന്നുണ്ട്. പ്രതിസന്ധികൾക്ക് നടുവിലും തുടരുന്ന മനുഷ്യജീവിതത്തിനൈരന്തര്യത്തെക്കുറിച്ച് ആവർത്തിച്ചോർമ്മിപ്പിക്കുന്നുമുണ്ട്. ലോകംമുഴുവൻ ചൂഷണത്തിന് വിധേയമാകുന്ന ജനവിഭാഗങ്ങൾക്കെല്ലാം ഒരേ മുഖവും ഒരേ മനസ്സും ഒരേ മനശാസ്ത്രവുമാണെന്ന് ഈ കവിതകൾ നമ്മെ ഓർമ്മിപ്പിക്കുന്നു. അവരുടെ ഉയിർത്തെഴുന്നേൽപ്പിനുള്ള വാഞ്ഛയും അങ്ങനെ തന്നെ.

പാർശ്വവത്കരിക്കപ്പെട്ടവരുടെ (marginalised) സാഹിത്യമെന്നും കീഴാള (subalterm) സാഹിത്യ

മെന്നുമൊക്കെ അറിയപ്പെടുന്ന സാഹിത്യശാഖയുടെ ഭാഗമാണ് ഇവയെക്കുറിച്ചുള്ള പഠനങ്ങൾ. അവ ഗണിക്കപ്പെടുന്നവരുടെ കോപതാപങ്ങൾ തിരിച്ചറിയുന്നതിനോടൊപ്പം, അവരുടെ ശാക്തീകരണത്തിനുള്ള മാർഗ്ഗങ്ങൾ അന്വേഷിക്കുകയും ചെയ്യുന്നതാണ് ഇവയുടെ പുതിയ പരിപ്രേക്ഷ്യം. ചൂഷണത്തിന് വിധേയരാകുന്ന സമൂഹങ്ങൾ പൂർവ്വാധികം ശക്തിയോടെ ഉയിർത്തെഴുന്നേൽക്കുകയും, അവരുടെ പഠനങ്ങൾക്ക് കൂടുതൽ ശ്രദ്ധകൈവരുകയും, പുതിയ ജ്ഞാനനിർമ്മിതികളുടെ പിൻബലത്തോടെ അവ ആവർത്തിച്ചു പഠിക്കപ്പെടുകയും ചെയ്യുന്ന ഈ കാലഘട്ടത്തിൽ, അതിജീവന വഴികളിൽ പിൽക്കാലത്തിനു മാതൃകയായി മാറിയ ജനസമൂഹങ്ങളുടെ താരതമ്യപഠനത്തിന് പ്രസക്തിയുണ്ടെന്ന് കരുതുന്നു.

കുറിപ്പുകൾ

1. Lilyan Kesteloot, Black Writers in French, p. 103.
2. Susan Frutkin, Aime Cesaire: Black between Worlds, Monograph in International affairs, p.22.
3. കെ. സച്ചിദാനന്ദൻ, ആഫ്രിക്കൻ കവിത, പുറം.44

ISSN 0975-8941
94 June-December 2019 (Vol. XII No. 1&2) Research Lines

Voice of the Silenced as Depicted in the Novels of Shashi Deshpande

Priyadarshini. S.
Assistant Professor, Department of English,
NSS Hindu College, Kerala

Received: 20th November 2019 Accepted: 26th December 2019

ABSTRACT

The novels of Shashi Deshpande play a significant role in making women's personal and social life meaningful. Empowerment of women are factors which decide whether a woman can participate in social activities or not. These factors not only allow her to participate in decision-making, but also play an important role in her social life. This shows that although empowerment is theoretically possible, it has only restricted significance. The discourses on woman are one from which women, imaginatively, economically and politically disembowelled, are effectively excluded. In post-colonial patriarchal culture, naming strategies have an over determined role, invested with an enticing double force and double meaning. The present study is an attempt to focus on the protagonist of Shashi Deshpande.

Key Words: Indian novels - Feminism - Empowerment - Survival - Patriarchal - Awakening

An empowered woman can realize her selfhood and play a significant role in making her personal and social life meaningful. Empowerment is not only related to her abilities, but to customs, traditions, and religious practices that either provide or restrict the space for her to bloom. They are the factors which decide whether a woman can participate in social activities or not. These factors not only allow her to participate in decision-making, but also play an important role in her social life. This shows that although empowerment is theoretically possible, it has only restricted significance. The discourses on woman are one from which women, imaginatively, economically and politically disembowelled, are effectively excluded. In post-colonial patriarchal culture, naming strategies have an over determined role, invested with an enticing double force and double meaning.

The awakening of consciousness among women are climaxed into a new wave called feminism began at the close of World War I. It led to a change in all aspects of women's life, especially regarding free thinking and creative pursuits. The long-denied power to name, to confer meaning, and thus to control material reality, are all the more powerfully practiced and gratifyingly exercised when finally acquired. The Indian women novelists, especially those who emerged after 1980, questioned the very concept of male hegemony by presenting before the public their overwhelming aspirations and sexual radicalism. These novelists gave primary significance to the portrayal of self in all its vulnerabilities and protested against the limitations of women's lives.

The force of Deshpande's denunciation of women's lives relates to the way she is able to universalise their condition, chiefly by drawing similarities between Saru, Indu, Jaya, Urmila and a variety of other female figures. When read from the perspective of the 'peripheral' figures in the novels of Shashi Deshpande, we are able to construct a varied reading of the novels, highlighting the survival strategies resorted to by these characters.

There are frequent shocks of recognition in the novels that create existential problems for educated women characters. There are moments in the novel where the irony is subtle, but so realistic that it will certainly produce a completely different reading of women characters facing survival problems. It is through these moments of recognition that one more interesting aspect of the patriarchal set-up is revealed: the perpetrators of the power structures within the family circle are most often women, and it is the relationship of one woman to another woman mediated through a man that re-inscribes the power of a woman over another woman. These are the women who have internalised patriarchy by making marriage a centre of exploitation.

The institution of marriage is sought after, as it offers the possibility of exerting power. The very structure of the dominant part of the Indian society which makes it possible at one stage for a woman to exert power over another woman, even while being the subject of subjugation herself, is something which prevents any attempt at universalising. Added to this, the differences between the classes are so great that the condition of women belonging to different classes cannot be universalised in spite of these moments of universal relevance.

In *That Long Silence*, the protagonist is able to be herself because she has been created with a proficiency to express herself — to write. Likewise, Saru in *The Dark Holds No Terrors*, knows about the intensity of the crime from which she suffered throughout her life. This given position of the writing –thinking-ennobled middle class woman allows the protagonists to think the way she thinks. However, the concluding sections of the novels seem to suggest that one cannot come out of this labyrinth during one's life time. The narration once more seems to be echoing the *chakravyuha* theory of Urmilla in *The Binding Vine*. It is as if the conflicts faced by Jaya and Saru are resolved in the form of some kind of uniqueness, which is perhaps possible only to somebody like them, with a superiority conferred upon them because of the ability to think and write.

To write, to have enough money to buy time, is opulence in Indian society, especially in a class which Shashi Deshpande seems to be representing through her novels. But Deshpande's protagonists are often aware of their reliance on the other class of women who, by offering their own services at a cheaper rate, make it possible for such inventiveness to exist. There are really no solutions being offered by the novels. The *chakravyuha*theory seems to be so embedded in the novel that there is no possibility for an easy solution.

The critical readings of her novels show that there is a monolithic concept which all of them are talking about: the Indian women frayed between tradition and modernity. She is the one who is in search of self-identity; she is the one who tries to shape her identity in a sexist society, she is a free thinker who is searching the means of survival to grapple with the male sex.

Saru's mother in the The Dark Holds no Terrors is a patriarchal mother, who exploits male power for survival. As it is true that the childhood moulds a person's individuality, Saru's defiance against her mother can be viewed from her childhood onwards. Her mother is pictured as a person who never understands her daughter and is always the first in blaming her. What might have made her mother do these strange things is a question to be pondered.

At first reading, the mother seems to be the only person responsible for the downfall of her daughter. But when we go deep into the novel the mother stands as a deep rooted symbol who visualizes her own image in Saru. The mother might have gone through a past which she detests, and Saru, being her daughter, is seeing her own self in her daughter.

Saru's mother can be seen as a person who hates girlhood, womanhood, there by hating her only

daughter to the core. She is wearing a mask of patriarchy and hiding her self behind the man-made mask. Saru does not give the impression that she is anti-mother, but while trying to sort out her relationship with her husband's split personality, she reconciles with her mother. Her mother had refused to see her daughter till she died, and this created in Saru a feeling that it was because of her mother's curse that she was having an unhappy married life. The mother is seen as a dominating person, controlling the whole household activities — a dictator who has her own view points regarding each and every aspect of life. As nothing is known regarding her mother's childhood, we cannot blame her for Saru's misery.

Sarita's survival instincts are triggered when she becomes a rape victim in the hands of her own husband. Manu's sadistic attack on her body and soul terrorizes her, and she kills herself. Here Shashi Deshpande reveals the brutality of male dominance in thwarting the victim's will-power. Her home becomes a place of terror, and that becomes unbearable for her.

Saru faces adjustment problems throughout her life. He terms these as the primary adjustment and secondary adjustment. These adjustments are responsible for all sorts of mental traumas in the life of a girl child. Primary adjustment means adjusting with the family and secondary adjustment is related to the society. Saru is a helpless, mal-adjusted victim, and is always in a state of flight from reality.

In the novels of Shashi Deshpande, the female protagonists point out the mad reality of all family relationships, the farcical nature of all marriages and the illusory quality of all human relationships. These unhappy, unsatisfied women occupy the centre stage in Desai's and Deshpande's fiction. They prove to be a more attractive, more rich and finely tuned beings than all the doers and achievers one has come across so far. Through characters like, Sita, Sarita and Jaya, the novelists pleads for better role models and support structures for women, especially women who are facing survival threats from both family and society. Here all the protagonists take escapism and loneliness as the only ways to survive. The difficulties of bridging the gap between aspiration and reality, of juggling domesticity, love, children, career and emotional fulfilment, leave women exhausted, often on the verge of mental crisis. The existence of such a malaise in India and outside world points out the tension involved in contemporary living.

For Deshpande's protagonists, the way to self-discovery and strength is not a series of events in a sequential movement in time. She uses both first and third person narrative for the recapitulation that builds the novel. Memories that break the sequence of time float in effortlessly by association of ideas, which carry significations brought out by meaningful juxtapositions. To be true to herself, woman has to excoriate the film of superimposed attitudes and role. Her emancipation is not in repudiating the claims of her family, but in drawing upon untapped inner reserves of strength.

Sweeping changes in the status of women may still be a faraway dream for the feminine aspirants of freedom, yet it cannot be denied that they form a large majority of human society. The protagonists of the discussed novels inspire women to fight silence and express themselves by creating a mark of their own. They are not simply malcontented or rebellious women who consider the male gender the sole cause of all their ills. The new women emerging from the cocoon of trials flash their beautiful wings, and are ready to take on the world of reality. The gradual transformation of their individuality seeks new dimensions, exploring the vicissitudes of life. They exhibit their inner strength and reserve, thereby proving to the world at large that they can silently challenge the suzerainty of man, and still emerge victorious. The stories of Saru, Jaya, Urmila, Kalpana and so on, show their enormous resilience and optimism. They prove themselves to be as resilient and resourceful as mother earth supporting, strengthening and enduring everyone around them. Woman becomes the progenitor and sustainer of the human species: the guardian of culture and the advocate of tolerance and acceptance.

References

1. Atrey, Mukta. and Kirpal, Viney, (1992). eds. *The Girl Child in Twentieth Century Indian Literature*. New Delhi: Sterling Publishers, Print.
2. Baig, Tara Ali. (1976). *India's Women Power.* New Delhi: S Chand & Co, Print.
3. Bande, Usha. (2006). *Writing Resistance: A Comparative Study of the Selected Novels by Women Writers*. New Delhi: Pearl Offset Press Pvt Ltd, Print.
4. Bhatnagar, M.K. (1998). "Indian English Literature – Perspective." *Indian Writings in English.*ed. Manmohan K. Bhatnagar. Vol.3. New Delhi: Atlantic, Print.
5. Deshpande, Shashi. (1990). *The Dark Holds No Terrors*. New Delhi: Penguin Books, Print.
6. Deshpande, Shashi. (1992). *Roots and Shadows*. New Delhi: Disha Books, Print.
7. Deshpande, Shashi. (1989). *That Long Silence*. New Delhi: Penguin Books, Print.
8. Deshpande, Shashi. (1993). *The Binding Vine*. New Delhi: Penguin Books, Print.

ISSN 0975-8941

Call For Papers

Next Issue	:	Research Lines Vol.13 No:1 June 2020
Last date for submission of Research Papers	:	May 10, 2020
Address for Communication	:	**Dr. Priya Joseph** Chief Editor Research Lines Deva Matha College, Kuravilangad Kottayam Dist, Kerala-686 633 e.mail: drpriyajoe@gmail.com Mobile: 9446889751

ISSN 0975-8941

Information for Contributors

1. Original Research papers for publication should be submitted in duplicate in hard copy along with soft copy in CD, typed in Page Maker/ MS Word
2. Use single Colum layout with both left and right margins justified.
3. All mathematical/ scientific symbol may be typed and named in margin of paper to avoid ambiguities.
4. Font: Main body -12 point, Times New Roman or the closest comparable font available.
5. Tables& figures to the extent possible should appear in the document near/after where they are referred in the text.
6. The first page of the research paper should contain the following information:

   i)the title (ii)the name(s) and address(es) of the authors, (iii)official and residential phone/email address of the authors (iv) an abstract of not more than 50 words.
7. The paper should start with an introduction and end with a conclusion summarizing the findings of the paper.
8. The length of the paper should be limited to a maximum of 8 pages.
9. Contributor's assurance that the paper has not been sent elsewhere for publication.
10. The editor/publisher will not have any responsibility for the errors in the results/ claims. The author should have full responsibility with regard to the authenticity of the statements and claims in the paper.
11. The journal is published bi-annually in June and December every year.
12. Papers for publication should be sent by registered post to –

Dr. Priya Joseph
Chief Editor
Research Lines
Deva Matha College
Kuravilangad, Kerala, Pin – 686 633

ISSN 0975-8941

DECLARATION

Form 1 (See Rule – 3)

STATEMENT ABOUT OWNERSHIP AND OTHER PARTICULARS OF THE JOURNAL

1. Title of the Newspaper	:	Research Lines
2. Language in which it is published	:	English, Malayalam& Hindi
3. Place of Publication	:	Deva Matha College, Kuravilangad Kottayam District
4. Periodicity of the Publication	:	Half yearly
5. Retail Selling price of the Journal	:	Rs. 1000/- Annual subscription
6. Printer and Publisher Name	:	Dr. Jojo K Joseph
7. Whether citizen of India?	:	Yes
8. Address of Publishers	:	Principal Deva Matha College, Kuravilangad Kottayam District
9. Chief Editor	:	Dr. Priya Joseph Department of Zoology Deva Matha College, Kuravilangad
10.Name and address of individuals Who own the Newspaper and Share holders holding more than one percent of the total Capital	:	Deva Matha College Kuravilangad Kottayam District

I Dr. Jojo K Joseph, hereby declare that the particulars given above are true.

(Sd)
Dr. Jojo K Joseph

Kuravilangad
16.12.2019

Volume XII No.1&2 June-December 2019 ISSN 0975-8941

Published by Dr. Jojo K. Joseph, Principal, Deva Matha College, Kuravilangad
Printed at Goodshepherd Press, Ktm., # 2569180