Holistic Thought



Multidisciplinary Annual Research Journal (peer reviewed) of Sree Narayana College, Kollam



Sree Narayana College, Kollam

Affiliated to University of Kerala NAAC 'A' Grade, ARIIA All India Rank II Estd. 1948



Holistic Thought

Multidisciplinary Annual Research Journal (peer reviewed) of Sree Narayana College, Kollam

Volume XXI No.1 2022-2023



Sree Narayana College, Kollam

(Affiliated to University of Kerala) NAAC 'A' Grade, ARIIA All India Rank II snckollam.ac.in Estd. 1948

Holistic Thought

Multidisciplinary Annual Research Journal (peer reviewed) of Sree Narayana College, Kollam

Volume XXI No.1 2022-2023

Printed and Published by

Prof. (Dr.) Nisha J. Tharayil, Principal *on behalf of* Sree Narayana College, Kollam South India, Kerala, Pin Code: 691 001 Phone: 0474 2741793

Associate Editor: Dr. P. Nikhil Chandra

For publication details visit https://snckollam.ac.in/holistic-thought/

Send your articles to: editorholisticthought@snckollam.ac.in



Aim and Scope

H olistic Thought, a multi-disciplinary annual journal, publishers problem oriented, empirically-grounded analytical research papers, theoretical and philosophical essays, policy discussions in the field of both natural and social sciences, in as technical language as possible. Original articles will be published either as papers or reviews after review process. The journal also publishers essay in the field humanities and the languages. Holistic Thought fosters crossdisciplinary approach in research, seeks eminent scholars, serious researchers as well as innovative young writers as its contributors.

Holistic Thought

Multidisciplinary Annual Research Journal (peer reviewed) of Sree Narayana College, Kollam

Chief Editor - Prof. (Dr.) Nisha J. Tharayil,

(Principal & Research Guide, Sree Narayana College, Kollam)

Associate Editor - Dr. P. Nikhil Chandra

(Asst. Prof. of Chemistry, Sree Narayana College, Kollam)

Advisory Panel

Dr. S. K. Prathap, Former HoD, Department of English, Sree Narayana College, Kollam Prof. (Dr.) V. L. Pushpa, Former HoD, Department of Chemistry, Sree Narayana College, Kollam Prof. (Dr.) A. P. Thomas, Director, ACESSD, M.G. University, Kottayam Prof. (Dr.) T. S. Anirudhan, Former Director, Department of Chemistry, University of Kerala, Trivandrum Prof. (Dr.) Suresh R., Professor, Department of Political Science, University of Kerala, Trivandrum Prof. (Dr.) M. R. Biju, Professor, Department of Public Administration and Policy Studies, Central University of Kerala, Kasaragod Prof. (Dr.) B. Vivekanandan, Former Chairman, CAWES, School of International Studies, J.N. University, New Delhi Dr. Jubi John, Senior Scientist, CSTD, CSIR-NIIST, Trivandrum Dr. Anoop Krishnan, Senior Scientist, NCESS, Akkulam, Trivandrum Dr. T. P. D. Rajan, Senior Principal Scientist, MSTD, CSIR-NIIST, Trivandrum Prof. (Dr.) Anithakumary T, Sahitya Faculty, Malayalam University, Tirur Dr. K. Meera, Former HoD, Department of Hindi, SreeNarayana College, Kollam

Editorial Board

Dr. S. V. Manoj (Department of Chemistry, SreeNarayana College, Kollam)

Prof. (Dr.) B. Hari (Department of Zoology, SreeNarayana College, Kollam)

Dr. K. Savitha (Department of History, SreeNarayana College, Kollam)

Prof. (Dr.) B. T. Sulekha (Department of Zoology, SreeNarayana College, Kollam)
Dr. Laiju S. (Department of Psycology, SreeNarayana College, Kollam)
Dr. S. Sankar (Department of Physics, SreeNarayana College, Kollam)

Reviewers panel

Dr. Sreeja Mole S. & Dr. Rahi T. B. (Economics) Dr. Indu R. & Dr. Harilekshmi (English) Dr. N. Shaji & Dr. Mahesh S. (Hindi) Dr. Rajitha T. & Dr. Aranya K. Sasi (History) Dr. M. S. Suchithra & Dr. S. Jayan (Malayalam) Dr. Soumya R. V. & Dr. Laiju S. (Philosophy) Dr. Archa Arun & Dr. Preetha G. S. (Politics) Dr. Sreejaprivadersini S. & Dr. Bera R. Uday (Sanskrit) Dr. Vinod B. S. & Smt. Greeshma Pallath (Biochemistry and Biotechnology) Dr. Nisha A. P. & Dr. Latha S. (Botany) Dr. Hari B. & Dr. S. Sheeba (Zoology) Dr. M. S. Roxy & Dr. Parvathy S. Biju (Physics) Dr. Remadevi B. & Dr. Rijith S. (Chemistry) Dr. Akhila R. & Ms. Kuleena Das (Mathematics) Dr. A. Rajasekharan & Dr. Anuji S. (Commerce)

Editor's Message

Dear Readers,

T olistic Thought is a non-profitable peer reviewed multidisciplinary research journal published yearly by Sree Narayana College, Kollam and is devoted to all aspects of findings and research associated with multidisciplinary concept which covers areas of science, language, literature, art, history and culture. It gives us immense pleasure to publish the Volume 21 Issue 1 of Multidisciplinary Journal of Holistic Thought. In this current publication, papers are published within the areas of Science, Social Science, Literature, Computer Science and Arts. The Journal provides a serious forum for publishing original contributions and comprehensive technical review articles of interdisciplinary and original research in different areas. We are trying our best to enhance the quality of papers by reducing its turnaround time with fair reviews and lucid editorial process. We wish to take the journal in a direction where it encompasses all the emerging areas, reflecting the research oriented approach, which is an essential link between academic as well as social research. Our main objective will be to strengthen the boundaries of the journal, to strengthen the reviewer database, and to motivate potential authors to contribute to the journal. Once again, congrats to all the contributors of the journal and we expect future collaboration with all of you and we believe that your contributions will enlighten the society in a positive mode. We would also delighted to welcome both theoretical and empirical contributions from the academic community in the next volume of Holistic Thought on science, arts, social science, literature and any other relevant disciplines, based upon original ideas and research.

Prof. (Dr.) Nisha J. Tharayil (Chief Editor) Dr.P.Nikhil Chandra (Associate Editor)

Contents

01	Synthesis and Characterization of Metal Nanoparticles Using Coleus Vettiveroides Leaf Extract
	Ambily Chandran
02	A Study on Antioxidant and AnticancerActivity of Syzygium Travencoricum (Gamble) Leaf Extract
	Greeshma P
03	Indoor Gardening for Aesthetic Beauty and Home Decoration
	Archana P. J
04	Consumer perception and buying Behaviour towards green marketing products
	Aarcha S. S
05	Antimicrobial activity and molecular characterization of probiotic strain, Bacillus thuringiensis K112 sourced from microbial technology lab depository
	Athira T. S
06	Women Empowerment in the Fishing Industry: Bringing Attention to an Often-Overlooked Community
	Misha V61
07	Biodegradation of Phenol by Bacterial Strain Isolated From Soil
	Sija S. L
08	Contrasive Analysis of the Philosophical Perfections of Sri Narayana Guru and Sri Chattambi Swamikal
	Anjaly B
09	നദികൾ പ്രകൃതിയുടെ ജീവനാഡി
	പി. നിഖിൽ ചന്ദ്ര103
10	പ്രസന്നരാജൻ – സഹൃദയനായ നിരൂപകൻ
	എം. എസ്. ബിജു109

11	ICDS Software
	Lekshmi Surya S. L 115
12	A study on Quality of Tourism Services among selected Responsible Tourism destinations in Kerala
	Parvathy Mohan 124
13	Secularism In India: Challenges And Responses
	Preetha G. S
14	GRAPHENE - "THE WONDER MATERIAL"
	Aromal R. S
15	Production of Indole Alkaloids in Adventitious Root Cultures of <i>Rauvolfia Hookeri</i> S. R. Sriniv & Chithra, A Rare and Endemic Medicinal Plant
	Reshmi S 164
16	विश्वमानविकता का सन्देशः श्रीनारायण गुरुदेव की कविताएँ
	महेष. एस172
17	നവമാധ്യമങ്ങളിലെ സ്ത്രീസ്വത്വനിർമ്മിതി
	സ്മിതാ പ്രകാശ്186

Synthesis and Characterization of Metal Nanoparticles Using Coleus Vettiveroides Leaf Extract

Ambily Chandran^a, I.G. Rathish^b, Saritha S.J.^c, Lija P. Lekshmanan^c, Lekshmi S. Dharan^c & Samnabeegum^d

^a Department of Chemistry, Sree Narayana College, Chengannur
 ^b Inter University Centre for IPR Studies, CUSAT, Cochin, Kerala.
 ^c Department of Chemistry, Sree Narayana College, Sivagiri, Varkala, Kerala
 ^d Department of Chemistry, Sree Narayana College, Sivagiri, Varkala, Kerala
 e-mail: ambilychandran23@gmail.com

Abstract

Green synthesis of metal nanoparticles using plant extracts has become an emerging field in nanotechnology due to its eco-friendly nature. In this study, zinc oxide nanoparticles were synthesized using Coleus vettiveroides leaf extract. The synthesized nanoparticles were characterized by X-ray analysis, diffraction Ultraviolet-Visible spectroscopy and Fourier Transform Infrared Spectroscopy (FT-IR). XRD results revealed the formation of hexagonal wurtzite structure. UV-Visible spectrum showed a distinct, characteristic peak at 362nm, specific for ZnO NPs. Chemical bond formation of Zinc oxide were confirmed by FT-IR analysis. The spectral analysis confirmed purity for the synthesized nanoparticles. . In this research article an attempt has been done to explore present and future prospects of synthesis of metal nanoparticles involving green nanotechnology using plant extracts.

Keywords: Green Synthesis, Coleus species, Nanoparticles

Introduction

Metal oxide nanoparticles has environmental applications as it can act as catalyst which is helpful in reduction or elimination of toxic hazardous chemicals from environment. The metallic nanoparticles have many significant roles and they are considered as most promising as they possess remarkable anti-microbial, cell-line studies and dye degradation properties due to their large surface area to volume ratio [1]. Some of the metal oxide nanoparticles like, Fe3O4, TiO2, CuO, and ZnO are thoroughly been investigated for their various biological activity. Among those metal oxide nanoparticles, zinc oxide nanoparticles are known to be one of the most multifunctional inorganic nanoparticle. Because they are less expensive to produce, safe and can be prepare easily. Some plant components such as roots, leaves, stem, seeds, and fruits, have also been used for zinc oxide nanoparticle synthesis, as plant extracts rich in phytochemicals, which act as reducing and stabilization agents. In this regard, the green synthesis of Zno nanoparticles was achieved by using the leaves extract of "Coleus Vettiveroides" also called "karuver "or"iribeli". To the best of our knowledge, the use of leaf extract of Coleus Vettiveroides plant for green synthesis of Zno nanoparticles has not been revealed. Hence the present task was carried out to synthesis and characterization of Zno nanoparticles using leaves of Coleus Vettiveroides. It belongs to Lamiacece family, is one such species which has so far not been reported in wild habitats, but exist only under cultivation [2, 3].

Methodology

Synthesis of zinc oxide nanoparticles

The plant extract is used for the synthesis of zinc oxide nanoparticles. About 12.5 ml of 0.1 M zinc nitrate solution was mixed with 100 ml aqueous leaf extract of Coleus vettiveroides. To this add 5 ml of double distilled water. For constant stirring, this solution was placed in a magnetic stirrer for 2 hours. After the complete dissolution of mixture, it was concentrated to pasty mass by boiling. The pasty mass is dried at 200°C for 6-8 hours by an oven. Then we get pale yellow solid powder which indicate the formation of ZnO nanoparticle.

Results and discussion

XRD analysis



Figure 1 XRD spectrum of ZnO nanoparticles

The peak position with 20 values of 31.81, 33.52, 36.42, 47.57, 55.55, 62.90 and 69.22 degree. It is noted that highest peak is at 36.28 degree. The values corresponds to pure zinc oxide nano and were assigned to (100), (002), (101), (102), (110), (103), and (112) planes respectively. These values are matching with the standard Joint Committee on Powder Diffraction Standards JCPDS card number 36-1451 indicating that the zinc oxide particles have crystalline structure and they are in the hexagonal wurtzite form [4].Presence of well-defined and sharp peak indicates crystalline structure. The XRD patterns of the nanoparticles are considerably broadened due to the very small size of these particles.

UV-Visible Spectrum



Figure 2:UV-Visible spectrum of ZnO nanoparticles

The ultraviolet regions falls in the region between 190-380nm. The spectrum showed a distinct, characteristic peak at 362nm, specific for ZnO NPs. The absorption band at 362nm was attributed to the excitation of valence electrons of ZnO arranged in the nanoparticles. This implies that the nanoparticles absorb light in the ultra-violet region. The characteristic absorption peak at 362 nm indicates the successful biosynthesis of ZnO NPs.

FT-IR Analysis



Figure 2:FT-IR spectrum of ZnO nanoparticles

Metal oxide generally gives absorption bands in fingerprint region that is below 1000 cm⁻¹ arising from inter atomic vibrations. The observed main peak at 760 cm⁻¹ corresponds to the Zn-O stretching vibration [5]. The other peaks present is due to the presence of phytochemical components, present in leaf extract, on ZnO nanoparticles.

Conclusions

The present study reports a simple, cost-effective and environment friendly synthesis of ZnO NPs using Coleus vettiveroides leaf extract and zinc nitrate hexahydrate. Various characterization techniques such as UV-Visible, FT-IR and X-ray diffraction analysis confirmed the formation of ZnO nanoparticles. ZnO nanoparticles and Phytoconstituents present in the plant extract may also contribute to the antimicrobial activity. The plant-based nanoparticle can have huge application in the field of food, pharmaceutical, and cosmetic industries and thus become a major area of research.

References

- 1. Chandrasekaran, R., Gnanasekar,S., Seetharaman,P., Keppanan, R., Arockiaswamy, W., &Sivaperumal, S.(2016) Formulation of carica papaya latex-functionalized Silver nanoparticles for its improved antibacterial and anti- cancer applications, J. Mol Liq. 219, 232-238.
- Thuesombet, P., Hannongbua, S., Akasit, S.,& Chadchawan, S. (2014) Ecotoxicology and environmental safety effect of silver nanoparticles on rice (Oryza sativa L. CV. KDML 105) seed germination and seedling growth. Ecotoxicology and Environmental safety, 104, 302-309.
- 3. Duan X. F., Huang, Y., Cui, Y., Wang, J. F., &Lieber, C. M. (2001) Indium phosphide nanowires as building blocks for nanoscale electronic and optoelectronic devices. Nature, 409, 66–69.
- Alim,K.A., Fonoberov, V. A., Shamsa, M.,&Balandin, A. A., (2005) J. Appl. Phys, 97, 124313.
- Hernández, A., Maya, L., Sánchez-Mora, E., & Sánchez, E. M. (2007) "Sol-Gel Synthesis, Characterization and Photocatalytic Activity of Mixed Oxide ZnO-Fe2O3," Journal of Sol-Gel Science and Technology, 42(1), 71-78.

A Study on Antioxidant and Anticancer Activity of Syzygium Travencoricum (Gamble) Leaf Extract

02

Greeshma P.*, Raji Devarajan

* Department of Biotechnology, Sree Narayana College, Kollam *e-mail: greeshmapallath@gmail.com*

Abstract

This study was carried out to evaluate the antioxidant, anticancerous efficiency and phenol content of Syzygium travencoricum by using various methods. Antioxidant property was analyesd on three ways such as DPPH assay, reducing power assay and total antioxidant capacity. DPPH analysis was investigated against ascorbic acid as positive control and absorbance was measured at 517 nm and study was based on IC50 values,(12.59µg/ml in standard and 265.07µg/ml in tested extract). 97.19 % of inhibition was shown in 100 concentration(µg/ml) of standard and 82.19 % of inhibition was shown in 1000 concentration(µg/ml) of tested extract. In reducing power assay absorbance of the standard is 8.94µg/ml and of extract is 142.87µg/ml. total antioxidant capacity is 410.88 mg/GAE/g. Anticancerous analysis was carriedout in MDA MB 231 breast cancer cell lines using MTT assay. Cytotoxic effect of ethyl acetate extract was estimated after 24 hrs incubation and found 97.43 % of inhibition in 1000 µg/ml concentration of plant extract. Ethyl acetate extract contains 0.097g/5ml of the phenol content was found by folin ciocalteau method.

Key words: Syzygium travencoricum, Antioxidant activity, Anticancer analysis, DPPH

Introduction

For a long period of time, plants have been a valuable source of natural products for maintaining human health, especially in the last decades. Natural products and their derivatives have historically been exploited as a valuable source of novel therapeutic agent. Natural plant products mainly based on the traditional herbal systems are being used in the pharmaceutical industry and primary health care systems in developing countries. Now a days, the use of phytochemicals for pharmaceutical purpose has gradually increased in many countries..(Norman J et al, 2000)

Plant derived compounds have tremendeous value in various fields, especially for maintaining good and proper health by irradicating dreadful disease that plunderedhuman life. Cancer is one of the deadly disease that engulfs the line of humans. So many synthetic drugs are used for curing this disease. But it has more negative effects on the body of patient. But in rural areas, plant products be used for curing this kind of disorders, So on the light of these various plant derived source be used as anticancerous agents. The major reason is that for overcoming the side effects of synthetic drugs.

Reactive oxygen species are widely believed to be involved in the etiology of many diseases as indicated by the signs of oxidative stress seen in those diseases. Conversely, antioxidants are believed to be protective. (Norman J et al, 2000)

Scientist focuses to search plant derived compounds for diminishing the activity of various substances that make harm to humans. So various kinds of studies are organized in medicinal plants. Syzygium species are used in these kinds of studies. *Syzygium travencoricum* is one of the species having various useful medicinal properties. Although a very few anti microbial studies are reported in this plant and no information available about anticancer and antioxidant studies till date. Hence focus this plant for study.

Materials and Methods

Collection of Source Plant

The leaves of the plant *Syzygium travancoricum* were collected from the surroundings of Sree Narayana College, kollam and was authenticated by Dr M S Kiranraj, Assistant professor of Botany, Sree Narayana College,

Kollam. The collected leaf samples were transferred to laboratory and taxonomic position was identified. The leaves were washed with freshwater to remove dirt and dust. The samples were rinsed with sterile distilled water and shade dried for a period of 25 days, cut in to small pieces and powdered in a mixer grinder.

Preparation of Plant Extract:-

30g of ground powder of plant sample were weighed and extracted by Soxhlet apparatus using 450ml of solvent such as ethyl acetate. The solution of leaf extract was then subjected to rotatory evaporator and reduced to $1/8^{\text{th}}$ volume. The solution obtained was stored at 4<.C

1. DPPH (1–1-diphenyl–2–picryl hydrazine) Free Radical Scavenging Assay

Quantitative measurement of radical scavenging property of acetone extract wascarried out according to the method of Mensor *et al.*, (2001). A methanolic solution of 1 mL of DPPH (0.1 mM) was added to 1 mL of different concentration (50-1000 μ g/mL) of the extract and allowed to react at room temperature for 30 min in the dark. Absorbance was measured at 517 nm. Methanol served as the blank, DPPH in methanol without the extract served as the control and ascorbic acid was taken as thereference standard. Lower absorbance of the reaction mixture indicated higher free radical scavenging activity. The capacity to scavenge the DPPH radical was calculated using the following equation :-

(Abs.control – Abs.sample) % radical scavenging activity = ----- x 100 Æbs.control

A graph was plotted with percentage of inhibition against concentration. The IC_{50} values (concentration of sample required to scavenge 50% of free radicals) were calculated from the regression equation of the graph. Smaller the IC_{50} higher will be the antioxidant activity of the extract.

2. Reducing Power Assay

Reducing power assay was evaluated according to the procedure of Gow-Chin and Pin-Deer (1994). Various concentrations of extract (500 μ L) were mixed with 1.5 mL of 0.2 M sodium phosphate buffer (pH 6.6) and 1.5 mL of 1% potassium ferricyanide. The mixture was incubated at 50°C for 20 min followed by addition of 5 mL of 10% trichloroacetic acid which was then centrifuged at 6000 rpm for 5 min at 4°C. The upper layer of the solution (1.5 mL) was mixed with 1.5 mL of distilled water and 300 μ L of ferric chloride (0.1%) and absorbance was read at 700 nm. Ascorbic acid was used as standard. Increased absorbance of the reaction mixture indicated increased reducing power. Concentration at 0.5 absorbance was marked as the reference to know the scavenging potential of each extract (Uddin*et al.*, 2014).

3. Total Antioxidant Capacity (TAC)

The total antioxidant capacity of different extracts was evaluated by phosphomolybdic acid method (Prieto *et al.*, 1999). To 0.1 mL of the extract (Con.100µg) 1 mL reagent mixture containing 0.6M sulphuric acid, 28 mM sodium phosphate and 4mM ammonium molybdate were added. The tubes were covered and kept for incubation in a water bath at 95°C for 90 min. After cooling to roomtemperature, the absorbance was measured at 695 nm against blank. Gallic acid was used as the standard and the total antioxidant capacity was calculated using from the equation $T = C \times (V/M)$ where, T is the total antioxidant content (mg/g) of theextracts, C is the concentration of Gallic acid (mg/mL) obtained from the calibration graph, V is the volume of the extract taken (mL) and M is the weight of the extract(g). TAC is expressed as milligram Gallic acid equivalents (mg GAE)/g of extract.

Estimation of Total Phenolic Content:-

Total phenolic estimation can be carried out with the Folin ciocalteau reagent. The leaf extract was poured into a dried petriplate and allowed to evaporate. The residue obtained was taken using sterile spatula. 5mg of the residue was weighed and dissolved in 5ml of ethyl acetate solution. Different aliquots of 0.2 to 1ml of sample were pipetted out into series of test tubes. Volume of each tube was made up to 3ml with distilled water. 0.5ml of Folin ciocalteau reagent was added into each test tubes. After 3 minutes 2ml of 20% Na2C03 was added to each tube and mixed thoroughly. Tubes were placed in a boiling water bath for exactly one minute, cooled and measured using spectrophotomertrically at 650 nm. A standard curve was prepared using different concentration of Catechol. From the graph total phenolic content could be calculated.

Determination of Anticanceractivity:-

1. Cell Line: MDA MB 231

Human breast cancer cell line MDAMB 231 was obtained from American type culture collection(ATCC) and maintained in DMEM (Dulbecco's Modified Eagle's Medium; Sigma Aldrich) supplemented with 1% penicillin/streptomycin and 10% Fetal Bovine Serum(FBS,Gibco). Cells were maintained in humidified incubator at 370c supplied with 5% carbon di oxide. Cells were routinely maintained in 75 cm2 and 25 cm2 tissue culture flasks (Greiner) and harvested using 0.25% trypsin (Sigma Aldrich) treatment for side population analysis.

MDA MB 231:

Morphology - epithelial like Species - human, Caucasian female 51 yrs old Tissue source - pleural effusion Tumor type - adeno carcinoma Cell type classification- mesenchymal



MDA MB 231 Cells

MTT Assay:

The MTT (3-[4,5-dimethylthiazol-2-yl]-2,5 diphenyl tetrazolium bromide) assay is based on the conversion of MTT into formazan crystals by living cells, which determines mitochondrial activity. Since for most cell populations the total mitochondrial activity is related to the number of viable cells, this assay is broadly used to measure the in vitro cytotoxic effects of drugs on cell lines or primary patient cells.

Result and Discussion

All over the world, as antioxidant therapy is gaining importance in the treatment of several metabolic diseases (diabetes mellitus, arthritis, cancer, aging, liver disorder, etc.), several scientific developmental programs have started with an aim at investigating medicinal properties of plants for their potential antioxidant properties.(Auddy B et al, Shrestha S et al). In our study, we have analysed anti oxidant and anti cancer activity of ethyl acetate extract of Syzygium travancoricum leaves. To test the antioxidant activity, we have analysed radical scavenging assay(DPPH), Reducing power assay, and total antioxidant capacity of the ethyl acetate leaf extract.

Radical scavenging assay: DPPH radicals are widely used as antiradicals to investigate the scavenging activities of several natural compounds and plant materials. To evaluate the scavenging effect of the extract, in this study, DPPH reduction was investigated against positive control ascorbic acid. (Koleva et al. 2002; Suresh et al. 2008). The DPPH contains and odd electron which gives a strong absorption maximum at 517 nm (Sarla et al. 2011). The purple color of DPPH turns into yellow when the odd electron of DPPH radical becomes paired with hydrogen from scavenging antioxidant to form a reduced DPPH-H. The more antioxidants occurred in the extract, the more DPPH reduction occurs. Radical scavenging assay provides an overall antioxidant property of the plant sample. Here , in our study based on the IC50 values, our extract shows an antioxidant activity in an average amount.

1. **DPPH Analysis**

Sample	Concentration (µg/mL)	% Inhibition
	10	47.25
	25	57.2
Standard (Ascorbic Acid)	50	71.23
	75	92.7
	100	97.19

Table 1: Radical Scavenging activity of Standard (Ascorbic Acid)

Concentration (µg/mL)	Average O.D	% Inhibition
50	0.588	11.98
100	0.475	28.89
250	0.369	44.76
500	0.237	64.52
1000	0.119	82.19

Table 2: Radical Scavenging activity of tested extract



IC₅₀ value of Standard is 12.59 µg/mL

Graph of tested extract



 IC_{50} value of the tested extract is $~265.07~\mu g/mL$

2. Reducing Power Assay

Inactivation of oxidants by reductants can be described as redox reactions in which one reaction species is reduced at the expense of the oxidation of the other. The presence of reductants such as antioxidant substances in the antioxidant samples causes the reduction of the Fe3+/ ferricyanide complex to the ferrous form.

Therefore, Fe $^{2+}$ can be monitored by measuring the formation of Perl's Prussian blue at 700nm (Chung et al. 2002). The reducing capacity of a compound may serve as a significant indicator of its potential antioxidant activity. Reducing power increases according to the increase in absorbance. (Jayaprakasha et al. 2001) Concentration at 0.5 absorbance was marked as the reference to know the scavenging potential of each extract (Uddin*et al.*, 2014). Here our plant sample gives an increasing value for reducing power assay which shows it has significant antioxidant activity. The other members of Myrtaceae family shows significant antioxidant antioxidant properties and like that our plant, Syzygium travancoricum also shows antioxidant activity.

Concentration of Ascorbic acid (µg/mL)	Average O.D	Concentration of extract (µg/mL)	Average O.D
10	0.48	50	0.294
25	1.43	100	0.376
50	1.75	250	0.649
75	1.95	500	1.231
100	2.27	1000	1.635

Table 3: Reducing power activity of the standard Ascorbic Acid

Concentration @ 0.5 Absorbance for standard = $8.94 \mu g/mL$

Concentration @ 0.5 Absorbance for extract = $142.87 \mu g/mL$

Graph of standard (Ascorbic Acid)



Graph of tested extract



3. Total Antioxidant Capacity

This assay also shows total antioxidant capacity of the plant. Gallic acid was used as the standard and the total antioxidant capacity was calculated using from the equation $T = C \times (V/M)$ where, T is the total antioxidant content (mg/g) of the extracts, C is the concentration of Gallic acid (mg/mL) obtained from the calibration graph, V is the volume of the extract taken (mL) and M is the weight of the extract (g). In our study, the ethyl acetate extract of plant sample shows significant antioxidant capacity.



Graph: Total Antioxidant Capacity of the standard Gallic Acid

Table 4 :Gallic acid standard for total antioxidant capacity

Concentration(mg/mL)	Absorbance @ 695nm
0.02	0.578
0.04	0.726
0.06	0.822
0.08	0.893
0.1	0.964

Concentration tested 100 µg/ 100µL

O.D value obtained: 2.444

Total Antioxidant Capacity= 410.88 mg GAE/Determination of total phenolic content:-

Total phenolic content of ethyl extracts were estimated by Folin Ciocalteu's method using catechol as standard. The reagent is formed from a mixture of phosphotungstic acid and phosphomolybdic acid which after oxidation of the phenols, is reduced to a mixture of blue oxides of tungsten and molybdenum. The blue coloration producedhas a maximum absorption in the region of 650 nm and a straight line graph was obtained and comparing it with standard and phenol content was estimated using the equation;

Phenolic concentration in mg/ml of extract = concentration of sample \times total volume of distilled water added to the residue/aliquots taken \div amount of sample

SI NO	Aliquotes taken in ml	O D at 650 nm
1	0.2	0.010
2	0.4	0.030
3	0.6	0.046
4	0.8	0.062
5	1	0.077

Table 4: phenolic estimation of leaf extract

Graph: phenolic estimation of leaf extract



From the graph the amount of phenol present was calculated and is 0.097mg per 5ml

Anticancer Analysis:

To test the anticancer properties of ethyl acetate extract of *Syzygium travancoricum* leaves, we conducted MTT assay using MDA MB 231 breast cancer celllines (breast invasive cell lines). The results of the cytotoxicity evaluation exposure time 24 h are summarized in Table 5. Growth inhibition was calculated as treated/control \times 100 (%T/C). Cytotoxicity curves (Figure 2) were obtained by plotting percentage of

viability against different concentrations of the extract.



Figure 2:Cytotoxiceffect of different concentration of ethyl acetate plant extract (after 24 hrs incubation) on MDA MB231 Cells (Breast invasive cells).

Table 5: Cytotoxic effect of Ethyl	AcetatePlant Extract on MDA ME
231(BreastInvasive cells)	after 24 hrs incubation

Sl. No	Concentration (µg/ml)	Dilutions	Absorbance (O.D)	Cell Viability (%) (Test OD/ Control OD)×100	% of Inhibition [(Control OD – Test OD)/ Control OD]×100
1	1000	Neat	0.01	2.56	97.43
2	500	1:1	0.05	12.8	87.17
3	250	1:2	0.11	28.2	71.79
4	125	1:4	0.16	41.02	58.97
5	62.5	1:8	0.22	56.41	43.58
6	31.2	1:16	0.25	64.10	35.89
7	15.6	1:32	0.31	79.48	20.51
8	Control	-	0.39	100	0



Graph:

The results shows that, like other members of Myrtaceae family the plant Syzygium travancoricum exhibits significant antioxidant properties and anti cancer activity. Though anticancer studies on other important plants of Myrtaceae, like Syzygium cumini have already been conducted, such studies are not yet done in Syzygium travancoricum. This preliminary results suggests us to conduct more detailed studies on this plant. Detailed phytochemical screening followed by anticancer and GC-MS analysis of polar and non polar extracts of this plant may give significant insights in to the properties of this plant. These properties also suggests the significance of protecting the plant from getting endangered. Literature studies shows the different Constituents of S. cumini seeds as fatty oils, tannins which include ellagic acid, ellagitannins, gallic acid, corilagen, phenolic componets such as ferulic acid, quercetin, veratrole, caffeic acid (EMEA 1999). Among these, ferulic, caffeic, gallic acids were tested for their potential anti proliferative and cytotoxic properties in human breast cancer cell line (MCF-7) as well as on a spontaneous mammary adenocarcinoma tumor. As a single agent, caffeic acid showed substantial growth inhibitory activity (Indap et al. 2008). Caffeic acid and its derivatives have been shown to be effective against HL-60 (human cells (Chen et al. 1996). Flavonoid quercetin has been leukemia) to possess anticancer activity against different types of demonstrated cancer cells (El Attar & Virji 1999; Aalinkeel et al. 2008; Zamin et al. 2009; Du et al. 2009; Shan et al. 2009; Zhang & Zhang 2009). Ellagic acid has been demonstrated to have anticancer activity against several types of cancer such as skin, pancreas, colon and esophegal cancer (Edderkaoui *et al.* 2008). Since Syzygium travancoricum also belongs to the same family these constituents might be responsible for its anti cancer activity too, which gives a broad area to be studied in future.

Conclusion

In the present study, the leaf ethyl acetate extract of S. travencoricum were tested to analyse its anti cancerous and anti oxidant activity. Antioxidant activity of S. travencoricum was analysed using three methods such as DPPH assay, reducing power assay and total antioxidant capacity. DPPH assay based on IC50 values, of standard is 12.59µg/ml and that of standard is 265.07µg/ml. Standard shows 97.19 % of inhibition in the concentration of 100µg/ml and tested extract shows 82.19 % of inhibition in the concentration of 1000µg/ml. Reducing power antioxidant assay shows significant antioxidant activity and the absorbance for standard is 8.94µg/ml and that of extract is 142.87µg/ml. Total antioxidant capacity is 410.88 mgGAE/g. the amount of phenol content present in the plant extract is 0.097µg/5ml. So the plant possess good antioxidant property. Anticancerous property was estimated in MDA MB 231 breast cancer cellines using MTT assay. 97.43% of inhibition in the concentration of 1000µg/ml. Eventhough urther studies sre S.travencoricum showed antioxidant and anti cancerous property. Further studies are needed to isolate and identify that compound responsible for such activity.

Summary

Humans are suffered to various kinds of diseases. Cancer and oxidative stress is prominent among them. Scientists are also focussed to treat such diseases without causing any damage in human body and recommended various plant derived products. The species of Syzygium possesses antioxidant and pharamacologically active compounds. In the present study, the leaf ethyl acetate extract of syzygium travencoricum were tested to its antioxidant and anti cancerous property. Antioxidant activity was tested in three ways such as DPPH assay, reducing power assay and total antioxidant capacity. DPPH assay shows average amount of antioxidant activity and was evaluated on the basis of IC50 value(12.59 μ g/ml of standard in DPPH assay shows 97.19 % of inhibition in concentration of 100 μ g/ml and that of tested extract is 82.19% of inhibition in 1000 μ g/ml.

Reducing activity of standard in reducing power assay is 8.94μ g/ml and that of tested extract is 142.8μ g/ml. Reducing potential is known by marking a reference at the concentration of 0.5. 410.88 mg/GAE/g is the total antioxidant capacity. The phenolic content of the extract is 0.097mg/5ml. Anti cancerous activity of extract was carried out in MDA MB 231 breast cancer celllines using MTT assay. Cytotoxic effect of ethyl acetate plant extract shows 97.45 % of inhibition in the concentration of 1000 μ g/ml. So from the results it is obivious that Syzygium species possess antioxidant and anticancerous activity.

References

- Auddy B, Ferreira F, Blasina L, Lafon F, Arredondo F, Dajas R. et al. Screening of antioxidant activity of three Indian medicinal plants, traditionally used for the management of neurodegenerative diseases. J Ethnopharmacol. 2003;84:131–138.
- BE Shan, MX Wang, RQ LiQuercetin inhibit human SW480 colon cancer growth in association with inhibition of cyclin D1 and survivin expression through Wnt/beta-catenin signaling pathway, Cancer Invest, 27 (2009), pp. 604-612
- Chung YC, Chang CT, Chao WW, Lin CF, Chou ST. 2002. Antioxidative activity and safety of the 50% ethanolic extract from red bean fermented by Bacillu subtilis, IMR-NK1. J Agr Food Chem 50: 2454.
- EMEA. 1999. European Medicines Agency for the evaluation of medicinal products *Syzygium cumini* Summary report. p 679.
- G Du, H Lin, M Wang, S Zhang, X Wu, L Lu, L Ji, L YuQuercetin greatly improved therapeutic index of doxorubicin against 4T1 breast cancer by its opposing effects on HIF-1alpha in tumor and normal cells Cancer Chemother Pharmacol, 65 (2009), pp. 277-287
- Indian J Pharmaceutical Sci, 68 (2008), pp. 470-474
- Jayaprakasha GK, Singh RP, Sakariah KK. 2001. Antioxidant activity of grape seed Vitis vinifera extracts on peroxidation models in vitro. FoodChem 73:285–290.
- Koleva II, Van Beek TA, Linssen JPH, de Groot A, Evstatieva LN. 2002, Screening of plant extracts forantioxidant activity: a

comparative study on three testing methods. Phytochem Ana 13: 8-17

- LL Zamin, E-C Filippi-Chiela, P Dillenburg- Pilla, F Horn, C Salbego, G LenzResveratrol and quercetin cooperate to induce senescence-like growth arrest in C6 rat glioma cells, Cancer Sci, 100 (2009), pp. 1655-1662
- M Edderkaoui, I Odinokova, I Ohno, I Gukovsky, VLW Go, SJ Pandol, AS G ukovskayaEllagic acid induces apoptosis through inhibition of NF-êB inpancreatic cancer cells, World J Gastroenterol, 14 (2008), pp. 3672-3680
- Mensor, L.L., Menezes, F.S., Leitao, G.G., Reis, A.S., dos Santos, T.C., Coube, C.S. and Leitao, S.G. (2001). Screening of Brazilian Plants extracts for antioxidants activity by the use of DPPH free radical method. Phytotherapy Research, 15:127-130.
- Norman J.Temple PhD; Antioxidants and disease: More questions than answers, , Nutrition Research, Volume 20, Issue 3, March 2000, Pages 449-459
- Pilar Prieto, Manuel Pineda , Miguel Aguilar. Spectrophotometric Quantitation of Antioxidant Capacity through the Formation of a Phosphomolybdenum Complex: Specific Application to the Determination of Vitamin E, Analytical Biochemistry, 1999, Pages 337-341.
- R Aalinkeel, B Bindukumar, JL Reynolds, DE Sykes, SD Mahajan, KC Chadh a, SA SchwartzThe dietary bioflavonoid, quercetin, selectively induces apoptosis of prostate cancer cells by downregulating the expression of heat shock protein 90 Prostate, 68 (2008), pp. 1773-1789
- Saklani Sarla1, Mishra Abhay Prakash1*, Rawat Apeksha1, Chandra Subhash1, Free Radical Scavenging (DPPH) and Ferric Reducing Ability (FRAP) of Aphanamixis polystachya (Wall) Parker, Int. J. Drug Dev. & Res., 2011, 3 (4): 156-164
- Shrestha S, Subaramaihha SR, Subbaiah SG, Eshwarappa RS, Lakkappa DB. Evaluating the antimicrobial activity of methanolic extract of rhus succedanea leaf gall. BioImpacts. 2013;3:195–198.
- Suresh PK, Sucheta S, Sudarshana VD, Selvamani P, Latha S. 2008. Antioxidant activity in some selected Indian medicinal plants.

Afr JBiotechnol 7:1826–1828

- Uddin MN, Begum J, Rahman MA, Ahmed NU, Akter R, Abdullah AM. 2010. Antinociceptive and Anti-Inflammatory Properties of the Methanol Leaf Extract of Argyreia argentea. J Pharm Sci & Res 2:465-471.
- W Zhang, F ZhangEffects of quercetin on proliferation, apoptosis, adhesion and migration, and invasion of HeLa cells, Eur J Gynaecol Oncol 30(2009), pp. 60-64

Indoor Gardening for Aesthetic Beauty and Home Decoration

Archana P. J.

Department of Botany, Sree Narayana College for Women, Kollam, Kerala, India *e-mail: archanapjbiotech@gmail.com*

Abstract

Many people find gardening to be a relaxing hobby. Many researches have been done on the beneficial impacts of gardening on both physical and mental well-being. Especially, gardening is said to boost self-esteem and lessen stress. Indoor gardening helps recuperation while reducing stress and increasing creativity, productivity, and attention. There is some proof that indoor plants improve the air's quality within our house. If you have kids or pets at home, you should be aware of which plants are poisonous. The advantages to indoor gardening are help for immune system strengthening, stimulates imagination and attentiveness, improve mood and reduce stress. Making an indoor garden has plenty of advantages. It will not only improve the appearance of your home but also the quality of the air. Growing your own vegetables indoors can ensure a consistent source of wholesome, organic, nutrient-rich food.

There are several varieties of indoor gardens. A variety of indoor gardens that may need various forms of maintenance can be managed in indoor areas. Before constructing a more advanced indoor garden, it is better to start with a simpler one. Their are different types of indoor gardening.

Air Plant: Epiphytes include air plants. That establish themselves on trees in their natural environment without soil or other media. They can be transformed into attractive decorations by simply hanging them on wood or putting them in a decorative vase. For plants to flourish, a sunny window should be placed near them, and they need weekly rinses.

Terrariums & Dish Gardens: Terrariums is a plant that is not as able to adapt to the humid environment in an enclosed terrarium may do better in

an open terrarium, which are miniature ecosystems enclosed in sealable containers. Low-maintenance terrariums may improve your indoor space.

Those plants are appropriate for dish gardening and terrarium displays. Picking plants with different leaf shapes and patterns will give the exhibit a more complex appearance. The plants you choose for your terrarium should be capable of withstanding the humidity inside. Dishes or shallow containers are used to create miniature landscape gardens in dish gardens. According on the plants you have, different kinds of maintenance were needed for dish gardens.

Aquascape: The art of aqua scaping involves using plants, driftwood, pebbles, and other elements frequently encountered in aquatic environments to create an underwater landscape.

Kokedama: The varient of the Japanese word for bonsai, kokedama, is "moss ball." The plant is placed at the centre of a circular root ball that has been molded into that shape. Types of plant used for indoor gardening are the following An air plant The Bromeliaceae family contains a unique collection of plants. Since most of them are epiphytic, they have trichomes—tiny hairs—on their leaves that allow them to take in nutrients and moisture from the air.Blushing Bride *Tillandsia ionantha*, Spanish Moss *Tillandsia usneoides*, *Tillandsia bulbosa*, *Tillandsia funckiana*.

Succulents: Succulent a broad class of plants that can conserve water by holding it in the fleshy sections in order to deal with water shortages and reduce water loss. With right permeable media, you may group these succulents in a dish garden. Elephant's Food *Portulacaria afra* (Variegated), Burro's Tail *Sedum morganianum*, , *Gasteria obliqua*, Fairy Washboard - *Haworthia limifolia* Mother of Millions *Bryophyllum daigremontianum*

Plants which drape These are plants that tend to trail or crawl and hang. Perfect for aerial planters or Kokedamas since it enables the plant to stretch downward, creating an attractive interior landscape. These plants can withstand some hardship.Lipstick Plant *Aeschynanthus pulcher*, Spider Plant *Chlorophytum comosum* 'Vittatum', Heart Leaf Philodendron *Philodendron hederaceum, Pseudorhipsalis ramulosa, Dischidia oiantha* (Varigated).

Plants with ornamental foliage have patterned and colourful leaves. You may grow them in a terrarium or arrange them into a sizable dish garden. Your indoor garden is brightened by their lovely leaves and flowers. African

Violet - Saintpaulia ionantha, Begonia sp. -'Martin's Mystery', Episcia cupreata, Devil's Ivy -Epipremnum aureum, Jewel Orchid- Ludisia discolor, Window-Leaf Monstera Monstera obliqua, Chinese Money Plant Pilea peperomioides, Peperomia 'Eden Rosso', Miniature Arrowhead Plant Syngonium 'Pixie', Panda Plant Kalanchoe tomentosa, Wandering Jew Trandescantia zebrine.

Indoor plants with beautiful and eye-catching features are called aesthetic plants, and these offer visual appeal to any environment. These characteristics could include beautiful colour contrasts, lovely leaf shapes, and many others. *Alocasia Odora, Fiddle Leaf, Anthurium Clarinervium, Kentia Palm, Peperomia Watermelon, Calathea White Fusion, Alocasia Zebrina.*

Plants that can flourish in a variety of indoor settings the indoor environment has a range in terms of temperature, humidity, and light. Plants differ in what they need for optimum development and growth, despite the fact that they may adapt to a wide range of situations. Light, temperature, and humidity come in a wide variety.

Family living area: where the entire family gathers and spends quality time together. Typically, this area offers medium to high light levels, low to moderate humidity levels, and moderate temperatures. The proper plants are: *Chlorophytum* (Spider Plant), *Chamaedorea seifritzii* (Bamboo Palm), *Philodendron scandens*, and *Spathiphyllum* sp (Peace Lily).

Private area: Private space, including the bathroom and bedroom, bathroom when it is in use, the humidity reaches its highest, and the temperature is between medium and low. Plants including Asplenium nidus (bird nest fern), *Nephrolepsis* sp., Scindapsus aureus (pothos), Philodendrons scandens, and *Cissus repens* can withstand the area's extreme humidity and lack of light.

Bed room: The temperature is always optimum or moderate, the intensity of light is moderate to high, and the humidity level is moderate to low. Here, plants like Chlorophytum can be used since they help clean the air by removal of contaminants like formaldehyde from clothing. *Clivia miniata, Cyclamen persicum, Spathiphyllum* "Mauna Loa," and *Chlorophytum comosum* are suitable plants for this category.

Service area: The kitchen is indeed a place where temperature and humidity can change significantly anywhere at time. When it is in use,
temperature and humidity are likely to increase, but if it is not, they are likely to fall. There are many different trees that can be used to manage them, but because it's a location that needs as lot of care, tall or large plants might not be the best choice. In this area, appropriate and beneficial plants can be planted, such as. Mint, thyme, parsley, and celery.

Public area: a location where members of the public or visitors can hang out together with their family. The plants that might be appropriate for this location have flashy, big, or colourful plants. High to medium light levels, moderate to low humidity levels, and a moderate temperature are typical for this location. *Pothos, Spathiphyllum* 'Mauna Loa' (Peace Lily), *Ficus pandurata, Hedera helix,* and *Begonia semperflorence* are among the appropriate plants that can be used to treat this illness (English ivy).

Construction of an indoor garden has a number of advantages. It will enhance the aesthetics of your space as well as the air quality. A steady supply of fresh, healthy organic food will be provided by growing your own vegetables in your indoor garden. You should try your hand at indoor gardening because it has this advantage as well as many others. There are choices for indoor gardening that will function wonderfully regardless of the size of your home or your access to sunshine. You only need a little creativity and study to transform any part of your house into a lush green space. Become a master of indoor gardening to develop your fresh mind.

You should try indoor gardening because it has so many advantages, including this one. There are indoor gardening options available, regardless of the amount of sunlight or the size of the area. The construction of an indoor garden has several benefits. Your property will look nicer and the air quality will improve as a result. Growing your own vegetables inside can ensure a consistent source of wholesome, organic food that is both fresh and nutrient-dense. There are several benefits to creating an indoor garden. Both the appearance and the air quality of your space will be improved. Growing your own vegetables in your indoor garden will give you a constant source of healthy, organic food that is fresh.

REFERENCE

• Priyanshu Sharma, Thaneshwari, Sachin TM and Syed Mahaboob Akram (2021) ,Indoor gardening for aesthetic and healthy life style ,*The Pharma Innovation Journal*, 10(5): 382-389

Consumer perception and buying Behaviour towards green marketing products

04

Aarcha S. S.

Department of Commerce, Sree Narayana College, Kollam, Kerala *e-mail-aarcha2ss@gmail.com*

Abstract

Green marketing is satisfying the needs and wants of the consumers with minimum impact on the environment. The development and protection of environmental resources and social responsibility which has been referred as corporate environmentalism, is an area of growing importance and concern for businesses, consumers, governments, and the society at large. Business performance measurement practices of the organization in relation to general marketing processes and strategies are largely associated with either the industry benchmarks of visionary industry leadership or technologically imposed practices or are based on subjective criteria of marketers understanding. The factors associated to marketing of green products and social perspectives of people in allowing the product usage or green adoption have been specifies in the paper through product recognition and identification of the factors that influence the purchase decision of the buyers and consider their intention. Hence the aim of the study lies in identifying the factors that influence the purchase bahaviour and highly impact the decision of the buyers with the purchase of green products.

Key words: Green marketing, Purchase bahaviour, Industry benchmark, Consumer perception

Introduction

Consumer behaviour is the study of when, why, how, and where people do or do not buy product. It blends elements from psychology, sociology, social anthropology and economics. It attempts to understand the buyer decision making process, both individually and in groups. It studies characteristics of individual consumers such as demographics and behavioural variables in an attempt to understand people's wants. It also tries to assess influences on the consumer from groups such as family, friends, reference groups, and society in general. Customer behaviour study is based on consumer buying behaviour, with the customer playing the three distinct roles of user, payer and buyer. Relationship marketing is an influential asset for customer behaviour analysis as it has a keen interest in the re-discovery of the true meaning of marketing through the re-affirmation of the importance of the customer or buyer. A greater importance is also placed on consumer retention, customer relationship management, personalization, customization and one-to-one marketing.

Objectives of the study

To study the awareness level of consumers towards green products.

To analyze the impact of green marketing practices on consumer green buying behavior.

To determine the factors influencing consumer perceptions in reference to consumer green buying behavior.

Review of Literature

Albert (1981) carried out a study on 234 respondents to analyze the Consumer Perceptions of Comparative Price Advertisements. The study reported that willingness to buy is influenced by one's impression of value. As the amount of the offered discount increased, there was a strong inclination to quit searching for information.

Kim (1987) investigated the amount of label/package ingredient information as variable influencing consumer quality perceptions. Convenience samples of student subjects enrolled in undergraduate business courses were selected at universities in both New Zealand and USA

Dantas (2004) carried out a study on 31 participants to know the Effect of Packaging on the Perception of Minimally Processed Products. The results showed that the participants noticed the packaging colour and transparency most.

Sachdev and Mahna (2014) conducted a study on 500 respondents to explore the influence of demographical variables and the four traditional marketingmix elements on their attitude, perception, and purchase intentions in the Haryana province of India. The research revealed 46 that traditional product attributes such as price, quality, and availability are still the most important ones that consumers considered when making a purchasing decision. Ahmed (2015) studied 300 customers of various superstores and markets to know their perceptions towards organic food and motives for choosing/not choosing foods that are produced in an eco-friendly way. Data were analyzed with the help of standard deviation, mean and correlation analysis. The study concluded that a majority of the customers have a positive perception of different attributes of organic foods which are Eco-friendly products.

Ghosal and Prasad (2021) explored the factors that shape the perception of customers regarding their demographic characteristics. The findings of the research have indicated that there is no substantial correlation between variables like age and the attitude of consumers towards online green products. It was observed here that Income is a variable that is not associated with the factors extracted.

Significance of green products

Green product has been widely adopted by the firm worldwide and the following are the possible reasons cited for this wide adoption.

- A) Opportunities in Green Product "As demand changes, many firms see these changes as an opportunity to exploit and have a competitive advantage over firms marketing non- environmental response alternatives.
- B) Government Pressure: As with all marketing related activities, government want to protect consumers and society, the significant green marketing implication. Reduce production of harmful products. Ensure that all type of consumers can evaluate the environmental Composition of goods. Government establishes regulations designed to control the amount of hazardous waste product by firm.
- C) Competitive Pressure: Another major force in the environment marketing area has been firms desire to maintain their competitive position. In many cases firm observe competition promotion their environmental behavior and emulate their behavior. In some instances, this competitive pressure has caused an entire industry to modify and reduce its detrimental environmental behavior.
- D) Social Responsibility: Many firms are beginning to realize that they are members of wide community and therefore must behave in an environmentally responsible manner. This result in environment issues being integration into firm's corporate culture.

E) Cost or Profit issues: Firm can use green product to address cost or profit related issues. Therefore, firms can reduce harm wastes may incur substantial cost savings.

Characteristics of green products

The products those are manufactured through green technology and that caused no environmental hazards are called green products. Promotion of green technology and green products is necessary for conservation of natural resources and sustainable development. Characteristics of green products are as follows:

- 1. Grown without the use of toxic chemicals and within hygienic conditions.
- 2. Can be recycled, reused and is biodegradable in nature.
- 3. Comes with eco- friendly packing.
- 4. Uses the least resources.
- 5. Has reduced or zero carbon footprint.
- 6. Has reduced or zero plastic footprint.

Advantages of Green Products

Advantages of Going Green to the Brands

- Access To New Markets: Developing green products opens the doors to an all-new market of green consumers who buy only green products and even pay more for the same.
- **Competitive Advantage:** It's a <u>proven fact</u> that going green is a big competitive advantage in the market right now.
- **Positive Public Image:** When <u>a brand</u> does something for the society and the environment, its <u>brand image</u> automatically enhances.
- **Brand Loyalty:** Green companies automatically gain a set of loyal green customers who prefer green products over conventional non-environmental friendly products.

Advantages of Going Green to the Customers

- **Cost-effective products**: Green products last longer than conventional products. Moreover, these products consume less energy and other resources thus reducing the bills of the users. For example, Solar speakers can last for 10 hours just by charging with solar energy.
- **Low maintenance:** If operated responsibly and maintained properly, the green products result in low maintenance costs. Take green

buildings, for example. They market themselves not only for being environmentally friendly but also for <u>less operational costs</u>.

• **Improves health:** Since eco-friendly products are made from materials that are free from harmful chemicals and components, they not only improve physical but also mental health. In green buildings, large windows are installed which allows healthy and fresh air along with natural lighting in abundance. It improves mental health and reduces stress.

Advantages of Going Green to the Society

- Generate More Jobs: According to a study by IRENA (International Renewable Energy Agency), the renewable energy industry has created almost 5 lakh new jobs opportunity in 2017, an increase of 5.3% than 2016. It is predicted that if the demands of green products continue to grow, the number will rise to 16 million by 2030. Thus, with the development of green products not only the environmental but also the economic conditions are improving.
- **Prevents overuse of resources**: Green products reduce the threat of overuse of resources and fossil fuels and encourages the generation of energy using natural resources.
- **Protects the environment:** Green products are made from organic and biodegradable materials and are designed to use least non-renewable resources and toxic chemicals to produce energy. This reduces the generation of greenhouse gases like CFCs, Ozone, methane etc. and hence prevents pollution and deterioration of climatic

Challenges Green Products Face

- **Costly Products:** Green products require innovation and a lot of investment. This increases the cost of developing the products, which results in making them a bit costly than the available alternatives in the market. The cost factor usually discourages the consumers in buying them.
- **Ignorance:** The common masses are still ignorant about the importance and benefits of going green.
- **Investment:** Green products requires the development of new technologies. This requires a large investment in research and development (R&D). Not every company or startup can afford to spend this amount.

Research Methodology

Research Design

Research design is a logical and systematic plan prepared for directing a research study. It is quest for knowledge. Research may be defined as a process of knowing new facts and verifying old ones by application of scientific methods to a natural or social phenomenon. Sample Technique Non probability sampling is used for the study and respondents are randomly selected. especially who are within the area of Kollam city were selected for primary data collection.

Sources of data

There are two types of data Primary and Secondary.

Primary data - primary data is gathered from direct observation or data personally collected. For the study primary data were collected mainly through survey method, using the tool questionnaire Secondary data - on the other hand, are those which have already been collected by someone else and which have already been passed through the statistical process. Here the secondary data was obtained from Various textbooks, registers, magazines, journals. Dissertations etc.

Sample size

A Sample of 50 respondents both male and female drawn from Kollam city

Findings

- 1. The larger part of the present study is relied on viz. male, between the age group of 20-35 years.
- 2. The general awareness of respondents towards green products is average
- 3. The study shows that the awareness among the respondents towards various brands of green products is low.
- 4. The study revealed that the awareness among the respondents regarding the environmental benefit of Green Products is high.

Suggestions

1. The Majority of consumers have also supported and mentioned that a Promotional campaign may be used in the rural area to promote the use and benefits of the eco-friendly product for health and the environment.

- 2. Huge number of respondents were unaware of where products could be purchased. These studies revealed marketers' inability to adequately pitch their green products. As a result, it is recommended that marketers of green items make an effort to position green products effectively in the market so that customer awareness of where green products can be purchased improves.
- 3. The findings indicated that respondents were not well aware of the many brands that offer green products in various categories. As a result, manufacturers must undertake concerted marketing efforts to raise customer awareness of companies that deal with green products.
- 4. Based on the findings, it was concluded that respondents were unfamiliar with various green product certifications, and it was advised that awareness of green product certifications be increased through educational or promotional initiatives. Companies in the FMCG industry should take the lead in raising public knowledge about various certifications and certifying authorities.
- 5. As the findings indicated consumers have given importance to the price factor at the time of buying green products.
- 6. This study proves that consumers are not able to recognize the Green Certification, Eco-Labelling & Packaging also they should motivate the consumers to switch over the products that are harmful to the environmental degradation.

Conclusion

During the research, it has been found that many attributes and factors affect the buying intention and purchase decision of consumers. These various factors have their influence on consumer perception towards consumer buying behavior, differently based on their demographic characteristics. Further regression analysis reveals the moderate level impact of green marketing practices on the green buying behavior of consumers, and the importance of Eco-friendly marketing efforts in the eyes of consumers has a favourable significant influence on consumer persuasion to purchase and choose eco-friendly items over conventional ones. Customers are concerned about the state of the environment and expect organizations to employ green practices for the protection of the environment.

References

- Banerjee, S., Gulas, C. S., & Iyer, E. (1995). Shades of green: A multidimensional analysis of environmental advertising. Journal of advertising
- Barge, D., More, D., & Bhola, S. S. (2014). Awareness of customers about the eco-friendly products-A study of Satara district. Golden Research Thoughts
- Chan, R. Y. (2001). Determinants of Chinese consumers' green purchase behavior. Psychology & Marketing
- Chekima, B., Wafa, S. A. W. S. K., Igau, O. A., & Chekima, S. (2015). Determinant factors of consumers' green purchase intention: The moderating role of environmental advertising. Asian Social Science
- D'Souza, C., Taghian, M., Sullivan-Mort, G., & Gilmore, A. (2015). An evaluation of the role of green marketing and a firm's internal practices for environmental sustainability. Journal of strategic marketing
- Ebrahimi, A., & Rudani, A. (2009). The role of ethical marketing in food purchasing behavior of consumers. Journal of Ethics in Science and Technology
- Ganesh, C., & Mohan, G. M. (2015). Green supply chain initiatives of manufacturing firms: complementary versus trade-off. Ictact Journal on Management Studies

Antimicrobial activity and molecular characterization of probiotic strain, *Bacillus thuringiensis* K112 sourced from microbial technology lab depository

Athira T. S.

Department of Biotechnology, Sree Narayana College, Kollam, Kerala, India *e-mail: mail2athirabhaskar@gmail.com*

Abstract

Antimicrobials such as bacteriocins are inhibitory peptides or proteins, which have bactericidal effects on micro-organisms closely related to the producer with their characteristic activities. Probiotics mean live microorganisms that have beneficial effects on their host's health. Although probiotic strains can be isolated from many sources; for human applications the main criteria is being human origin. The identification of microorganisms is the first step in the selection of potential probiotics. In this study, the strain was obtained from the Microbial Technology Laboratory of Food Science and Technology Department, Pondicherry University for studying antimicrobial activity and molecular characterization of probiotic strain sourced from the lab depository was identified and confirmed by analysing antimicrobial activity by cross streak method and agar well diffusion method, biochemical and molecular characterization, antibiotic sensitivity test, and protease, amylase, lipase and haemolytic assays. The bacterial species was established by 16S rRNA sequence analysis and constructed the phylogenetic tree. The strain observed was a potential probiotic namely K112 of bacillus species., viz., Bacillus thuringiensis (Bt). Bacillus thuringiensis is a Gram positive, facultative anaerobe, soil dwelling, spore forming bacteria that produces toxic against different insect species. This feature makes it the widely used biological control agent in agriculture. Arbitrary isolation of genomic DNA has been applied to the identification of commercial strains of Bacillus thuringiensis by using total DNAs extracted from single bacterial colony. Characteristic DNA and PCR amplification banding patterns can be readily and reproducibly obtained by agarose gel electrophoresis. This technique should prove to be a powerful tool for identification and discrimination of individual *B. thuringiensis* strain. These approaches are potentially powerful strategies for the characterization of the probiotic strain of *Bacillus thuringiensis* K112.

Keywords: Antimicrobials, Probiotic Strains, Bacillus thuringiensis(Bt)

Introduction

1.1. Antimicrobial Compounds

An antimicrobial is an agent that kills microorganisms or inhibits their growth. Agents that kills microorganisms are microbicidal, while those that merely inhibit their growth are called biostatic. The main classes of antimicrobial agents are disinfectants, which kills a wide range of microbes on non-living to prevent the spread of illness, antiseptics and antibiotics (Wainwright. M., 1996). The identification, classification and activity of antimicrobial compounds can be identified by Nuclear Magnetic Resonance (NMR) Spectroscopy and Mass Spectrometry (MS), the latter being often used for the determination of Molecular mass. The active fraction is first obtained from gel filtration of the culture filtrate. When the individual components are isolated in a pure form, and then the efforts are focused on the disclosure of their structure. This is carried out by spectroscopic methods, mainly MS and NMR (1D and 2D), although chemical transformations and comparison to known products are classical ways to corroborate the spectroscopic results to obtain additional information. This is particularly important in oligometric compounds (i.e., peptides, depsipeptides and glycosides) where selective hydrolysis may facilitate identification of the monomers (monosaccharides, amino acids, etc.) or the position of sulphate groups on the sugar or a glycone. The usefulness of those spectra, i.e., the size and quality of the information obtained, is critically dependent on certain experimental details. Although no general rules can be formulated, the MS of compounds found in the more polar fractions are subjected to soft ionization techniques such as CI, FAB, thermospray, and electrospray. Tandem MS-MS is particularly well suited for identification of fragments from molecules formed by several individual units such as peptides, depsipeptides, oligosacharides, and saponins. Similarly, the NMR of water soluble compounds such as saponins, sugars, and other polyhydroxy compounds are frequently more informative if taken in pyridine-d5 than in other solvents (methanol, etc.).

1.2. Classification of Antimicrobial Compounds Based on their Activity Antimicrobials are classified in several ways, including (Gootz et al., 1990),

- Spectrum of activity- Depending on the range of bacterial species susceptible to these agents, antimicrobials are classified as broad spectrum, intermediate spectrum or narrow spectrum. Broad spectrum are active against both gram positive and gram negative organisms. Tetracycline, phenicols, fluoroquinolones, 3rd and 4th generation cephalosporins are examples. Narrow spectrum antimicrobials have limited activity and primarily only useful against particular species of microorganisms. Bacitracin and glycopeptides are only effective against gram positive bacteria, whereas polymixins are usually only effective against gram negative bacteria.
- Effect of bacteria- Because of differences in the mechanisms by which antimicrobials affect the bacteria, the clinical use of antimicrobials may have very different effects on bacterial agents, leading to an endpoint of either inactivation or actual death of the bacteria. Many antimicrobials used in human medicine are not approved for the use in animals or are quite simply too expensive to use in animals. When antimicrobials are needed for an animal, veterinarians base their choices on many factors including, the type of infection, the method by which the antimicrobial is given and how that will be tolerated, the organism causing the infection and its susceptibility to the antimicrobial, as well as whether or not it should be given to the animal that way. It also has application in regarding the antimicrobials used in food production systems, some are the same as those used in people, but some are not.

1.3. Probiotic Organisms

Probiotics are commonly defined as viable microorganisms (bacteria or yeasts) that exhibit a beneficial effect on the health of the host when they are ingested. The belief that probiotic bacteria can influence health dates back to the beginning of the 20th century when the Ukrainian-born Nobel Prize laureate Elie Metchnikoff reported that Bulgarians lived longer than other populations and supposed that this was due to their consumption of fermented milk products containing viable bacteria.

The idea was that the harmless bacteria in the fermented products competed with pathogens injurious to health. The term "probiotic" means "for life"; it was coined by Lilly and Stilwell in 1965. Probiotics have been a subject of interest among the scientific community since the beginning of the twentieth century. Metchnikoff proposed the idea that "intestinal autointoxication" is caused by putrefactive or proteolytic bacteria that generate toxins in the large bowel. He described how the proteolytic bacteria, Clostridia, that exist as part of the gut flora produce toxic substances such as phenols and ammonia through the digestion of proteins. He believed that this intestinal auto-intoxication could contribute to the aging process, but this process could be suppressed by modifying the gut flora to replace harmful microbes with beneficial ones. Metchnikoff suggested that drinking fermented milk would establish harmless bacteria in the gut and decrease the pH, providing an environment in which the growth of proteolytic bacteria would be suppressed. The scientist began himself to drink milk fermented with "Bulgarian Bacillus" and reported that his health did benefit. This led to physicians eventually prescribing the fermented milk to their patients. In 1917, during a shigellosis outbreak, German professor Alfred Nissle isolated a strain of Escherichia coli from a soldier who was not affected by the disease. He then used this to treat people suffering from shigellosis and acute gastrointestinal salmonellosis. Henry Tissier of the Pasteur Institute isolated another important probiotic bacteria called Bifidobacterium, which is dominant in the intestinal flora of breastfed babies. He originally called it Bacillus bifidus communi. Tissier noticed that the bacteria conferred clinical benefits when used to treat diarrhoea in babies, an effect that was claimed to be due to the displacement of proteolytic bacteria that were causing the disease. Food and Agricultural Organization (FAO) and World Health Organization (WHO) guidelines define probiotics as live microorganisms adequate administration of which has favourable effect on the health of concerned individuals. By definition, probiotics are live microbial feed supplement that beneficially affects the host animal by improving its intestinal microbial balance as documented in clinical trial. They are used in foods, especially in fermented dairy products, but also in pharmaceutical preparations. These bacteria must belong to the natural flora in order to survive the acid environment during transit to the intestines. Probiotics are used either as preventives (prophylaxis) or as curatives (biotherapeutics) for particular diseases. Gram positive bacteria belonging to two genera. Lactobacillus and Bifidobacteria,

are extensively used a probiotics. Other microorganisms like E.coli, Enterococcus and Saccharomyces have often been used, but concerns have been expressed regarding their safe use. The available evidence indicates that the beneficial effects of probiotics are not only species, but also strain specific. In vitro studies suggest that probiotics potentially act favourably in the host through several different mechanisms. They have an antimicrobial effect through modifying the microflora, secreting antibacterial substances, competing with pathogens to prevent their adhesion to the intestinal epithelium, competing for nutrients necessary for pathogen survival, producing an antitoxin effect and reversing some of the consequences of infection on the intestinal epithelium, such as secretory changes and neutrophil migration. Probiotics are also capable of modulating the immune system, regulating the allergic immune cell response of the body and reducing cell proliferation in cancer. The effects of these agents may go beyond the gastrointestinal tract to distant areas, such as the urogenital and respiratory mucosa, and it may not be necessary to administer the intact probiotic organism to achieve benefits. At the basic research level, products of probiotics such as secreted proteins and DNA can block inflammation and stop the death of epithelial cells. For example, DNA from some probiotic preparations can suppress experimental colitis in several animal models. The bacteria can also be genetically modified for use as carriers for antigen delivery into diseased sites in the intestine.`

The term strain refers to a biological variety of species; a species in turn exists within a genus. Some beneficial probiotic strains include:

- Lactobacillus rhamnosus: supports bacterial balance and supports healthy skin. Helps fight urinary tract infections, respiratory infections, and reduce anxiety by reducing stress hormones and GABA neurotransmitter receptors. Also, survives GI tract.Bacillus subtilis: an endospore probiotic that is heat-resistant. Elicits a potent immune response and supports GALT. Suppresses growth of bad bacteria like salmonella and other pathogens.
- Bacillus coagulans: an endospore probiotic that is heat-resistant and improves nutrient absorption. Also has been shown to reduce inflammation and symptoms of arthritis.
- Saccharomyces boulardii: a yeast probiotic strain that restores natural flora in the large and small intestine and improves intestinal cell

growth. It has proved effective in treating inflammatory bowel disease like Crohn's disease. Its been shown to have anti-toxin effects, be antimicrobial, and reduce inflammation.'

Probiotic bacteria competes for adhesion sites, it has the ability to produce antimicrobial compounds like acids, hydrogen peroxide and bacteriocins which inhibits the pathogens. The inhibition of pathogen adhesion, colonization and biofilm formation may results in antagonism against pathogens. Probiotic bacteria can act through several paths: they prevent cellular adhesion and invasion of pathogenic bacteria, modify the intestinal environment by a reduction in pH as a result of fermentation products and they interact and modulate the local and systemic inflammatory immune response. For several decades now, bacteria called probiotics have been added to some foods because of their beneficial effects for human health. The bacteria in yoghurt and fermented milk products constitute the most important source of probiotics for humans. The vast majority of probiotic bacteria belong to the genera Lactobacillus, Bifidobacterium, Propionibacterium and Streptococcus.

For identification of the bacterial strain, sorting methods were initially based on physiological and chemotaxonomic features of the specific strain. Also biochemical and screening assays have to be done. The isolates were identified by characterizing them using gram staining, catalase test, oxidase test, IMViC tests and antimicrobial activity can be determined by cross streak and agarose gel diffusion methods. Almost from the beginning of last decade, phenotypic properties are complemented or have been replaced by different molecular techniques such as DNA-DNA hybridization experiments, DNA sequence analysis, or PCR methods as they have been developed in order to get more consistent and accurate identification of the strain. The probable reason may be identification at the genus level is relatively easy to do for the bacterial strain using phenotypic methods but differentiation of species from other related genus is more problematic in most of the cases. Species level identification of LAB often relies mostly on determination of the phylogenetic position using 16S rRNA gene sequence analysis and further genotypic or phenotypic comparison with nearest neighbours. Wholecell protein fingerprints using sodium dodecyl sulphatepolyacrylamide gel electrophoresis (SDS-PAGE) is also an extensively utilized phenotypic database for the identification of LAB. Recent studies revealing genotypic characterization using "Amplified Fragment Length Polymorphism" (AFLP) provides better differentiation in some of the phylogenetic groups and can serve as an alternative for laborious DNA-DNA hybridizations. The selected strain was characterized for various probiotic properties. These includes Antibiotic susceptibility test in order to determine the antibiotic resistance potential, the ability to produce bioactive metabolites and acid sensitivity test.

Materials and Methods

2.1. Collection of Sample

The unknown bacterial strain GB were provided from Microbial Technology Lab Depository, Department of Food Science and Technology, Pondicherry University.

2.2. ISOLATION OF PROBIOTIC STRAIN

Isolation is done to obtain pure bacterial cultures. Culture methods are employed depend on the purpose to isolate bacteria in pure cultures.

2.2.1 Streak Culture

Used for the isolation of bacteria from pure culture from clinical specimens. Platinum wire or nichrome wire is used. One loopful of the specimen is transferred onto the surface of a well dried plate. Spread over a small area at the periphery. The inoculum is then distributed thinly over the plate by streaking it with a loop in a series of parallel lines in different segments of the plate. On incubation, separated colonies are obtained over the last series of streaks.

2.2.2.Pour Plate Culture

Agar medium is melted (15ml) and cooled to 45° C. 1ml of the inoculum is added to the molten agar. Mix well and pour to a sterile petri dish. Allow it to set. Incubate at 37° C, colonies will be distributed throughout the depth of the medium.

2.3 Characterization of The Probiotic Strain

2.3.1. Morphological Characterization

On the basis of size, shape, colour (pigmentation), texture, height (elevation, is a description of how the colony grows vertically), edge (margin, describes the borders of the colony), these are the characteristics used to accurately and consistently describe the morphology of a bacterial colony. Characterization of bacteria can be done by the following methods:

• Gram staining

Place slide with heat fixed smear on staining tray. Gently flood smear with Primary stain (Crystal Violet) and let stand for 1 min. Tilt the slide, slightly and gently rinse with tap water or distilled water using a wash bottle. Gently flood the smear with mordant (Gram's iodine) and let stand for 1 min. Tilt the slide slightly and gently rinse with tap water or distilled water using a wash bottle. The smear will appear as a purple circle on the slide. Decolourisation using 95% ethyl alcohol or acetone. Tilt the slide gently and apply the alcohol drop by drop for 5-10 seconds until the alcohol runs almost clear. Be careful not to over decolourise. Immediately rinse with water. Gently flood with Counter Stain (Safranin) to counter stain and let stand for 45s. Tilt the slide gently, rinse with distilled water or tap water using a wash bottle. Blot the slide with bibulous paper. View the smear using a light microscope under oil immersion.

2.3.2. Biochemical Characterization

I. Imvic Test

A. Indole Production Test

Test tubes were taken and washed properly. Peptone broth was prepared and about 5ml of broth was poured in each test tube and kept for autoclaving. After sterilization, the tubes were brought to room temperature. The test organism was then inoculated by using a sterilized inoculation loop and the tubes were labelled according to the organism inoculated. The inoculated tubes were kept for incubation at 24-48 hrs. After incubation Kovacs reagent was added and result was noted.

B. Methyl Red Test

Prepare sterile MR-VP broth and allow to cooling. Under asceptic conditions inoculate a loop full of test organism into the medium. After inoculation, incubate the tubes at 37^{0} C for 24-48 hrs. After incubation, add few drops of methyl indicator into the broth. Observe the colour change.

C. Voges-Proskauer Test

Test tubes taken and washed. MR-VP broth was prepared and about 5ml of media was poured into the tubes and kept for sterilization. After sterilization the tubes were cool down. Using sterile techniques organisms were inoculated into the labelled tube by means of inoculation loop. One tube was kept as control. Then the tubes were incubated for 24-48 hrs at

 37^{0} C. After incubation period, a few drops of Barritt's reagent was added to each tube and the colour change was noted.

D. Citrate Utilization Test

Inoculate Simmon's citrate agar lightly on the slant by touching the tip of a needle to colony ie; 18 to 24 hrs old. Incubate at 35^{0} C to 37^{0} C for 18 to 24 hrs. Some organisms may require upto 7 days of incubation due to their limited rate of growth on the citrate medium. Observe the development of blue colour, denoting alkalinisation.

II. Oxidase Test

Nutrient agar medium was prepared and the pH was adjusted to 7.2 and then sterilized at 1210C for 15 minutes. The medium was dispersed into sterile petri plates and kept for solidification. Then the test cultures were inoculated with sterile inoculation loop, and 1 plate was kept as control. The plates were labelled and inoculated at 37^{0} C for 24 hours. After incubation, a small bit of filter paper was dipped into 1% test reagent and a loop full of test culture smeared on it. The result was noted.

III. Catalase Test

Nutrient agar medium was prepared and sterilized at 121° C for 15 minutes. The medium was then dispersed into sterile petri plates. Test organism was inoculated with a sterile inoculation loop under asceptic condition, the plates were incubated for 24 hours at 37° C. After incubation, a glass slide was taken and few drops of H₂O₂ solution with the help of a sterile inoculation loop. The results were noted.

2.4. Screening Of Probiotic Bacterial Strain

The following screening assays were carried out for detecting antimicrobial activity of the bacterial strain.

2.4.1. Assays

A.Protease Assay

Skimmed milk agar (Himedia) was prepared. The organism to be checked for the proteolytic activity was streaked (continuous streak) on the agar plate. Then plate was incubated at 37^{0} C for 48 hours.

B. Amylase Assay

Use a sterile swab or a sterile loop to pick a few colonies from the pure culture plate. Streak a starch plate in the form of a line across the width of the plate. (Several cultures can be tested on a single agar plate, each represented by a line or the plate may be divided into four quadrants (pie plate) for this purpose. Incubate plate at 37^oC for 48 hrs. Add 2-3 drops of 10% iodine solution directly onto the edge of colonies. Wait 10-15 minutes and record the results.

C. Lipase Assay

Pipette 2.0ml of olive oil emulsion (A) into a test tube and equilibrate at 37°C for about 5 minutes. Add 0.2ml of the enzyme solution and mix. After exactly 15 minutes at 37°C, add 2.0ml of TCA solution (E) to stop the reaction and remove the precipitate by filtration through filter paper (Toyo-Roshi No.131 or Whatman No.42). Pipette 0.05ml of the filtrate thus obtained into a test tube. Add 3.0ml of colour developing reagent (G) and incubate at 37°C for 15 minutes. Measure the optical density at 545nm against water (OD test). At the same time, prepare the blank by first mixing 2.0ml of TCA solution, followed by the addition of the enzyme solution (1st step). By using the filtrate obtained from the mixture, carry out the 2nd step using the same procedure as the test and measure the optical density at 545nm (OD blank). Dissolve the enzyme preparation in ice-cold enzyme diluent (H) and dilute to 0.4-1.2U/ml with the same buffer, immediately before assay.

D. Haemolytic Assay

Human blood was centrifuged for 10 minutes (3,000 rpm) and the supernatant was removed. Next, the erythrocytes were washed 3 times with 0.9% saline solution and then re-suspended to a concentration of 5% in 0.9% saline solution. Subsequently, 100 μ l of saline solution was added until well number 10 of a U-shape microplate. An amount of 100 μ l of peptide was added to the first well and 2- fold dilutions were performed until well number 10, well 11 containing a 100 μ l saline only (Negative control-0% haemolysis) and well 12 containing a 100 μ l of 5% human blood was added until well number 12 and the plate was incubated at 37 °C

for 30 minutes. The haemolysis results were measured by comparing the positive and negative controls.

2.4.2. Antibiotic Sensitivity Test

Select a pure culture plate of one of the organisms to be tested. Aseptically emulsify a colony from the plate in the sterile saline solution. Mix it thoroughly to ensure that no solid material from the colony is visible in the saline solution. Repeat until the turbidity of the saline solution visually match that of the standard turbidity. Take a sterile swab and dip it into the broth culture of organism. Gently squeeze the swab against the inside of the tube in order to remove excess fluid in the swab. Take a sterile Mueller-Hinton agar (MHA) plate or a nutrient agar (NA) plate. Use the swab with the test organism to streak a MHA plate or a NA plate for a lawn of growth. After the streaking is complete, allow the plate to dry for 5 minutes. Antibiotic discs (Gentamycin, Ampicillin, Kanamycin, Streptomycin, Vancomycin) can be placed on the surface of the agar using sterilized forceps. Gently press the disc onto the surface of the agar using flame sterilized forceps or inoculation loop. Carefully invert the inoculated plates and incubate for 24 hours at 37°C. After incubation, use a metric ruler to measure the diameter of the zone of inhibition for each antibiotic used. Compare the measurement obtained from the individual antibiotics with the standard table to determine the sensitivity zone and also test whether the bacterial species is sensitive or resistant to the tested antibiotic.

2.4.3. Screening of Antimicrobial Activity of Bacteria for Antagonistic Activity against Selected Pathogen by Cross Streak Method and Agar Well Diffusion

• Cross streak method

The potential antagonistic bacteria were selected by screening the sponge isolates against a battery of human pathogens. The human pathogens (Shigella, Campylobacter, Salmonella) were obtained from the Microbial Technology Lab, Pondicherry University, TamilNadu. While the Bacillus isolates were culled from Penaeus monodon. All the test organisms were maintained on nutrient agar slants at 4°C before being used in the inhibitory assays. The antimicrobial activities of the sponge associated bacteria were performed by cross-streak method. MuellerHinton agar plates were prepared and inoculated with sponge isolates by a single perpendicular streak of inocula in the centre of the Petri-dish and incubated at 27°C for 4 days. The plates were seeded with test organisms by a perpendicular streak

at a 90° angle to the line of the sponge isolates. Antagonism was observed based on the inhibitory interaction between the sponge isolates and test organisms. The reference standard (Nalidixic acid) was used for the detection of strain sensitivity/resistance. Inhibition activities and colonization effect are noticed at 24, 48, 72 and 96 hours. All the tests were conducted in triplicates.

• Agar well diffusion method

The bacterial strains which displaying the antagonistic activity in crossstreak method was further confirmed with the agar well diffusion method. The sponge bacterial strains were grown in a nutrient broth, incubated at 25°C for 18h, and adjusted to an approximate concentration of 108 CFU ml–1. The Mueller Hinton agar plates were prepared and uniformly swabbed with respective pathogens. Thereafter, it was punched with a five millimeters diameter wells and filled with 120 μ l of the respective microbial cell suspension (CS). The well with broth used for culture was considered as negative control. The Petri-dishes were incubated at 37°C for 24h. After incubation, plates were examined for inhibition zones. The assay was performed in triplicates of individual Petri-dishes. Clear zone of inhibition formed around wells were considered as indicative of antimicrobial activity. The inhibitory activity was measured by calculating the area of clear zone.

2.5. Antimicrobial Activity of Strain

The antimicrobial activity of the Bacillus strain against the pathogenic microorganisms were evaluated by using agar well diffusion method. The bacillus strain was inoculated into nutrient broth supplemented with 2% NaCl incubated at 28° C on a shaker incubator (200-250 rpm) for 7 days. After incubation the broths were centrifuged at 10,000 rpm for 10 minutes at 40° C. The cell free supernatant was transferred asceptically into a conical flask and stored at 4° C for further assay. To cell free supernatant, equal volume of various solvents (viz., chloroform, ethyl acetate and methanol) was added separately and centrifuged at 8000rpm for 10 min at 4° C to extract the pyrrolo[1,2-a]pyrazine-1,4-dione,hexahydro. The compound obtained from each solvent was tested for their activity against the pathogens (Shigella, Campylobacter, Salmonella) by the well diffusion method. After incubation for 24 and 48 hours, the zones of inhibition were measured. The extraction can be carried out using methanol and chloroform also.

2.6 Molecular Characterization

2.6.1. DNA Isolation and Electrophoresis Technique

• Enzymatic Isolation of DNA

Centrifuge 2ml of cell culture at 8000rpm, 4^oC for 10 minutes. Resuspend the cells in 2µl of TES buffer. Centrifuge at 8000rpm, 4^{0} C, 10 minute. Discard the supernatant. Resuspend the cells in 50µl of TES buffer. Add 20µl lysozyme, shake gently and incubate at 37[°]C for 30 minutes. Dilute the lysate by adding 80µl of TES buffer. Add protease K (1µl) and 1% SDS, incubate at 30^oC for 30 minutes. Add 700µl buffer saturated phenol. Shake gently at room temperature for 10 minutes. Centrifuge at 5000rpm at room temperature for 10 minutes. Transfer the aqueous phase into a new centrifuge tube. Add equal volume of buffer saturated phenol and shake gently for 1-2 minute. Centrifuge at 5000rpm at room temperature for 5 minutes. Transfer aqueous phase to centrifuge tube containing two volume of 95% ethanol. Centrifuge at 12,000rpm, 4°C for 20 minutes. Air dry pellets for 15 minutes. Resuspend in 35ul TE buffer. • Agarose Gel Electrophoresis The DNA samples were electrophoresed on 0.8% agarose gel and 1X TAE to check the concentration and purity of isolated DNA. A running tray of agarose gel electrophoresis system was initiated by placing it firmly on the casting tray. A comb was placed on the run of casting tray to make wells. 0.8% agarose (0.24g in 30ml 1X TAE) solution was prepared in 1X TAE by heating and it was cooled to 50° C, poured into tray. Ethidium bromide was added to the gel (0.5µl ethidium bromide for 10ml TAE). 5µl of DNA sample was loaded into the wells along with the loading dye. Run the gel at constant voltage of 100V and current of 45mA for a period. For a period of 1 hr till the bromophenol blue has travelled 6cm from the wells. View the gel on the UV transilluminator.

2.6.2. PCR Analysis

• 16 S rRNA amplification

The 16S rRNA region was amplified using the universal bacterial 16S rRNA primers 27F (5' –GTTT GATC MTGGCTC AG-3') and 1492R (5'-TACGGYTACCTT GTT ACGACTT-3'). The PCR amplification of target sequence was carried out in a total volume of 50 μ l of the following reaction mixture. 5 μ l of PCR buffer (10X); 1.0 μ l of taq DNA polymerase (30 μ l) and 2.0 μ l of template DNA (50ng μ l approximate) and 38 μ l sterilized distilled water. Amplification condition were as follows: 3 minute of initial denaturation at 94°C, followed by 40 cycles of demonstration at 94°C for

30 seconds, 50°C for 30 seconds and 72°C. PCR product was separated on 2% agarose gel and photographed under UV illuminator.

• 16 S rRNA gene sequencing and phylogenetic analysis

The 16S rRNA Product was got sequenced. The sequencing reaction of 16 S rRNA amplified product was performed by using both forward BAC 1378R primers. 16 S rRNA sequence was compared with the Gen Bank data base by using `2a2aq3Phylogenetic tree was constructed using MEGA 4 software through neighbour joining method.

Result and Discussion

In the present study, the attempt was to analyse the antimicrobial activity and molecular characterization of probiotic stain Bacillus thuringiensis K112 sourced from Microbial Technology Lab depository were characterized by morphological, biochemical-molecular characterization, antimicrobial activity and concerning assays. The Bacillus genus is a heterogeneous group of Gram-positive, facultative anaerobic, endosporeforming bacteria spread into the environment, even though soil is generally accepted as its natural reservoir. The ability to produce endospores allows Bacillus to withstand extreme environmental conditions as those occurring in food processing. One of the main characteristics shared among Bacillus strains is the ability to produce a wide range of antimicrobial compounds active against bacteria and fungi. Even though microbial control exerted by these metabolites was demonstrated in plant environments, few reports focused their attention on how these compounds can interact with food microbiota. One single Bacillus strain is often able to produce several types of molecules stable over a wide range of pH and temperature and partially resistant to enzyme treatments. These substances are usually protein- and peptide-based compounds such as enzymes, bacteriocins and lipopeptides.

The genus Bacillus encompasses a number of bacteriocinogenic species. Bacillus thuringiensis is widely used in agriculture for the control of many insect pathogens. It is characterized by the production of crystal proteins (d-endotoxins) with a specific activity against certain insect species (Beegle and Yamamoto., 1992) nematodes, mites and protozoa (Feitelson et al., 1992). Moreover, a number of extracellular compounds are produced by B.thuringiensis, including phospholipases, chitinases, proteases (Lovgren et al., 1990), b-exotoxins, secreted vegetative insecticidal proteins and antibiotic compounds with antifungal activity (Stabb et al., 1994).

Sl.No	Characters	K112	
1	Motility	Motile	
2	Colony Size	0.5-2.5mm	
3	Shape	Rod	
4	Colour	Off-White	
5	Margin	Serrate	
6	Opacity	Opaque	
7	Elevation	Slightly umbonate	
8	Capsules	Non-capsulated	
9	Flagella	Peritricous	
10	Gram staining	Gram +ve, Bacillus	
11	Biochemical Test		
Ι	Indole	+	
Ii	Methyl red	+	
Iii	Voges- Proskauer	-	
Iv	Citrate utilization	-	
v	Oxidase	-	
vi	Catalase	+	
12	Assays		
i	Protease	+	
ii	Amylase	-	
iii	Lipase	+	
iv	Haemolytic	-	
13	Antibiotic Sensitivity Test		
i	Gentamycin	S	
ii	Ampicillin	S	
iii	Kanamycin	S	
iv	Streptomycin	S	
v	Vancomycin	S	
14	Antimicrobial Activity Assay		
i	Cross streak	S	
ii	Agar well diffusion Assay	S	

Table 1. Morphological, Physiological and Biochemical characteristics of theprobiotic strain K112

+ Positive, - Negative, mm: millimetre, S: Sensitive

LIST OF FIGURES





3.1. Isolation of Strain

The isolated bacterial strain (Fig.2) was cultured in a nutrient agar plate via quadrant streak method and incubated at 37^{0} C in a BOD incubator for 24 hrs, and observed the appearance of off- white coloured cluster colony formation. It was understood that the isolated bacterial strain is so sensitive to the sub culturing.

3.2. Characterization of Probiotic Bacterial Strain

3.2.1. Morphological Characterization

• Gram Staining result

The gram reaction (Fig.3.Slide prepared for gram positive bacillus sp.,) of the isolate was determined by light microscopy after gram staining.

Bacillus are known to be gram positive. It means that they give blue-purple colour on gram staining.

3.2.2. Biochemical Characterization

I. IMViC Test

In accordance with the biochemical tests, the IMViC tests (Fig.4) are careful for differentiating the enterobacteriaceae family. The IMViC tests were included the following 4 tests viz., Indole test, Methyl red test, Voges-Proskauer Test and Citrate utilization test. The isolated bacterial colony was inoculated in the broth and agar was incubated. Indole test (Fig.A) measures the ability of the bacterial strain to degrade tryptophan to indole, pyruvic acid and ammonia. The production of indole was detected using Kovac's reagent (para dimethyl amino benzaldehyde, isoamyl alcohol and concentrated HCl). In the tryptophan broth containing the specific bacterial colony, 5 drops of Kovac's reagent was added along the side of the test tube and a cherry red coloured ring formed was noted and obtained the result as the test is positive. Methyl red test (Fig.B) detects whether the bacillus species produce acid from glucose fermentation or not. Methyl red is an isodye with the pH near 7 and yellow coloured at pH greater than 7.5-10 drops of methyl red was added into the buffered glucose broth containing isolated bacterial colony and was already incubated for 24 hrs, the result observed was positive with the development of red colour after the addition of methyl red reagent. Voges- Proskauer test (Fig.C) determines whether the organism produce acetone or not. In this test, 2 reagents Barrits A and Barrits B (40% KOH) are used to detect the production of acetone. The buffered glucose broth was inoculated with the bacterial colony and incubated for 24 hrs. After that Barrit A (5-6 drops) and Barrits B (5-6) drops was added into the broth containing the bacterial colony shows the absence of appearance of pink to red colour indicates negative result, because the culture produces a copper like colour, potentially resulting in a false-positive interpretation. Citrate utilization test (Fig.D) detects whether the bacillus species can utilize citrate as a soul source of carbon or not. The media (Simmons Citrate Agar) contains citrate in the form of Sodium citrate and bromothimol blue indicator. As the citrate is converted into oxaloacetate, NH₃ and NaOH produced which increases the pH and bromothimol blue converted from green to blue colour. The Simmons citrate agar was used to make slant, the bacterial colony isolated was streaked on this and incubated for 24 hrs and the colour was noted.

Absence of indication of indication of Pershian blue colour shows negative result, ie., in the media trace or no growth will be visible. No colour change will occur, the medium will remain the deep forest green colour of the uninoculated agar. Only bacteria that can utilize citrate as the sole carbon energy source will be able to grow on the Simmons citrate test culture will be virtually indistinguished from an uninoculated slant. II. Oxidase test and III. Catalase test Oxidase test (Fig.5) determines the capacity of Bacillus species to produce cytochrome oxidase C. Development of dark purple colour (indophenols) within 10 seconds indicates positive result. Catalase test determines the pressure of catalase enzyme in the bacillus species, If it is present then it converts H_2O_2 and O_2 (effervescence formation). Presence of effervescence was noted, no bubble formation indicates the negative result, ie; ther is no catalase enzyme to hydrolyze the hydrogenperoxide.

4.3. Screening of Probiotic Bacterial Strain

4.3.1. Assays

Protease Assay (Fig.7) using skimmed milk agar indicates zone formation, Bacillus thuringiensis is positive for protease enzyme production, shows positive result. Amylase assay (Fig.8) shows that Bacillus thuringiensis is negative for amylase enzyme production. Lipase assay using CAS agar shows that when the bacillus species produces lipase enzyme and it breaks down the tributyrin, a clear halo surrounds the areas where the lipase producing organism has grown indicates the positive result. Haemolytic assay using human blood was analysed by the haemolysis of erythrocytes indicates the negative result.

4.3.2. Antibiotic Sensitivity Test

From the above (Fig.6) clear zone of inhibition formation can be observed on each individual antibiotic discs (gentamycin, vancomycin, streptomycin, kanamycin and ampicillin). Thus by determining the sensitivity zone, the bacillus species is sensitive to the tested antibiotics.

4.4. Antimicrobial Assay

The obtained strain was examined according to its antimicrobial activity. For this purpose, strains were detected against the indicator microorganisms, Shigella, Campylobacter and Salmonella with the solvents (chloroform, ethyl acetate, methanol). The diameter of inhibition zones showed that the Bacillus species have antimicrobial/antibacterial effect on the indicator microorganisms. The diameter of zones were given below.

	INDICATOR MICROORGANISMS		
SOLVENTS(µL)	DIAMETER OF INHIBITION ZONES (mm)		
	Shigella	Campylobacter	Salmonella
Chloroform	11±1.5	20±1.3	17±1.6
Ethyl acetate	15±1.6	13±1.7	21±1.2
Methanol	20±1.1	19±1.9	14±1.5

Table 2. Antimicrobial activity of Bacillus strain against selected indicatormicroorganisms (human pathogens)

Fig.14. Graph representing the zone of inhibition of K112 in agar well diffusionmethod



X axis - Solvents (µL)

Y axis - Zone of Inhibition (mm)

Screening of antimicrobial activity of bacteria for antagonistic activity against selected pathogen by cross streak method and agar well diffusion method

Antagonistic activity of Bacillus thuringiensis supernatant was further evaluated by cross streak method and an agar-well diffusion method. Zones of inhibition were observed with cell-free probiotic supernatant. The zone of clearance shows the inhibition of growth of indicator strain by the isolated Bacillus thuringiensis. It indicates the presence of bioactive molecules by the bacillus culture. It has been attributed to production of organic acids or hydrogen peroxide or bacteriocins or any other inhibitory substances by bacterial cell. Cross streak method (Fig.9) the result obtained was the microorganism is sensitive, cross streak method is used to rapidly screen microorganisms for antagonism. The microbial strain of interest is seeded by a single streak in the center of the agar plate. After an incubation period depending upon the microbial strain, the plate is seeded with the microorganisms tested by single streak perpendicular to the central streak. After further incubation, the antimicrobial interactions are analyzed by observing the inhibition zone size. Agar well diffusion method (Fig.10,11&12), the selected indicator organisms such as Shigella, Campylobacter and Salmonella, the antimicrobial activity of K112 strain was noted in the table 2. From the above figure (Fig.10)of Shigella, K112 is more sensitive to methanol (20+/-1.1), In (Fig.11) of Salmonella, K112 is more sensitive to ethyl acetate (21+/-1.2) and in (Fig.12) of Campylobacter, K112 is more sensitive to chloroform (20+/-1.3). From this results it was understood the agar well diffusion method is often used to highlight the antagonism between microorganisms and the procedure is similar to that used in the disc-diffusion method. It involves making an agar culture of the strain of interest on its appropriate culture medium by tight streaks on the plate surface. During their growth, microbial cells secret molecules which diffuse in the agar medium. After incubation, an agar-plot or cylinder is cut aseptically with a sterile cork borer and deposited on the agar surface of another plate previously inoculated by the test microorganism. The substances diffuse from the well to the agar medium. Then, the antimicrobial activity of the microbial secreted molecules is detected by the appearance of the inhibition zone around the agar.

4.5. Molecular Characterization

Agarose gel electrophoresis-DNA bands are clearly visualized (Fig.13) on the UV transilluminator.



Phylogenetic Tree of bacterial strain Bacillus thuringiensis K112.

Fig.15. Phylogenetic tree of Bt K112

• PCR analysis

By performing the 16SrRNA amplification and analysis, it was confirmed with primers 27F (5' –GTTT GATC MTGGCTC AG-3') and 1492R (5'-TACGGYTACCTT GTT ACGACTT-3'). K112 was identified on the basis of partial 16SrRNA gene sequencing. The sequence segment from the isolate was compared with the available nucleotide sequences in NCBI-nr database using BLAST 2.2.9 system (www.ncbi.nlm.nih.gov/BLAST/). The sequence of the 16SrRNA gene of the isolate K112 showed 98% homology with the 16SrRNA gene sequence of *Bacillus thuringiensis*. The phylogenetic analysis was performed by constructing a phylogenetic tree in which the strain K112 fell within cluster comprising Bacillus species. From

the all round observations including morphological and biochemical characterization of the isolate K112 exhibited gram positive rod and possession of biochemical traits such as utilization of citrate, indole, methyl red, oxidase and finally confirmed it as *Bacillus thuringiensis* K112.

Acknowledgements

I am grateful to all of those with whom I have had the pleasure to each of the respected members of **Dept. of Food Science and Technology Pondicherry University, India** for providing laboratory facilities to carry out this work and **Dept. of Biotechnology, Sree Narayana College, Kollam, Kerala, India** for supporting me and provided me extensive personal and professional guidance and taught me a great deal about both scientific research and life in general.

References

- Aayushi Mishra., Kanti Prakash Sharma.,: Isolation and characterization of probiotic microorganism from fermented dairy products, Research Article, GERF Bulletin of Biosciences, June 2014., 5(1): 10-14 2. Accuracy of species identity of commercial bacterial cultures intended for probiotic or nutritional use. [Res Microbiol.2006]
- 3. Antoine J. M., (2010) Probiotics: beneficial factors of the defence system. Proc Nutr Soc 69: 429-433
- 4. Anukam K. C., Reid G., Probiotics: 100 years (1907-2007) after Elie Metchnikoff's observation. In-Mendez-Vilas A. editor. Communicating Current Research and Educational Topics and Trends Microbiology. on Applied Vol 1. Formatex: Badajoz, Spain:2007.pp.466-474
- 5. Barry A. L., (1976). Antimicrobial susceptibility tests: principle and practice. Lea and Febiger, Philadelphia; 92
- 6. Beegle C. C., and Yamamoto T., (1992) History of Bacillus thuringiensis Berliner research and development. Canadian Entomologist 124, 587-616
- Billoo A. G., Memon M. A., Khaskheli S. A., et al., Role of probiotics in management and prevention of diarrhoea. World J Gastroenterol 2006; 28:4557-6

- 8. British Journal of Nutrition/Volume 109/Supplement S2/January 2013, pp S35-S50
- Cherif A., Chehimi S., Limem., Hansen B. M., Hendriksen N. B., Dffonchio D., and Boudabas A., (2003). Detection and characterization of the novel bacteriocin entomocin 9, and safety evaluation of its producer, Bacillus thuringiensis spp; Entomocidus HD9 Journal of Applied Microbiology 95: 990-1000
- Cherif A., Ouzari H., Daffonchio D., Cherif H., Slama K. B., Hassen A., Jaoua S., and Boudabous A., (2001). Thuricin 7: a novel bacteriocin produced by Bacillus thuringiensis BMG 1.7, a new strain isolated from soil Letters in Applied Microbiology 32, 2434-2247
- Chou L. S., and Weimer B., (1999). Isolation and characterization of acid and bile tolerant isolates from strains of Bacillus thuringiensis. Journal of Dairy Science 82:23-31
- Collado M. C., Meriluoto J., and Salminen S., (2008). Adheshion and aggregation properties of probiotic and pathogen strains. Eur. Food Res. Technol., 226: 1065-1073
- Collins J. K., Thornton G., and Sullivan G. O., (1998). Selection of probiotic strains of human application. International Dairy Journal 8: 487-490
- Collins M. D., Rodrigues U., and Ash C., (1991). Phylogenetic analysis of the genus Lactobacillus and related bacteria ad determined by reverse transcriptase sequencing of 16SrRNA. FEMS Micobiol. Lett., 77: 5-12
- D. L Edwards et al., U.S. Patent 4,948,734 (1988) Journal of Applied Microbiology., 89,511-516
- D. Nikolova., Y. Evstatieva., R. Georgieva., S. Danova., V. Savov., S. Ilieva., and P. Dalev., (2009) Molecular Taxonomic Characterisation of Probiotic Strain Lactobacillus sp. 50P1, Biotechnology & Biotechnology Equipment, 23: sup1, 779- 782, DOI: 10.1080/ 13102818.2009.10818539
- 17. De Vrese M., Schrenzenmeir J., Probiotics, Prebiotics and Synbiotics Adv Biochem Eng Biotechol. (2008). 111:1-66 [PubMed]

- Dicks L., M. T and Botes M., (2010). Probiotic lactic acid bacteria in gastrointestinal tract: health benefits, safety and mode of action. Beneficial Microbes.,1:11-29
- Doern G. V., Dascal A., and Keville M., (1985). Antibiotic susceptibility testing using M-H agar. Diagn. Microbio 1. Infect. Dis., 3: 185-191
- Dugas B., Mercenier A., Lenoir-Wijnkoop I., Arnaud C., Dugas N., and Postaire E., (1999). Immunity and probiotics. Trends Immunology Today 20(9):387-390
- FAO/WHO. Probiotics in Food. Health and Nutritional properties. FAO Food and Nutrition Paper 85. Rome, Italy. 2006
- 22. Feitelson J. S., Payne J., and Kim L., (1992) Bacillus thuringiensis : insects and beyond. Bio/ Technology 10, 271-275
- 23. Fuller R., (1992). Probiotics: The Scientific Basis. Vol-1. Chapmann and Hall, US;
- 24. Fuller Roy. (2007)., History and development of probiotics, http://www.albertcllasic.net/probiotics.php (accessed June 3,2001)
- Gililand S. E., Staley T. E., and Bush L.J., 1984. Importance in bile tolerance of Lactobacillus acidophilus used as dietary adjunct. Journal Dairy Sci., 67: 3045-3051
- 26. Goktepe I., Juneija V. K., and Ahmedna M., (2006). Probiotics in food safety and human health. Boca Raton, FL : Taylor and Francis group
- Guarino A., Lo Vecchio A., Canani R. B., (2008) Probiotics as prevention and treatment for diarrhoea. Curr Opin Gastroenterol.; 25 (1): 18-23
- 28. Guarner F., Requena T., Marcos A., et al., (2010)Consensus statements from the workshop, Probiotics and health: scientific evidence. Nutr Hosp; 25: (5) 700-704
- 29. H Hofte and H. R Whiteley: Insecticidal crystal proteins of Bacillus thuringiensis, Microbiology and Molecular Biology reviews, American Society for Microbiology

- H. E Schnepf and H. R Whitely., (2000)Proc. Natl. Acad. Sci. USA, 78: 2893-2897 (1981)
- 31. Hirayama K., and Rafter J., (2000). The role of probiotic bacteria in cancer prevention. Microbes and Infection 2: 681-686
- Holzapfel W. H., Schillinger U., Du Toit M., Dicks L., (1997). Systematics of probiotic lactic acid bacteria with reference to modern phenotypic and genomic methods. Microecol Ther; 26:1-10
- J Margalit., D Dean., (1985) The story of Bacillus thuringiensis var. Israelensis (Bti)- Journal.,ncbi.nlm.nih.gov
- 34. J. L Balcazar., T. Rojas-Luna., (2007). Current microbiology, Springer
- Jijon H., et al., (2004) DNA from probiotic bacteria modulates murine and human epithelial and immune function. Gastroenterology: 126: 1358-73 [PubMed]
- Juarez-Perez., V. M., M. D. Ferrandis., and R. Frutos. (1997). PCRbased approach for detection of novel Bacillus thuringiensis subsp. Galleriae. Appl. Environ. Microbiol 59:1131-1137. [PMC free article] [Pub Med]
- 37. Kalliomaki M. A., Isolauri E., (2004)Probiotics and down-regulation of the allergic response. Immunol Allergy Clin North Am: 24:739-52
- Kullen M. J., Sanozky-Dawes R. B., Crowell D. C., and Klaenhammer T. R., (2000) Journal of Applied Microbiology, 89,511-516
- Kirby M. D., K., Bauer A.W., Sherris J. C., and Turck M., (1966). Antibiotic susceptibility testing by standard single disc diffusion method. Am J Clin Pathol. 45, p.493-496

Women Empowerment in the Fishing Industry: Bringing Attention to an Often-Overlooked Community

Misha V.

Department of Commerce, Sree Narayana College, Kollam, Kerala, *e-mail: mishav@snckollam.ac.in*

Abstract

In terms of their participation in fish-related operations, such as fish vending, fish drying, value addition, fish packing, and fish marketing, fisherwomen play an important role in the fisheries sectors. Fisherwomen work in a variety of roles for their families, communities, and the fishing industry as a whole, yet their importance is still underappreciated. This needs to change, and women should be viewed as productive partners and equal partners in fishing operations that raise the nutritional and living standards of both them and their families. Even while education has had a significant positive impact on the status of women in Kerala, the situation for fisherwomen remains appalling. As far as policy makers are concerned, the role of women in fisheries has received little attention. In order to sustain their livelihoods more successfully, women must be empowered socially, economically, politically, and legally in various aspects of their lives. This paper discusses the need for women empowerment in the fishing industry in Kerala.

Key words: Fisher women, Fishing industry, Empowerment

Introduction

The Indian economy's national sector of pride is the fishing industry. Any strategy for development must take into account the socioeconomic development of this enormous population. India is blessed with an abundance of diverse and large-scale fishing resources, and in recent years, there has been a continuous increase in the utilisation of these resources. About 14 million people are employed in the sector's primary, secondary, and tertiary segments. Women are projected to make up on average 50% of
the labour in the fisheries industry in nations like India, making it a significant source of income for them. The socioeconomic development of our nation depends heavily on the fishing industry because it increases food production, creates employment possibilities, improves nutritional status and earning foreign exchange etc.

In Kerala, fisherwomen play a significant role in the fisheries industry by participating in activities related to fish, such as fish vending, drying, peeling prawns, sorting, grading, packing fish, and manufacturing nets. Their primary activities are housekeeping, fish processing, and sale of fish. Women have a significant part in the fish processing plants. The men who work in the catch fisheries are out at sea. Women take over the labour once the males are back from the sea. This will relieve further pressure on guys who, after successfully engaging the women, once more venture into the sea. The two main tasks undertaken by fisher women are preprocessing and marketing of fresh fish.

The women's roles and obligations go much beyond just helping out around the house and contributing to household revenue. Women are able to meet everyday family necessities, save money for unforeseen emergencies or extra costs, and contribute to the household through intentional saving and adjustment with fishermen. Development of any society, community, or nation depends largely on how essential and complimentary men and women are to one another. Women, however, have endured years of complete neglect and exploitation. Even if the situation of women in the world has significantly improved after the Second World War, there is still considerable room for improvement. Even though women play substantial roles in all facets of fishing, including the artisanal, small-scale, and commercial sectors, their contributions go unacknowledged and underappreciated.

Kerala's overall population is 334 lakhs, with the fisherfolk population estimated to be 3.13% of the census population, or around 10.44 lakhs. They live in 222 marine fishing villages and 113 inland fishing communities around the state. The inland industry employs 2.40 lakh people, whereas the maritime sector employs 8.04 lakhs. (Source: Department of Fisheries, Government of Kerala). The following table lists the information on marine fisherfolk by district.

Table 1

District	Coastal	Marine		Inland		Total	Total
District	length	Male	Female	Male	Female	Marine	Inland
Thiruvananthapuram	78	64666	57200	455	531	121866	986
Kollam	37	54217	46566	13784	12981	100783	26765
Pathananthitta				951	826		1777
Alappuzha	82	78716	73023	25508	24424	151739	49932
Kottayam				10043	9517		19560
Idukki				273	273		546
Eranakulam	46	53182	50823	24181	23674	104005	47855
Thrissur	54	29064	28956	8081	7404	58020	15485
Palakkad				880	871		1751
Malappuram	70	38080	30491	1845	1610	68571	3455
Kozhikkodu	71	43813	38744	4263	4484	82557	8747
Wayanad				78	84		162
Kannur	82	22012	12731	2473	2615	34743	5088
Kasaragodu	70	18218	16791	420	400	35009	820
Total	590	401968	355325	93235	89694	757293	182929

District-wise Distribution of Male and Female Fisherfolk Population (Marine and Inland) in Kerala 2019-20 (Estimated)

Source: Department of fisheries, Government of Kerala

In fisher women households, women hold the primary position and have a significant impact on the overall development of the family through their employment, providing financial support to the family in particular. This is because even low-income males do not have to deal with a wide range of complex cultural, social, traditional, economic, and legal restraints that women have. In comparison to males, they have significantly less possibilities to pursue education and training, and as a result, they lack

many of the skills needed in the modern workplace. There seems to be a strong feminization of poverty. The burden of poverty and oppression falls disproportionately on women when the community as a whole is struggling.

Due to a lower catch, fisherwomen buy fish at wholesale or retail stores. Every day, very early in the morning, fisherwomen begin their labour. They put in more than 8 to 11 hours of work each day. Women had to wait for the boats to come back. They then take part in an auction that is fiercely competitive. When the catch is smaller, demand will be higher. The highest bidder will buy it and subsequently sell it for a profit. In a family of fisherwomen, the women will be primarily responsible for managing the household's needs, including food, childcare, education, health, and cleanliness as well as finances including taking out and repaying loans.

In the off-season, her workload doubles. In addition, many women own small businesses providing various fishing supplies and other home items. To provide breakfast and snacks to fisherman, food selling units operated by women are located in landing centres. One of the most economically distressed sectors in society is the fishing industry. Women's participation in fisheries may be examined from a social, political, and technological perspective, all of which reveal that women's contributions are often overlooked. This under appreciation of women's contributions stymies long-term growth, leading to increased poverty and food insecurity.

Difficulties Confronting Fisherwomen in Kerala

- 1. Sociologists and economics have long ignored the socioeconomic conditions of fisherwomen.
- 2. Improved marketing facilities for fish vendors is one of the primary issues that the fisher women are concerned about.
- 5. The fisherwomen are trapped in a cycle of borrowing and repaying money, resulting in poor savings and high debts. The most crucial stage in the community's uplift is to enhance purchasing power by raising fishing income and establishing auxiliary occupations.
- 6. The fishing community is traditionally lacking the culture of education, and they have been kept away from the general educational milieu.
- 7. Women from fishermen community usually engaged in the subcategory works or performing supportive roles to men

- 8. Fisherwomen usually do not enjoy the freedom to go for some work or starts a business or interact with agents, customers especially when they are males.
- 9. The too formal administrative procedures for obtaining loans also make it inaccessible for fisherwomen entrepreneurs and with series formalities and procedures coupled with lack of basic education and awareness makes the fisher folks become shy to approach these institutions.
- 10. The fisherwomen are often denied credit from public sector institutions due to lack of ownership of assets. The too-formal administrative procedures for obtaining credit also make it inaccessible to small-scale entrepreneurs.
- 11. In many situations, vendors are usually denied access to public transport, given the nature of the product they are dealing with. This means hiring autorickshaws, or other forms of transport, a significant expense in itself. Male fish vendors, with access to their own transport, are at a comparative advantage.
- 12. The responsibility of household management-food, childcare, children's education, family health, sanitation, financial management and the responsibility of getting and repaying debts will be mostly on the women's shoulders and the burden of her responsibilities doubles in the offseason.

Need For Women Empowerment In Fishing Sector

Empowerment is the process of gaining, creating, or coordinating the power you need to achieve your objectives. Empowerment is a multifaceted, multi-dimensional, and multi-layered term that is described as a feeling that stimulates psychological energy in order to achieve one's objectives. Empowerment, according to the Government of India Report, is described as the transition from a position of forced powerlessness to one of power. The word "women's empowerment" refers to the process of giving women the power to resist others' influence and to help them live a stable and successful life. Women have traditionally been seen as the weaker members of society. Women's empowerment entails providing them with the tools they need to be economically self-sufficient, selfreliant, and have good self-esteem in order to meet any challenge, as well as the ability to engage in growth activities. Women who are motivated should be able to engage in the decision-making process.

Empowerment strategies are a broad term that refers to any strategy that allows women to reach their full potential. These methods are primarily based on raising consciousness of information and resources, assisting them in asserting autonomy in decision-making, assuming greater control over circumstances and thus influencing their survival, and finally, assisting them in breaking free from all shackles of tradition, values, and practices. It would be difficult to change their situation until they become aware of the injustice they are subjected to and take steps to improve their situation.

Women's presence in the fishing industry will not be apparent until after the catch has been landed. This may be a tradition that developed out of the need for men to rest and relax after a long period of hard work in the water. Until about a decade ago, women dominated the fish retailing industry in both the inland and marine sectors across the region. After the fish haul, women lend a big hand in sorting, grading, and processing the catch in the coastal belts, and they make up a significant part of the work force in export-oriented marine products processing units.

The fisherwomen were the ones who sold the catch that the men carried in to the markets. Due to dwindling fish stocks, they will have to source produce from other sources, negotiate with cooperatives, and battle manipulative moneylenders. With less produce, they had less revenue, and with less income, they were in debt to money lenders. They were made ever more fragile and insecure as conventional fish markets were absorbed by large corporations. They were forced to travel long distances to sell their produce in markets, but they were refused access to public transportation due to their stinky baskets. To make matters worse, large-scale sand mining operations contaminated the water, forcing women to walk long distances to obtain drinking water.

Men and women participate in distinct and sometimes complementary practices in the fisheries field, which are heavily influenced by the social, cultural, and economic contexts in which they work. Women and men may play dominant roles or be in high-dependency situations. Women make up roughly half of the population involved in fisheries production. Males dominate fish catching in most areas. Male crews man ocean-going vessels for offshore and deep-sea fishing, while women mostly handle smaller boats and canoes in coastal artisanal fishing communities. Women are often in charge of onshore tasks that require expertise and time, such as making and mending nets, sorting, and marketing. Onshore tasks that require expertise and time, such as making and mending nets, processing and marketing catches, and providing services to the vessels, are often handled by women. However, in some developing countries, women have emerged as important fish entrepreneurs who control large sums of money, fund a number of fish-based businesses, and produce significant returns for their families and communities.

The role of women and men in the fishing industry has been dramatically reduced due to mechanisation. The majority of fish markets are owned by large contractors and merchants. Men are losing jobs as a result of the decrease in human resources, and some are engaging in irresponsible habits such as consuming alcoholic beverages and gambling. This also means that women are taking on the task of raising money to cover household expenses and other unforeseen costs. Traditional fish vendors are now threatened by large companies. They can easily capture the fisheries market with their vast capital and technical capabilities.

In Kerala, the facilities and conditions in the fish markets are also appalling. Fish markets are highly unhealthy. Despite the fact that women make up a large portion of the market's fish vendors, they are unfairly denied the market's few facilities. Women are sent to the dirtiest and leastnoticed corners of the markets, resulting in gross gender discrimination. They aren't even provided with tables on which to show their fish. Women are often refused access to basic amenities and utilities such as running water, clean drinking water, ice boxes or freezers, as well as a separate toilet and dressing area.

In disaster and emergency situations, gender inequality and marginalization of women are rampant. They were unable to receive proper nutrition or access healthcare services during this period. The protection of women from sexual harassment and the avoidance of dependency are critical. But it's also important to see women as individuals with unique experiences, rather than as helpless victims. Women's livelihoods and earning potential must be prioritized as well. Furthermore, all policies and programs promoting women's rights and protecting their interests must take into account the long-term effects of a shift in gender balance. Women, on average, have more problems with technology, financing for business growth, and transportation than men. Their predicament is exacerbated at the retail level, where price fluctuations for their goods occur, or where social and/or cultural constraints restrict their market prospects to nearby locations. Even if women have access to local markets, they do not have access to the national or global markets that men do. They also assume responsibility for their families' everyday subsistence needs, depleting their working capital in the process.

Women engage in the fishing industry in a variety of ways, depending on the market. Women should be equal partners and active participants in fisheries programs that will raise their nutritional and living conditions and those of their families. They should be given the opportunity to acquire appropriate technologies that will allow them to effectively contribute to the long-term production and growth of fisheries. As a result, increasing women's involvement and decision-making in fisheries development activities is critical. The proper policy implications for recognizing women's position in fisheries should be emphasized.

How Do We Encourage Gender Equality in the Fishing Industry and Empower Fisherwomen?

In order to ensure that their desires and needs are properly covered and met, both women and men must be given equal opportunities and be able to engage in the development process. Despite the fact that international human rights law acknowledges equal rights for men and women, women continue to be oppressed and their workloads and obligations have increased. Women must be enabled to engage in decision-making processes and have access to physical and capital resources in order to grow their industry and meet their needs and ambitions, given their critical position in the post-harvest market.

At both the national and regional levels, the arrival of globalisation and modernisation has resulted in significant changes in the fisheries sector. Fisherwomen face threats of violence in far marketplaces and on the streets as production has increasingly been transferred from villages to factories, contributing to the cultural pressures on them. Despite this, women have continually defied various types of imposition, limitation, and coercion stemming from more difficult access to maritime goods, facilities, and systems. Dialogues with the government and other groups took place as a result of unwavering pickets, strikes, and other civil mass acts, and the fisherwomen were recognized as stakeholders in the process.

Women's rights, freedoms, and resources must be overcome socio-cultural norms and beliefs, as well as political and economic forces that suppress or marginalize them, so that they can engage more fully and fairly in the sustainable development of their societies. Empowering women entails preparing each woman to actively engage in the decision-making process in order to achieve a better standard of living. Empowerment is a multifaceted, active process that should enable people to reach their greatest potential in all aspects of life. This power must be gained, maintained, and used. The average Indian fishing family nowadays struggles to make ends meet throughout the year. As a result, the great potential of unemployed fisherwomen must be realised, which can be accomplished by empowering them to do something remunerative on their own. This, however, requires that the women are motivated, have a degree of awareness, the ability to think critically and take decisions, and above all possess a measure of selfesteem. Some ways and means of empowering fisherwomen in Kerala is discussed below.

- 1. They require education and training for different areas of management and production. They are given education about nutrition, health and sanitation, violence and child care and training on new technologies, best practices and techniques along with financial assistance. Education and training empowers them with the ability to think, act, take appropriate decisions and protect oneself from oppression & abuse.
- 2. With the advent of automation, motorization and communication in fisheries sector, women can also go for active fishing in the coastal inshore sector if adequate training is given. Involvement of fisher women in all areas of fishing practices should be encouraged.
- 3. The empowerment of women through SHGs would give benefit not only to the individual fisherwomen but also for the family and the entire community as a whole. Participation of fisherwomen in the development process through Self-help groups helps to bring desired changes in the quality of individual life and also social cohesion in the society.

- 4. Need-based training programmes for fisherwomen should be organized to enhance the awareness and technical know-how in the respective area. This would definitely encourage them to start self-generating gainful employment ventures.
- 5. Women vendors have organized themselves in various ways to facilitate their trade. The organizations range from informal groups of women who collectively hire transport to bring their fish to markets, to more formal fish marketing co-operative societies.

The Government of Kerala Initiatives

The Government of Kerala is very committed in uplifting the fisher folk in Kerala. The Fisheries Department of Kerala, governed by the Honorable Minister for Fisheries, is considered to be one of the most important productive and developmental sectors of the state. Various attempts have been made by the Government of Kerala through various agencies and departments for the social and economic development of fisher folk especially for fisherwomen in Kerala. It strengthen the livelihood activities of fisherwomen groups and thereby ensuring their economic efficiency. It considers the fishing community as an unorganized sector and provides financial and marketing assistance to them. The financial inclusiveness program be specifically extended to this sector also. Moreover the implementation of different policies by the government for the fisher folk helps the betterment of the community, especially in the case of fisherwomen. It has given many opportunities for women to come forward to the main stream of the society.For fisher women empowerment, the Ministry of Fisheries has initiated many programs with the support of government and non-government organizations. The Government assists in improving the efficiency of SHGs for planning and implementing special schemes in fisheries sector. The government lessen the gender discrimination of fisherwomen by giving priority for fisherwomen to institutional credit access, equal participation of fisherwomen in auction, fixing of minimum quantities (quota) of fish for women, and so on. In order to avoid the exploitation of money lenders, the fisher women are given interest free loans. The Government of Kerala institutions such as Matsyafed and Kerala Fisherman's Welfare Fund Board also implement some schemes for the fisherwomen community.

Society for Assistance to Fisherwomen (SAF) is a registered organization under Travancore Cochin literary and charitable societies Act. It has a great role in enhancing the socio-economic condition of fisherwomen in Kerala. The Vembanad project and Theeramythri program are some initiatives running under SAF for the betterment of fisherwomen in Kerala. The main aim of SAF is the upliftment of this community and eradication of poverty of fishing folks.

Conclusion

The lack of awareness and low-level education are one of the major obstacles to the development of fisherwomen in Kerala. They need continuous motivation and encouragement for development. The proper education and training definitely motivate them to start the entrepreneurial activities among them. The Entrepreneurship among women, no doubt, improves the wealth of the family and nation. However, since the foundation of the SAF, the social and economic character of the fishing community has improved as a result of the implementation of various income-generating enterprises in the state's coastal districts. Women's participation in various professions such as food production, supermarkets, and fish drying units aided the community in increasing revenue and improving living conditions. Their interactions with other members of the community taught them the value of education and inspired them to educate their children.

References

- 1. Fisheries Hand Book. http://fisheries.kerala.gov.in/sites/default/files/ 2020-10/fisheries%20 hand%20book%202020.pdf
- 2. Hand book on fisheries statistics.https://dof.gov.in/sites/default/files/2021-02/Final_Book.pdf
- 3. http://www.fisheries.tn.gov.in/selfhelpgroup.html
- 4. http://www.safkerala.org
- 5. https://www.fisheries.kerala.gov.in/saf
- Kerala Marine Fisheries Statistics. http://fisheries.kerala.gov.in/sites/default/ files/2018-08/marine_2015.pdf
- 7. Marine Fisheries Census India. http://eprints.cmfri.org.in/8998.

Biodegradation of Phenol by Bacterial Strain Isolated From Soil

Sija S. L.*, Akshay S Kumar

Department of Biotechnology Sree Narayana College, Kollam, Kerala, India * *e-mail: sijasl007@gmail.com*

Abstract

The present work primarily involves the study on biological degradation of phenol using various bacterial strains. In the present study, soil sample from the dumpsite of hospital wastes is taken for the enrichment study for isolation of soil microorganism present in the contaminated site. A major problem facing countries around the world is environmental contamination caused by the release of toxic organic compounds such as phenols. These compounds can contaminate different sectors of the environment such as atmosphere, water and soil. The growth and phenol biodegradation study were carried out in mineral salt medium broth with phenol as the sole carbon source and energy. The isolated strains were examined for colony morphology, Gram staining and biochemical tests. Phenol degrading ability of all the bacterial strains was evaluated initially. The efficiency and resistivity of this biomass was checked with phenol concentration 0.5%. Four different microbes were identified and isolated which could resist this high concentration of phenol. The physiological parameters of the isolate were optimized and it was found that the optimum temperature and pH condition for the microorganism is 35° C and 7 respectively.

Keywords: Biodegradation, Bioremediation, Phenol, Contaminated Soil, Bacteria

Introduction

The methods of pollution control are receiving increased attention as a result of the current rise in concern over pollution and its effects and are equally more important because all pollutants that are emitted into the atmosphere are in some way or another very damaging to people, resulting in various diseases or disorders. From the list of many pollutants one of the pollutants is phenol which is 11th most toxic compound out of 126 toxic compounds (ATSDR, 2008; EPA, 1979). Also, the limit for inhalation of phenol vapor is set to 0.04ppm by EPA. The major problematic cause of phenol release contamination of soil and water is this phenol released from industries in free form or in the form of phenol derivative. These contaminants have devastating effects on our health and life of all the other species which are in their vicinity. They also have an adverse effect on the ecological system and lead to poison the food chains of terrestrial and aquatic life. Many bacteria, including both aerobic and anaerobic ones, use phenol as their only source of carbon and energy as a result of its frequent prevalence in the environment. Hence, the idea of phenol degradation employing microorganisms is introduced. The most crucial approach for phenol degradation is microorganisms because it doesn't create any harmful waste or byproducts.

For this reason, removal of phenolic compounds from the environment is a crucial strategy to maintain human and environmental health, and different strategies have been explored to reduce and eliminate the release of phenolic compounds. Various physical, chemical and biological methods have been employed to reduce toxic levels of these compounds, with a particular emphasis on phenol compounds, in wastewater effluents prior to their discharge into the environment (Kulkarni and Kaware, 2013). Despite the success of some treatment's methods, some of the disadvantages of these methods were high costs, and uncompleted chemical reactions leading to the production of byproducts potentially more toxic than the original pollutants (Dubey and Hussain, 2013). Consequently, low cost and effective alternative solutions are necessary. Bioremediation strategies were advanced in the last three decades, using microbial species as degrading agents as a more efficient means to remove these pollutants from the environment (Adams et al., 2015). Many microorganisms utilize phenol as the sole carbon source for their growth. Several microbes both anaerobic aerobic microorganisms degrading phenol are isolated and and characterized, parameters for example contaminant concentrations, feasible biomass, concentrations, temperature, pH, microbial completion and adaptation are the most significant factors that influence phenol degradation rate and depends on the period during which the culture was adapted to

phenol. In this study, phenol was used as a model compound for removal by microorganisms.

Materials and Methods

Collection of soil samples

Soil samples were collected from the area contaminated with the sewage discharged from the Hospital area, Kollam, Kerala. The samples were collected aseptically from top 4 cm soil profile where most of the microbial activity takes place, and thus where most of the bacterial population is concentrated. The soil samples were collected using sterile sealed polythene bags and transported to the laboratory for further analysis.



Fig.1: Area of sample collection

Isolation of bacterial strain capable of degradation of phenol by soil enrichment method

Isolation of bacterial strain was performed using Mineral Salt Medium (MSM).

Chemical composition	g/L
KH ₂ PO ₄	0.5
K ₂ HPO ₄	1.5
NaCl	0.5
MgSO ₄ .7 H ₂ O	0.5
NH ₄ NO ₃	1
FeSO ₄ .7H ₂ O	0.01
CaCl ₂ .2H ₂ O	0.01
NH ₄ SO ₄	0.5
рН	7

Table 1: Composition of mineral salt medium

Mineral salt medium was prepared by adding the components above and then kept in laminar air flow for some times. A volume of 100 ml of mineral salt medium were taken in each 5 conical flasks with different phenol concentration (0.1-0.5%). A quantity of 1gm of soil sample was suspended in each 5 conical flasks containing 100 ml of mineral salt medium. Phenol was used as sole source of carbon and then the culture flasks were incubated at 32°C on rotary shaking incubator at 120 rpm for a week (Nagamani *et al.*, 2009)

After 5days, serial dilution was done by taking 1ml of sample from each of the 5 conical flasks containing the mineral salt broth with different phenol concentration and transfer it into 9ml of sterile water taken in each test tube and mixed properly. Then 1ml of the suspension from the initial test tube was aseptically transferred into test tube containing 9ml of sterile water and mixed properly (10^{-2}) . Further 1ml of suspension was transferred into the test tube containing 9ml distilled water thoroughly and diluted upto 10^{-6} dilution.

From each dilution, 0.1ml of the sample was poured into already prepared mineral salt agar plates. The inocula were spread properly by using an L-rod. The plates were incubated for 24h at 37°C. After incubation, average number of bacterial colonies in each plate was counted and calculated. Total bacteria present per gram of soil sample was calculated as

Number of colony forming units (CFU)per gram of soil = $\frac{1}{\text{Dilution factor}}$ X Number of colonies

Isolation of pure culture

Select individual colonies from the plates. Choose only colonies that are well separated from neighboring colonies and look morphologically distinct from each other. Sterilize the loop by dipping it in alcohol and flaming it. Quickly open petridish of interest, and touch the loop to a bare spot in the agar to cool it. Then, remove a small amount of a colony of interest onto the loop. Taking a fresh nutrient agar plate, make a streak a few centimeters long on one side. Sterilize and cool again, then make a streak that crosses the initial streak only on the first pass. Repeat this process twice more in the same manner.

Maintaining the stock culture

The stock culture was maintained on a mineral salt agar plate and they were kept at 4°C and transferred periodically for further analysis. The isolated culture was sub cultured in the mineral salt medium and 1.5ml of the culture were mixed with 0.5ml of sterile 60% glycerol stock and preserved in cryotubes. The tubes were mixed properly by vortexing and kept 80°C for long term storage.

Morphological and biochemical characterization of bacteria (Prescott *et al.*, 2008)

Morphological and biochemical characterization of isolated bacterial strains were done by Gram staining and through several biochemical tests such as IMViC test (Indole test, Methyl red test, Voges Proskauer test and Citrate utilization test), amylase test and catalase test.

Growth kinetics of microorganisms degrading phenol

Biomass was estimated by Dry cell weight method. A volume of 100 ml of sterile mineral salt medium containing phenol (0.5%) as sole source of carbon were taken in each 4 conical flasks. The bacterial strains obtained by enrichment isolation method were inoculated into a sterile mineral salt media broth and incubated at 35°C in shaking incubator at 120 rpm. Samples were taken at 12 hr interval up to 96 hour and 1 ml of the culture was taken in an Eppendorf tube. The tube was then kept in the centrifuge at 1400 rpm for 10 minutes. It was observed that biomass was collected at the

bottom and the top liquid part is called the supernatant. The supernatant was then separated from the top and the biomass was allowed to dry for 15 minutes. The weight of an empty Eppendorf tube was measured and then the weight of the tube with biomass was measured. The difference of these two weights gave the growth of biomass resulted due to phenol degradation.

Estimation of phenolic compound Degradation

A volume of 100 ml of mineral salt medium were taken in each 5 conical flasks and the culture media were adjusted to pH 7.0. One is taken as control. Sterilize the broth and then add phenol 0.5g/100ml (0.5%) as sole source of carbon to each conical flask. The bacterial strains obtained by enrichment isolation method were inoculated into sterile broth. The sterile mineral media broth containing 0.5% phenol as carbon source without any inoculum was kept as control. A series of such conical flasks was then shaken at a constant speed of 120 rpm at a temperature of $35^{\circ}C$.

At regular intervals (0hr, 24hr, 48hr, 72hr) the estimation of phenolic concentration was done by using Folin's Ciocalteau method. Samples (0.5ml) collected from different conical flasks at regular intervals were mixed with 2.5 ml of Folin-Ciocalteu reagent (previously diluted 10-fold with distilled water) and 2 ml of Na₂ CO 3 (7.5%). After 15 min at 45°C, the absorbance was measured at 650 nm versus blank sample on spectrophotometer (shimadzu-UV-3600). The samples were prepared in triplicate for each analysis and the mean value of absorbance was obtained. The average absorbance values obtained at different concentrations of gallic acid were used to plot the calibration curve. The decrease in concentration of the phenolic compound was determined by using gallic acid equivalent per gram of dry weight (mg GAE/g dw). The percentage degradation of gallic acid by bacteria was calculated by the following equation (Shweta *et al.*, 2013).

Percentage of degradation

Statistical analysis

Data were expressed as means \pm standard deviation (SD) of three replicate determinations. All statistical analysis was carried out using a SPSS

(Chicago, IL) statistical software package (SPSS for Windows, ver.17, 2008). To determine whether there were any differences among the means, one way analysis (ANOVA) and the Duncan's New Multiple range test were applied to the result at 0.05 level of significance (p<0.05).

Results and Discussion

Isolation of bacterial strain capable of degrading phenol by soil enrichment method

Isolation of bacterial strain was performed using an enrichment culture technique using Mineral Salt Medium (MSM). A volume of 100 ml of mineral salt medium were taken in each 5 conical flasks with a selected phenol concentration (0.1-0.5%) as the sole source of carbon at optimized pH (7) and temperature 35°C (Fig.2). A quantity of 1gm of soil sample collected from dumpsites where hospital wastes as well as the sewage generated from the hospital are been discharged was suspended in each 5 conical flasks containing 100 ml of mineral salt medium. Up on enrichment with a xenobiotic compound, the natural selection of microorganisms adapted to the presence of a xenobiotic has high potential for the biodegradation of the compound. Enrichment culture technique has earlier been used to isolate several bacteria capable of phenol degradation, which includes *Arthrobacter, Bacillus cereus, Citrobacter, Mircococcus* and *Pseudomonas putida* (Kanekar *et al.*, 1999).



Fig.2: Enrichment of soil samples in mineral salt media containing different concentration of phenol (0.1-0.5%)

Selective isolation of phenol degrading bacteria

The isolation of specific colonies of microorganism was done by serial dilution method. After performing serial dilution method (Fig.3), numerous colonies were obtained from each of the 5 conical flasks containing the mineral salt broth with different phenol concentration such as (0.1-0.5) %. The total bacterial population (CFU/ml) was observed at 10^{-4} dilution for all the tested concentration. The population was high (2 x 10^5 CFU/ml) in the culture flask containing 0.2% of phenol concentration. The culture flask containing (0.1-0.5%) of phenol concentration. The culture flask containing 0.5% of phenol showed 0.38 x 105 CFU/ml. The growth of phenol resisting microorganism is described in the table 2. The cultures obtained in the various dilutions of the tested soil samples are shown in figure 4. Even a minute amount of soil contains millions of bacteria and hence dilution of soil sample is necessary before bacterial isolation. This was performed by the serial dilution spread plate technique. Similar method has been used by Paller *et al.*, 1995.



Fig.3: Serial dilution of soil samples

Concentration of phenol (g/100ml)	Number of CFU
0.1	1.5x 10 ⁵ CFU/ml
0.2	2 x 10 ⁵ CFU/ml
0.3	0.63 x 10 ⁵ CFU/ml
0.4	0.59 x 10 ⁵ CFU/ml
0.5	0.38 x 10 ⁵ CFU/ml

Table 2: The details of the soil samples collected from different locations.



Fig.4: Cultures obtained in the various dilutions of the tested soil samples Isolation of pure culture

Among different colonies, four bacterial colonies were aseptically taken and streaked on nutrient agar plates and pure cultures of those colonies were prepared (Figure 5).



Fig.5: Pure cultures (B1, B2, B3 & B4) obtained on the nutrient agar plates

Morphological characterization of bacteria

Isolated bacteria were characterized through morphological characterization by Gram staining. The results of colony morphological study of isolated bacteria presented in Table 3. Morphological characteristic revealed that the isolated bacterial strains (B1 & B3) on the agar medium were rod shaped and gram positive whereas the isolated bacterial strains (B2 & B4) on the agar medium were round shaped and gram negative (Table 3 & Table 4).

Colony Features	Bacterial Strains					
	B1	B2	B3	B4		
Colour	White	white	Creamy	Creamy		
Shape	Rod	Round	Rod	Round		
Margin	Filamentous	Regular	Entire	Regular		
Elevation	Flat	Flat	Raised	Raised		
Surface	Smooth	Smooth	Smooth	Smooth		
Pigments	Nil	Nil	Nil	Nil		

Table 3: Colony morphology of isolated soil bacteria

Table 4: Gram's staining of bacterial isolates

Bacterial isolates	Result		
B1	Gram Positive		
B2	Gram Negative		
B3	Gram Positive		
B 4	Gram Negative		

Biochemical characterization of bacteria

The phenol degrading bacteria were isolated from different soil samples were characterized through several biochemical tests such as IMViC test (Indole test, Methyl red test, Voges Proskauer test and Citrate utilization test) (Table 5). Morphological and biochemical tests were carried out according to Bergey's Manual of determinative Bacteriology (Buchana and Gibbons, 1974).

	Bacterial Isolates					
Tests	B1	B2	B3	B4		
Indole test	Positive	Negative	Positive	Negative		
Methyl red test	Positive	Negative	Positive	Negative		
Voges Proskauer test	Positive	Negative	Negative	Negative		
Citrate utilization test	Positive	Negative	Negative	Negative		

Table 5: Biochemical test of isolated soil bacteria

Indole test

In this experiment, the isolated bacterial strains (B1, B2, B3& B4) to be tested was inoculated in peptone broth and incubated overnight at 37°C for 48 hours along with uninoculated peptone broth (control). After incubation, few drops of Kovac's reagent were added. The tubes inoculated with bacterial strains B1 and B3 showed the formation of a pink colour in the reagent layer indicated the positive reaction. While the negative reaction was shown in the tubes inoculated with bacterial strains B2 and B4 (Fig.6).



Fig.6: Indole test [B1, B2, B3, B4 & C (uninoculated)]

Methyl red test

Methyl red is widely used as pH indicator for its characteristic that change colour in response of changes in pH. The bacterial strains (B1, B2, B3 & B4) to be tested was inoculated into peptone broth and incubated at 37°C for 48 hours along with uninoculated peptone broth (control). The pH of the medium was tested by addition of 5 drops of methyl red reagent. The tubes inoculated with bacterial strains B1 and B3 showed the development of red colour and it was taken as positive whereas methyl red negative organisms (B2 & B4) produced yellow colour (Fig.7).



Fig.7: Methyl red test [B1, B2, B3, B4 & C (uninoculated)]

Voges Proskauer test

The bacterial strains (B1, B2, B3 & B4) to be tested was inoculated into peptone broth and incubated at 37°C for 48 hours along with uninoculated peptone broth (control). Barritt's reagent A and Barritt's reagent were added to the broth with shaking and the tube was allowed to stand for 15 minutes. The tubes inoculated with bacterial strain B1 showed the development of a cherry-red colour and it was taken as positive whereas the bacterial strains B2, B3 & B4 showed negative result (Fig.8).





Citrate utilization test

In this part of the experiment, the isolated bacterial strains (B1, B2, B3 & B4) were inoculate and incubated for 24hrs on Simmon's slant agar along with uninoculated Simmon's slant agar (control). The first tube inoculated with bacterial strain B1 showed positive result, in which the colour of the agar changed from green to blue. Meanwhile, the remaining tubes inoculated with bacterial strains B2, B3 & B4 showed negative result, in which the agar remained green in colour. The colour of the uninoculated Simmon's slant agar (control) remained green (Fig.9).



Fig.9: Citrate utilization test [B1, B2, B3, B4 & C (uninoculated)

Biochemical test is carried out to differentiate the members of family enterobacteriaceae. Two bacterial strains B1 and B3 showed positive reactions for Indole test, Methyl red test whereas only one bacterial strain (B1) showed positive result for Voges Proskauer test and Citrate utilization test. IMViC test were also carried out in various studies to differentiate the members of family enterobacteriaceae (Chakraborty *et al.*, 2010).

Primary screening for amylase production

Primary screening of the isolated bacterial colonies (B1, B2, B3 & B4) were done individually for their ability to produce amylase on the starch casein agar plates. The freshly prepared single culture was point inoculated on the center of the agar plates and incubated at 30°C for 3 days. The hydrolysis of starch around colonies was visualized by flooding the plates with grams iodine solution. The plates were then kept undisturbed for 5-10 minutes and then the iodine solution was discarded from the plates.

In the zone of degradation, no colour forms, which is the basis of the detection and screening of an amylolytic strain. The zone formation around the colony was due to the hydrolysis of starch by amylolytic enzymes produced by culture. Among the 4 bacterial isolates, only 3 isolates (B1, B2 & B4) were found to be the producers of amylase in starch agar (Fig.10).



Fig.10: The zone formation around the colony due to the hydrolysis of starch by amylolytic enzymes (B1, B2 & B4)

Catalase Test

This test demonstrates the presence of catalase, an enzyme that catalyses the release of oxygen from hydrogen peroxide (H₂O₂). It is used to differentiate those bacteria that produces an enzyme catalase from noncatalase producing bacteria. Here all the bacterial strains (B1, B2, B3 & B4) showed negative result (Fig:11). Normally 3% H₂O₂ is used for the routine culture while 15% H₂O₂ is used for detection of catalase in anaerobes.





Growth kinetics of microorganisms degrading phenol

The cell growth at different time with an interval of 12 hours was recorded. The readings are as per noted in Table 6. A graph was plotted with time versus the biomass growth (Fig.12). The maximum growth of biomass shows that particular microorganism can resist phenol with maximum growth and maximum degradation of phenol. It is observed from the table below that the organisms B1& B2 showed maximum growth at 60 hours but the growth of biomass is greater for the organism B3 at 48 hours.

	Cell growth or biomass (mg)				
	B1	B2	B3	B4	
0hr	0	0	0	0	
12hr	0.11	0.043	0.045	0.033	
24hr	0.19	0.16	0.18	0.09	
36hr	0.23	0.195	0.185	0.12	
48hr	0.35	0.36	0.6	0.21	
60hr	0.48	0.41	0.57	0.38	
72hr	0.21	0.29	0.3	0.28	
84hr	0.17	0.17	0.1	0.11	
96hr	0.02	0.036	0.05	0.034	

 Table 6: Observation for the cell growth with respect to incubation time for 4 isolated colonies



Fig.12: Degradation of phenol by various bacterial strains ([B1, B2, B3, B4 & C (uninoculated)]

Estimation of phenolic compound Degradation by isolated bacterial strains

In the present study, four different bacterial samples were explored to estimate their phenolic compound degradation. Total phenol compounds, as determined by Folin-Ciocalteu method, are reported as gallic acid equivalents by reference to standard curve (Fig.13). The calibration curve showed linearity for gallic acid in the range of 2-10 mg/ml, with a correlation coefficient (\mathbb{R}^2) of 0.992 (Fig.13). Spectrophotometric detection was done at 650 nm. Formation of blue colour with different concentration of standard gallic acid is represented in Figure 14.



Fig. 13: Standard calibration curve of gallic acid at concentrations of 2, 4, 6, 8 and 10 mg/ml



Fig.14: Formation of blue colour with different concentration of standard gallic acid (2 -10mg/ml)

Table: 7 Degradation of phenol by various bacterial strains ([B1,]	B2,
B3, B4 & C (uninoculated)]	

	Phenol concentration (mg/ml)					
	B1	B2	B3	B4	Control	
Ohr	5	5	5	5	5	
24hr	3.34	4.01	3.77	2.47	5	
48hr	2.78	3.18	2.5	1.45	5	
72hr	2.11	2.29	1.72	0.28	5	



Fig.15: Degradation of phenol by various bacterial strains ([B1, B2, B3, B4 & C (uninoculated)]

After 24 hours of inoculation, the bacterial strains B1, B2, B3 and B4 showed a decrease in concentration of phenolic compound ie, gallic acid to 3.34, 4.01, 3.77 and 2.47 mg/ml respectively. After 48 hours it was reduced to 2.78, 3.18, 2.5 and1.45mg/ml respectively and after 72 hours it was reduced to 2.11, 2.29, 1.72 and 0.28 mg/ml respectively (Fig.15). The result of the present study showed that the bacterial strain B4 showed maximum phenolic degradation after 72hrs of incubation, ie, from 5mg/ml to 0.28mg/ml. After 48 hours of incubation, the 92.2%, 95% and 95.8% of phenolic compound in the sample has been reduced by the bacterial strain B4 (Fig.15).

Similar to the result of the present study, the use of starch nutrient agar and iodine for detecting amylase producing microorganisms have been reported by Forgarty and Kelly (1979) and also by Iverson and Millis (1974), who stated that starch hydrolysis can be detected on plates as a clear zone surrounding a colony. The mechanism of a clear zone observed was due to the fact that the amylase produced during the growth of the organisms has hydrolysed the starch around the colony, there by testing negative when flooded with iodine. Out of these isolates, only four were selected and they were subjected to higher initial phenol concentration 0.5%. Of the strains tested, B4 showed a higher potential to degrade phenol at 0.5% which ultimately led to higher biomass production by the strain. The results obtained are in agreement with the findings of (El-Sayed et al., 2003) they have isolated Pseudomonas aeruginosa from a coking plant which used phenol as the sole carbon source. Several species of Pseudomonas as phenol degraders have been reported by various researchers; Pseudomonas cepacia (Ghadi and Sangodhkar, 1995), Pseudomonas pictorum (Chitra et al., 1995) and Pseudomonas putida (Kanekar et al., 1999).

Acknowledgements

The authors are thankful to Dept. of Biotechnology, Sree Narayana College, Kollam, Kerala, India for providing laboratory facilities to carry out this work.

References

- Adams GO, Fufeyin PT, Okoro SE, Ehinomen I. (2015). Bioremediation, biostimulation and bioaugmention: a review. *International Journal of Environmental Bioremediation & Biodegradation*, 3.
- ATSDR (2008). Toxicological profile for phenol. Georgia.: Division of toxicology and environmental medicine/applied toxicology branch, US Department of health and human services.
- Buchanan RE and Gibbons NE. (1974) Bergey's Manual of Determinative Bacteriology. 8th Edition, Williams and Wilkins, Baltimore, 1268 p.
- Chakraborty S, Bhattacharya T, Patel TN. (2010). Biodegradation of phenol by native microorganisms isolated from coke processing wastewater. *Journalof Environmental Biology* 31, 293-296.
- Chitra S, Sekaran G, Padamavathi S, Chandrakaran G. (1995). Removal of phenol from waste water using a biocatalyst. *Applied and Environmental Microbiology* 13, 1-4.
- Dubey SK and HUSSAIN A (2013). Phenol Biodegradation: A review. Proc. of the international conference on Advances in Civil, Structural and Environmental Engineering-ACSEE 2013. China.
- El-Sayed WS, Ibrahim MK, Abu-Shady M, El-Beih F. (2003). Isolation and characterization of phenol catabolizing bacteria from a coking plant. *Bioscience Biotechnology and Biochemistry* 67, 2026-2029.
- EPA. (1979). Method 420.1: Phenolics (Spectrophotometric, Manual 4 AAP With Distillation) [Online]. USA Environmental Protection Agency (EPA).Available:<u>https://www.epa.gov/sites/production/files/2015-08/</u> documents/ method_420-1 _1978.pdf. [Accessed 5th of May 2015].
- Fogarty William M and Catherine T. Kelly. (1979). Enzymic Developments in the Production of Maltose and Glucose Enzyme Technology pp 149-163.
- Ghadi SC and Sangodkar (1995). Potentials of *Pseudomonas cepacia* PAA bioremediation of aquatic wastes containing phenol. Frontiers in Applied Environmental Microbiology (Ed.) A.Mohandas and I.S. Bright Singh, School of Environmental Studies, Cochin University of Science and Technology, Cochin, 9-11.
- Iverson WG and Nancy F Millis. (1974). A Method for the Detection of Starch Hydrolysis by Bacteria. *Journal of applied microbiology*, 37(3). 443-446.
- Kanekar PP, Sarnaik SS, Kelkar AS. (1999). Bioremediation of phenol by alkaliphilic

bacteria isolated from alkaline Lake of Lonar, India. *Journal of Applied Microbiology* Symposium Supplement 85, 1285-1335.

- Kulkarni SJ and Kaware JP (2013). Review on research for removal of phenol from wastewater.*Internationaljournal of scientific and research publications*, 3, 654.
- Nagamani A, Soligala R, Lowry M. (2009). Isolation and characterization of phenol degrading *Xanthobacter flavus*. *African Journal of Biotechnology*., 8 (20), 5449-5453.
- Paller G, Hommel RK, Kleber H.P. (1995). Phenol degradation by *Acinetobacter calcoaceticus* NCIB 8250. *Journal Basic Microbiology* 35, 325–335.
- Prescott ML, Harley PJ, Klein AD. Microbiology 7th edition. Publishing Group. 2008; 42-51, 232-233, 762-764.
- Shweta and Dhandayuthapani K. (2013) "Influence of media supplements on phenol biodegradation by *Pseudomonas aeruginosa* SPD 10," *Int. J. Curr. Microbiol. App.Sci.* 2 (6), 64-69.

Contrasive Analysis of the Philosophical Perfections of Sri Narayana Guru and Sri Chattambi Swamikal

Anjaly B.

Department of Sanskrit Sree Narayan College, Kollam *e-mail: vijayanjaly@gmail.com*

Abstract

The philosophies and activities of Sree Narayana Guru and Sri Chattambi Swami stems forth from the same Advaita view. A closer study of their philosophies would reveal some remarkable differences. These differences may be observed both in their thoughts as well as the manners in which those got translated into words and activities. These differences ranged from those in the tones of language they used to the diverse attitudes they maintained towards religion and other faiths.

The Styles and Tones of Writing

A comparative study of the written works of Sree Narayana Guru and Sri Chattambi Swami may proceed from a study of their works of philosophic nature. In the case of Sree Narayana Guru prominent works in this category are Darsanamala, Atmopadesasatakam, Advaitadipika and Brahmavidyapanchaka. In the case of Sri Chattambi Swami the study has to be based on Advaitacintapaddhati and Nijanandavilasam. In the works of these teachers that are taken up for comparative evaluation, the first difference that we observe is that the four works of Sree Narayana Guru cited above are in verse while the works of Sri Chattambi Swami are in prose. The Darsanamala of Sree Narayana Guru may be looked upon as a basic text book on Advaita Philosophy. Here Advaita is considered from its different aspects. These ten aspects of adyaropa (superimposition), apavada(negation), asatya (untruth), maya (illusion), bhanam (shining forth), karma (activity), jnana (knowledge), bhakti (religious devotion), yoga (ultimate union) and (Nirvana) (transcendent liberation) are dealt with in ten verses for each such aspect.

It is in a parallel vein that Sri Chattambi Swami lays forth his thoughts in Advaitacintapaddhati which may be considered his primary writing on Advaita. He presents his thoughts in the form of six` prakarana's (explorative and explanative essays) as Adhyaropa apavadangal (on superimposition and negation)etc. Their works meet all the requirements of scholastic authenticity, structural linkage and logical coherence. These works go by the line of the `Samhita- kara's who present their philosophy serially as sadhanam (statement of objectives or meditative perception), prakaranam (exposition), Vadam (dialogue) and Brahmatmabodhanam (Awareness of the Ultimate and the limiting).It may be noticed that both Sree Narayana Guru and Sri Chattambi Swami begin their respective works on Advaita with a discussion of Adhyaropa and apavada (Superimposition and negation) While the Guru takes up these two separately devoting ten verses to each, Sri Chattambi Swami treats them together.

Sri Chattambi Swami is seen to adopt a style of delineation that is patent to the traditional expositions of Vedanta like that of Sankara that starts with a series of definitions and explanations of its primary principles and constituents. In this traditional line, he goes on from tracing out the origin of the Godhead Trinity (Trimurty)etc. Evidently the line adopted by Sri Chattambi Swami is one that goes through the entire procedural gamut of traditional Advaita masters and texts.

Sree Narayana Guru strikes a markedly variant note in this. His style in more than one aspect deviates from the traditional and breathes in the novelty of a unique personal style into his writings on Advaita. This can be seen in the very opening verse of Darsanamala. In Darsanamala Sree Narayana Guru subscribes poet like to a formal patterning o his verses. He orders them into units of ten verses in anustup metrical pattern for each one of the ten topics he deals with. He has taken care to keep his diction also in the poetic vein throughout while thus we see a poet of great merits in Sree Narayana Guru even in his writings on Advaita Vedanta, what we see in Sri Chattambi Swami is the master of a unique prose style. His prose borders on the rhetorical and is capable of carrying great logical and argumentative vehemence.

The employment of the classic advaita terminology in such writings makes them hard of comprehension to the common reader who is not well versed in such terminology. It could be observed from this that while Sri Chattambi Swami pursues an inherently scholastic line of approach, Sree Narayana Guru adopts a more pragmatic approach that would be more appealing to the common reader.

Diction in the Philosophic Writings of Sree Narayana Guru and Sri Chattambi Swami

The choice of words in particular and style in general compare interestingly in the case of Sree Narayana Guru and Sri Chattambi Swami This is in line with the different approaches they adopted in life and teachings. Sree Narayana Guru was not much inclined to confine him to the precincts of a strict scholarly discipline. The words and language of Atmopadesasatakam could be cited in example. On the surface, it is a piece of writing dealing with Advaita.He couches these thoughts in a simple and lucid Malayalam that is readily accessible to the common man.

Lines like-

"Avanavan Atma sukhattinacaarikku

nnavayaparannu sukhattinay varenam"¹

(What deeds one involves in for attaining own happiness, should in turn be the source of happiness for others) are readily understood by anyone.

The unique style and choice of words in these poems subtly empowers the reader to instruct himself on methods of spiritual inquiry and personal uplift. The first verse of Daivadasaka, another short philosophic poem by Sree Narayana Guru is a great example of this lucid and simple diction. The Guru takes philosophic topics of great depth to the young and old alike with amazing felicity and appeal in these two works – Atmopadesasatakam and Daivadasaka.

This simplicity of diction is seldom shared by Sri Chattambi Swami. His word, very often inclines towards the scholarly and technical. His approach to the subject matter also is confined to the area of erudition and scholarly dialogue. A marked argumentative tone also may be noted. These qualities of the language of Sri Chattambi Swami are best illustrated by his work Nijanandavilasam. The work comprises of eight explorative essays with titles like: Avstatraya sodhana Prakaranam etc. These titles are all grossly Sanskrit's and hard of comprehension to the common reader of Malayalam. That beyond the titles, the essays themselves are written in a ` Malayalam' which is not far removed from the language of the title, should give us a fairly good picture of the nature of the language of Sri Chattambi Swami in this work.

A comparative observation of the language of the two seers, lead to the conclusion that, while in general Sri Chattambi Swami, adopts a scholarly language of exalted erudition, the language Sree Narayana Guru is more akin to the language of common parlance we see this resulting in the Guru being able to draw the common man to thoughts like that of Advaita vedanta.

Views of Sree Narayana Guru and Sri Chattambi Swami on Faiths, Religiocity, Rituals and Superstitios Believes and Practices Attitudes to and Critique of Religion and Faith

Sree Narayana Guru and Sri Chattambi Swami were united in their broader goal of facilitating the evolvement of better society. However, how they went along or departed from the ways of faith and religion in this respect is markedly different. While Sree Narayana Guru apparently supported going along the lines of institutionalized religion in some respect, Sri Chattambi Swami directed his studies and teachings in such away that they would bring a new light to bear on ritualistic practices that in some instances took the form of a railing attack on the superstitious practices like animal sacrifices and in others effected in reiterating and spiritually or philosophically fortifying some ritualistic practices. Initially Sri Chattambi Swami had envisaged it as a part of his mission, to educate the people out of pagan rituals. And establish among the society a more evolved kind of rituals and practices backed by the authority of the Vedas and the Tantras and conducive to the evolution of a more of refined spiritualism. This has been very helpful in preparing the ground for the comprehensive renovation of society that Sree Narayana Guru so successfully worked on. A keen observation of the lines of thought and activities would reveal a subtle deviation of Sri Chattambi Swami leaning more towards a religious renewal while Sree Narayana Guru took to a total reshaping of society. The influence of this divergence is evidenced in their attitudes in accepting and refuting elements in religious practices and faiths. Many movements for progressive transformation of society were alive across the length and breadth of India during the later half of 19 c. and the early part of 20 c. They were either with the nature of religious revival or social changes. In Kerala both these aspects constituted a confluence, with Sri Chattambi
Swami representing more of one while Sree Narayana Guru, represented more nof the other.

While Sree Narayana Guru is seen to have adopted a near rationalistic approach in many aspects of faiths and practices, he seldom appears to refute Religion. Sri Chattambi Swami was different in this that there have been instants of apparent refutation of or attack on certain riligious faiths from his part. "Matam etayalum Manusyan Nannayai mati "(Betterment of Man has primacy; it little matters how or through what religion.) Is a famous Sree Narayana Guru statement which places him grounded on confirmed religious tolerance. A vehement attack on the proselytizing campaigns of Christian missionaries that vilified Hindu Religion, is seen to issue forth as a book from Sri Chattambi Swami, which has the telling title of Christumata Chedanam (A dissection of The Christian faith/ A cutting to shape of The Christian Faith). Even here a discerning reader would find that, it is not so much Christanity that the Swamikal rails against as the vile practices of a band of proselytizing zealots. However, a work of this nature could not ever be expected from Sree Narayana Guru. The ecumenism of Sree Narayana Guru is beautifully and tellingly in the 41st verse of Atmopadesasatakam² 'The ignorant wallow in ungainful arguments based on faulty reasoning's they invent in matters of faith. Their state could be compared to that of a group of blind men who insist the shape of the elephant is what each among them feels from such part of elephant that each got to touch at the moment.

Comparative Attitudes to Scholarly Debates, Dialogues and Philosophic Issues

The principal texts considered to be belonging to Vedanta are The Upanishads, Brahma sutra and Bhagavat GIta. Among these, it is the Brahma Sutras that has commonly been submitted to hair splitting debate in erudite circles through its history. These series of arguments followed Sankara writing a commentary on them. It is worth special notice that in no one of his works numbering upward of sixty-four, has Sree Narayana Guru is seen to adopt the argumentative mode. He goes the way of concordance has been highlighted by his being instrumental in convening the first Asian concordance of religions and the second in the world. The legend that the Guru himself wrote to be displayed at the conference venue read: ` Not to Argue and to Win – `It is to Know and to inform.

Sri Chattambi Swami puts forth the theory that the original main plank of Kerala society was the `nayaka ' segment of society who later came to be known as `nayar' s. The `Brahmin' s as such enjoyed no authority or primacy over others and the foisting of the type of the system of for casts was effected by these `brahmins' through erroneous interpretation of the Vedas to suit their crafty ends. This kind of argumentative attitude is prominently seen in Sri Chattambi Swami Vedadhikaranirupanam and Prachinamalayalam.Two other works of Sri Chattambi Swami in this argumentative vein are Moksa Pradipa Khandana and Jivakarunya nirupana.

While Sri Chattambi Swami is seen to have adopted all along, the line of debating and arguments resorted traditionally by scholars including Sankara, Sree Narayana Guru strike a markedly different note. Sree Narayana Guru is seldom seen in an argument of any kind.

Sree Narayana Guru and Sri Chattambi Swami in Movements for Transformation in Society.

It has been well acknowledged how instrumental both Sree Narayana Guru and Sri Chattambi Swami have been in the Renaissance of Kerala Society. However the ways the two were remarkably different. Sree Narayana Guru could engage himself with surpassing felicity and effectiveness in activities for social transformation, while himself solidly anchored in Advaita Vedanta. Most of the humanitarian concerns of the modern world like democracy, social justice, equality, and secularism found a place in the activities and activism that the Guru impelled. The influence of Sri Chattambi Swami, on the other hand was mostly confined to the sphere of the philosophic. He wielded his pen as sword in the war he waged against his ideological adversaries. His researches into the past the polemics he indulged in and even the interest he took in literature and other art forms were mostly to this end.

Inspite of having had to uphold in theory egalitarianism as a natural corollary Advaita, Sankara Acarya had in practice play an acquiescent role along the line of the segregationists. Despite disagreeing with Sankara in many ideological issues, the general attitude of Sri Chattambi Swami had many things in common with that of Sankara. The relectence that is perceived on the part of Sri Chattambi Swami in headlong plunging into social activism may be considered as being in tune with this. The singular

greatness of Sree Narayana Guru realizes in that he was successful in finding enough space while rooted in the awareness of the single truth of Brahma (Transcendent wholeness of Truth), to use the principal of Advaita itself to wage a war against the iniquities and superstitious practices that were rampant in the society of his times.

Though Sri Chattambi Swami, did not, as observed earlier, directly involve himself in many activities, his spiritual influence was greatly enlightening in transforming ritualistic practices in the society and providing them with a valid scriptural foundation. He spearheaded such movements chiefly through his disciples. The most prominent among the disciples of Sri Swami were Nilakanntha Tirthapada and Chattambi Tirthapada Paramahamsa. It was through them that Sri Chattambi Swami launched the program of renovating standardizing ritualistic practices cleansing them of superstitious accretions and social malaise. 'Acarapdhati' (Ritualistic Systems) and 'DevarchanaPadhati'³ (Systems of Riligious Worship) of Nilakantha Tirthapada and `Lekhana Malika (A Garland of Writings) of Tirthapada Paramahmasa, were works addressing mainly the Nair community of Kerala, providing them with guidelines in effecting transformation in ritual practices. Sri Chattambi Swami had taken active interest in the writing of these works and had recorded a note highlighting its purpose in the introductory message he appended to ` Devarchana Padhati'.In the wake of these works, a reformative movement lead by Ambalappattu Rainga Sankaran, Thazhattottathu Veluppillai, Mannathu Padmanabhan and others campaigned for a standardization and renovation of rituals through out Kerala. But there attempts did not meet with maximum success as the grip of Brahminism had so overwhelmed the community.

The movement of social transformation gaining momentum among the Ezhava Community of Kerala, under the influence of Sree Narayana Guru drew the attention of the progressive sections of Nair society. They desired to install Sri Chattambi Swami in a similar role among themselves. But Sri Chattambi Swami displayed no assent to this and kept himself aloof. He should have been averse to any organizing that was sectarian in nature. though he did not take up the same kind of role as Sree Narayana Guru did; Sri Chattambi Swami and his erudition were greatly instrumental in effecting an intellectual revival and organizational awakening among the Nairs of Kerala. Challenging the monopoly of Brahmins in matters related

to the Vedas, and rationally diproving any special claims Brahmins had apportioned to themselves, he awakened the self respect of the Nair community. In this he had logically refuted even the most accepted Sankara Acarya. Sri Chattambi Swami was the first to expose the extent to which Brahminism had undermined communities in Kerala like that of the Nairs.The influence of Sri Chattambi Swami lent a solid and valid grounding to the social revolution. In a way the involvement of Sri Chattambi Swami in areas of spiritual knowledge and that of sree narayana guru in social activism was complementing each other in taking the land and its people to great levels of transformation that had bearings upon all the important aspects of life.

Sree Narayana Guru and Sri Chattambi Swami were staunchly placed in Advaita Vedanta. They had several points of meetings and divergence in their ideological positioning and modus operandi as has been observed in this study. Above and beyond all this the one emphatic statement that carry all the weight of recent history of the Malayalam speaking land, is that Sri Chattambi Swami and Sree Narayana Guru has together contributed to the modernization of this land like no other

<u>Notes</u>

- 1) Sree Narayana Guru, Darshnamala, Chapter 1, verse 1.
- 2) Sree Narayana Guru, Atmopadesasatakam, verse44.
- Devarchana Padhati, Sree Neelkntha Teerthapada Swami,Vidyadhiraja Puvlications,Peruman,1989,page1

Reference Books

- Chattampi Swamikal- Jivithavum Krtikalum, Maheswaran Nair.K, Dooma Books, Trivandrum, 1995
- 2) Guru Darshana Girima, Dr. Bhaskaran. T, Kairali Publications,South Parvoor, Ernakulam, 2001
- Buddhanum Nanuguruvum, Dr. Sugathan.K , Mathrubhumi Books, 2005
- Sri Narayana Jivacarthram, Kottookoikkal Velayudhan, S. Mayapriyadarsini, Thiruvanthapuram-14, 1983

- 5) Sri Tirthapada Paramahamsa Swamikal Vol-1, Biography, by Sri Vidyananda Tirthapada Swamikal & Pandit Sri C.Ramakrishnan Nair, Tirthapadasramam, Tirthapadapuram (p.o), Kerala,1962
- Sri Chattambi Swami Sadabdha Smaraka Grandham, Sadabdhajayanti Prasidhikaranam, SRI Ramavilas Press, Quilon, Kerala, 1953
- Sri Tirthapada Paramahamsa Swamikal Vol-1, Biography, by Sri Vidyananda Tirthapada Swamikal & Pandit Sri C.Ramakrishnan Nair, Tirthapadasramam, Tirthapadapuram (p.o), Kerala,1962
- 8) Sri Narayana Guruvinte Sampoorna Kritikal, Bhaskaran ,T, The Matrubhumi Printing company Ltd, Calicut,1985
- 9) Gurupatham, Dr. Geetha Suraj, T.R. Educational and Charitable Trust, Peringottukara, Thrissur, 2003
- Two Saiva Teachers of the Sixteenth Century, Nigamajnana I and his disciple Nigamajnana ii, T. Ganesan, French Institute of Pondicherry, 2009

നദികൾ പ്രകൃതിയുടെ ജീവനാഡി

പി. നിഖിൽ ചന്ദ്ര

രസതന്ത്ര വിഭാഗം ശ്രി നാരായണ കോളേജ്, കൊല്ലം *e-mail: pnikhilchandra@gmail.com*

പ്രബന്ധസംഗ്രഹം

നദികൾ കേവലം ജലപ്രവാഹതോടെയുള്ള ജലാശയങ്ങൾ മാത്രമല്ലെന്നും അവ ജീവൻ തുടിക്കുന്ന ഭൂമിദേവിയുടെ ജീവോശ്വാസമാണെന്നും പണ്ടുമുതലേ മനുഷ്യർ മനസ്സിലാക്കിയിരുന്നു. അതുകൊണ്ടുതന്നെ അവളെ പുജിക്കുവാനും എന്നാൽ ആരാധിക്കുവാനും നിലനിർത്തുവാനും മനുഷ്യർ ശ്രദ്ധിച്ചിരുന്നു. ആധുനിക ലോകത്തിൽ ഇവയെന്നും ശ്രദ്ധിക്കുവാൻ മനുഷ്യന സമയമില്ലാതായിരിക്കുന്നു. നമ്മൾ നമ്മളായിരിക്കുന്നതിനുള്ള കാരണം നമ്മുടെ നദികളാണ്. ഭാരതം വളർന്നു വികസിച്ചിട്ടുള്ളത് മോഹൻജോ ദാരോ ഹാരപ്പ തുടങ്ങിയവ നമ്മുടെ നദീതടങ്ങളിലാണ് . നദികൾ ഗതിമാറി ഒഴുകിയപ്പോഴാണ് ആ നാഗരികതൾക്ക് നാശം സംഭവിച്ചത്. ആധുനിക സയൻസ് ആൻഡ് ടെക്നോളജിയുടെ അന്തസത്ത ഉൾക്കൊണ്ടുകൊണ്ട് നമ്മുടെ നദികളെ സംരക്ഷിക്കേണ്ട ചുമതല നമുക്കേവർക്കും ഉണ്ട്. പുതു മനുഷ്യരുടെ ജീവന്റെ ഇരിപ്പിടങ്ങളായ നദികളിലേക്കുള്ള ശ്രദ്ധയില്ലായ്മയും താല്പര്യമില്ലായ്മ യിലേക്കുമുള്ള വിരൽ ചൂണ്ടൽ ആണ് ലേഖനം.

നദികൾ പ്രകൃതിയുടെ ജീവനാഡി

പുരാതനവും ആധുനികവുമായ എല്ലാ മനുഷ്യ സംസകാരങ്ങളും ഉടലെടുത്തത് നദികളുടെ തീരങ്ങളിലാണെന്ന് നമ്മൾക്കറിയാം. നൈൽ റിവർ വാലി, സിന്ധു നദീതടം, യെല്ലോ റിവർ വാലി തുടങ്ങിയവയൊക്കെ വലിയ വലിയ നദികളുടെ തീരങ്ങളിലാണ് തുടങ്ങിയതും. അവിടെ മനുഷ്യന കൃഷി ഇറക്കാനും കാലികളെ വളർത്തുവാനും, കുടിവെള്ളം, വൃത്തിയാക്കൽ, കഴുകൽ എന്ന് വേണ്ട സകല സംഗതികൾക്കും ഭൂമിയുടെ പരിസ്ഥിതി ചരിത്രത്തിലെ ഏറ്റവും പ്രധാനപ്പെട്ട ഈ സ്ഥലം തന്നെ വേണം. ഒരേ പ്രദേശത്തെ വ്യത്യസ്ത തടാകങ്ങൾ വൃത്യസ്ത ആവാസവ്യവസ്ഥയെ പിന്തുണയ്ക്കുന്നതായി നമ്മൾക്ക് കാണുവാൻ സാധിക്കും. നദികൾ നിശബ്ബമായി തങ്ങളുടെ ജോലി സ്വാധീനം തുടരുന്നതിനാൽ ജീവനുള്ള ലോകത്ത് ചെലുത്തുന്ന അവ

മിക്കപ്പോഴും ആളുകൾക്ക് മനസ്സിലാകില്ല, പ്രേത്യേകിച്ചു 44 എണ്ണം ഉള്ള നമ്മൾ മലയാളികൾക്ക്. മനുഷ്യർക്ക് മാത്രമല്ല, എല്ലാ ജീവജാലങ്ങൾക്കും നദിയൊരു വ്യവസ്ഥയാണ്, കൂടാതെ മറ്റ് ജലജീവികൾക്കും വിവിധ സസ്യങ്ങൾക്കും നദികളിൽ വളരുകയും അത് ഭക്ഷ്യ ശൃംഖലയിലെ സന്തുലിതാവസ്ഥ നിലനിർത്തുന്നതിനും നദികൾ നടത്തുന്ന പങ്ക് വിലമതിക്കാനാകാത്തതാണ്.

ഇന്ത്യയിലെ എല്ലാ പ്രധാന നദികൾക്കും പുരാണ കാലം മുതൽ വലിയ പ്രാധാന്യമുണ്ടാകാൻ കാരണം നമ്മുടെ കൃഷിയും വിശ്വാസവും നദികളുമായി അഗാധമായി ബന്ധപെട്ടു കിടക്കുന്നതു കൊണ്ടാണ്. നമ്മൾ നദികൾക്ക് സവിശേഷത അദ്ഭുതശക്തി ഉണ്ടെന്ന് വിശ്വസിക്കുന്നു, അവയ്ക്ക് നമ്മുടെ പാപങ്ങൾ കഴുകിക്കളയാം, നമ്മൾക്ക് പുണ്യം ലഭിക്കും തുടങ്ങി അങ്ങനെ വിരോധാഭാസമെന്തെന്നാൽ, നമ്മുടെ അങ്ങനെ. എന്നാൽ നദികളോടുള്ള ആഴമായ ബഹുമാനവും ആരാധനയും ഒരു വശത്തു നിൽക്കുമ്പോൾ അവയുടെ പരിശുദ്ധിയും ശുചിത്വവും നിലനിർത്താൻ യാതൊരു ശ്രദ്ധയും നമ്മൾ കൈകൊളളുന്നില്ല. എന്ന് കാണുവാൻ സാധിക്കും. ഭാരതീയ നദികളായ ഗംഗ, യമുന, ബ്രഹ്മപുത്ര, കാവേരി, കേരളത്തിലെ പമ്പ അല്ലെങ്കിൽ നമ്മുടെ മറ്റേതെങ്കിലും നദിയാകട്ടെ, ഒന്ന് പോലും മനുഷ്യ മലിനീകരണത്തിൽ നിന്ന് ഒരുതരത്തിലല്ലെങ്കിൽ മുക്തമല്ല, അത് മറ്റൊരുതരത്തിൽ വൻതോതിൽ നശിച്ചുകൊണ്ടിരിക്കുകയാണ്.

നദിയിലെ തുടരുന്ന മലിനീകരണം എല്ലാ ജീവജാലങ്ങളിലും ഗുരുതരമായ ജലജന്യരോഗങ്ങൾക്കും ആരോഗ്യ പ്രശ്നങ്ങൾക്കും കാരണമാകുന്നു.

നദികളുടെ മലിനീകരണം സംഭവിക്കുന്നതിന് പ്രധാന കാരണമായി നിലവിലുള്ള മാലിന്യങ്ങള്ളിലേക്കാണ്. കൂടുതൽ ഡാറ്റകളും കെചുണ്ടുന്നത് ഗാർഹിക ഇതിൽ നോക്കിയാൽ, എന്നാൽ എത്രത്തോളം സത്യമുണ്ടെന്ന് വളരെക്കുറച്ചാണ് എന്ന് നമ്മൾ നേരിട്ട് പഠിച്ചാൽ മനസിലാകും. അല്ലെങ്കിൽ അങ്ങനെ ആക്കേണ്ടത് ചിലരുടെ ആവശ്യവുമാണ്. പ്രധാനമായും വൃവസായകവും മതപരവുമായ കാര്യങ്ങളും കുടാതെ ഒഴിവാക്കാനാകാത്ത കാർഷിക ഗാർഹിക മാലിന്യങ്ങളുമാണ് ഒരു നദിയെ പതുക്കെ പതുക്കെ ഇല്പാതാക്കുന്നത്. ഇതിൽ ആദ്യത്തെ രണ്ടെണ്ണം കാരണമാണ് 80% നദികളും നാശമാകുന്നത്. ശുദ്ധജലത്തിന്റെ പ്രാധാന്യത്തെപ്പറ്റി നമ്മൾ അതില്ലാത്ത അറബികളോടോ ആഫ്രിക്കാരടോ ചോദിക്കട്ടെ, പട്ടിണി എന്തിനു പാവങ്ങളായ ബംഗാളിയോടോ ബിഹാരിയോടോ ചോദിക്കുക. നമ്മുടെ ടാപ്പിൽ നിന്നും വരുന്ന വെള്ളം അവർ ആർത്തിയോടെ കുടിക്കുന്നത് കാണുവാൻ ഇടയായി. അവന്റെ അഭിപ്രായത്തിൽ ഏതു ഫിൽറ്റെർഡ് വെള്ളത്തേക്കാളും ഇത്, ലോകത്തിലെ എറ്റവും മികച്ച കുടിവെള്ളമാണ്.

ഭാരതത്തിന്റെ ജീവശ്വാസങ്ങളായിരുന്ന ചില പ്രധാന നദികളെപ്പറ്റി നോക്കാം. തെലുങ്കാന സംസ്ഥാനത്തിലൂടെ ഒഴുകുന്ന കൃഷ്ണ നദിയുടെ കൈവഴിയാണ മുസി നദി അഥവാ മുസിനുരു. ചരിത്രപരമായ പഴയ നഗരത്തെയും പുതിയ വിഭജിക്കുന്ന മുസി നദിയുടെ തീരത്താണ് നഗരത്തെയും ഹൈദരാബാദ് ഹൈദരാബാദിന്റെ ജീവനാഡി നിൽക്കുന്നത്. ആയിരുന്ന ഒരുകാലത്തു മുസിയുടെ മലിനീകരണത്തിന കാരണം വ്യാവസായിക മാലിന്യങ്ങളാണ്, പ്രധാനമായും ഫാർമസ്യൂട്ടിക്കൽ കമ്പനികൾ പുറത്തുവിടുന്നവ. പടിഞ്ഞാറൻ ഗുജറാത്തിലെ പ്രധാന നദികളിൽ ഒന്നാണ് സബർമതി നദി, ഒഴുകുന്ന മൂന്നാമത്തെ നദി. നദി രാജ്യത്തെ ഏറ്റവും മലിനമായ സബർമതി പ്രധാനമായും അറിയപ്പെട്ടിരുന്നത് മഹാത്മാഗാന്ധിയുമായുള്ള സഹവാസമാണ്, അദ്ദേഹം തന്റെ ആശ്രമം തീരത്ത് സ്ഥാപിച്ചു.

വ്യാവസായിക മാലിന്യങ്ങളും മറ്റ് മലിനജലവും സബര്മതിയെ നാശത്തിലേക്ക് എത്തിച്ചു.

ബിസിനസ് പഞ്ചാബിന്റെ വലിയ നഗരവും തലസ്ഥാനമാണ് ഏറ്റവും ലുധിയാന. മെഴ്സിഡസ്, ബിഎംഡബ്ല്യു, ജാഗ്വാർ, റേഞ്ച് റോവർ കാറുകൾ പോലുള്ള ഉയർന്ന നിലവാരമുള്ള വാഹനങ്ങളുള്ള ഇന്ത്യയിലെ മികച്ച 10 നഗരങ്ങളിൽ ഒന്നാണ്. സംസ്ഥാനത്തിന്റെ മൊത്ത ആഭ്യന്തര ഉൽപാദനത്തിൽ (ജിഡിപി) ഏറ്റവും കൂടുതൽ സംഭാവന നൽകുന്നതും ലുധിയാന മുനിസിപ്പൽ കോർപ്പറേഷൻ ആണ്. മുമ്പ് ബുദ്ധ ദാരിയ എന്നറിയപ്പെട്ടിരുന്ന ബുദ്ധനുള്ള നദി സത്ലജിന്റെ കൈവഴി ഇന്ന് അറിയപ്പെടുന്നത് 'നരകത്തിൽ നിന്നുള്ള നദി' നദിയുടെ മലിനമാക്കപ്പെട്ട എന്നാണ്. വ്യവസായം കാരണം ചുറ്റും താമസിക്കുന്ന ജനങ്ങൾ ഇപ്പോൾ കാൻസർ പോലുള്ള അസുഖങ്ങളായി കഷ്ടപ്പെടുന്നു.

ബംഗാൾ കടലിലേക്ക് ഒഴുകുന്ന തമിഴ്നാട്ടിലെ ഏറ്റവും ചെറിയ ക്ലാസിഫൈഡ് കൂം നദി. ലോകബാങ്ക് സഹായത്തോടെ നടത്തിയ നദികളിൽ ഒന്നാണ് പഠനത്തിൽ ഇതിലെ ജലം മലിനജലത്തേക്കാൾ 80% അധികം മലിനമാണെന്നു കണ്ടെത്തി. മഹാരാഷ്ട്രയിലെ ഏറ്റവും പഴക്കാ ചെന്ന നദികളിലൊന്നായ ഇപ്പോൾ മലിനജലമല്ലാതെ മറ്റൊന്നുമില്ല. ഏഷ്യയിലെ ഏറ്റവും മിത്തിയിൽ വലിയ ചേരിയായ ധാരവി ഉൾപ്പെടെ വിവിധ ചേരി ക്ലസ്റ്ററുകളിലൂടെ നദി ഏതാണ്ട് 70% നദീതീരങ്ങളിലും ലക്ഷക്കണക്കിന ചേരി ഒഴുകുന്നു. യൂണിറ്റുകൾ ഉണ്ട്, അവിടെ നിന്ന് ആഭ്യന്തര മാലിന്യങ്ങളും തുറന്ന മലിനീകരണ മാലിന്യങ്ങളും പോലും നദിയിലേക്ക് ഒഴുകുന്നു. സർക്കാർ അവഗണന എന്നിവയാൽ പതിറ്റാണ്ടുകളായി നദി ആസൂത്രിതമായി നശിപ്പിക്കപ്പെടുന്നു. മൂല–മുത്ത നദികളുടെ സംഗമസ്ഥാനത്താണ് പൂനെ സ്ഥിതി ചെയ്യുന്നത്. ഇവിടെയും വില്ലൻ ഓടയിലെയും വ്യവസായങ്ങളിലെ മലിന ജലം തന്നെ. മഹാരാഷ്ട്രക്കാരുടെ വലിയ ഉത്സവമായ ഗണേഷ് ചതുർത്ഥി ഉത്സവം അവസാനിക്കുന്നത് ആയിരക്കണക്കിന ഗണേശ വിഗ്രഹങ്ങൾ കടലിൽ മുക്കിക്കൊണ്ടാണ്. കളിമണ്ണിന് പകരം വിലകുറഞ്ഞ പാസ്റ്റർ ഓഫ് പാരിസ് വിഗ്രഹങ്ങൾ നിമജ്ജനം ചെയ്യുന്നത് അവ വലിച്ചെറിയപ്പെടുന്ന ജലാശയങ്ങളിലെ പരിസ്ഥിതിയെയും സമുദ്രജീവികളെയും പ്രതികൂലമായി ബാധിക്കുന്നു. ഹെവി മെറ്റൽ പെയിന്റുകളും അലങ്കാരത്തിന് ഉപയോഗിക്കുന്ന ആഭരണങ്ങളും ആരാധനയിൽ ഉപയോഗിക്കുന്ന മറ്റ് വസ്തുക്കളും ജലത്തിന്റെ അപചയം വർദ്ധിപ്പിക്കുന്നു.

ബാംഗ്ലൂരിലെ വൃഷഭാവതി നദി ഒരു ചെറിയ നദിയും അർക്കാവതി നദിയുടെ കൈവഴിയുമാണ്. ബെംഗളൂരു നഗരത്തിന്റെ നദി തക്ക് ഭാഗത്തുകുടി ഒഴുകുന്നു, ആഭ്യന്തര, കാർഷിക സ്രോതസ്സുകളും വ്യാവസായിക മാലിന്യങ്ങളിൽ നിന്നുള്ള മലിനീകരണവും മൂലം വളരെയധികം മലിനീകരിക്കപ്പെടുന്നു. വ്യാവസായിക ഘടകങ്ങൾ നിർമ്മിക്കുന്ന ഫാക്റികൾ, ഇലക്രോ–പ്ലേറ്റിംഗ് ജോലികൾ, ഹെവി ലോഹങ്ങൾ, തുണിത്തരങ്ങൾ, ഓട്ടോ, കാർബണേറ്റഡ് പാനീയങ്ങൾ, ഇവയെല്ലാം ഡ്രെയിനേജ് സംവിധാനങ്ങൾ വഴി നദിയിലേക്ക് മാലിന്യങ്ങൾ പുറന്തള്ളുന്നു. കർണാടക, തമിഴ്നാട് സംസ്ഥാനങ്ങളിലുടെ ഒഴുകുന്ന 765 കിലോമീറ്റർ നീളമുള്ള കാവേരി, സംസ് കരിക്കാത്ത മാലിന്യങ്ങൾ നീക്കം ചെയ്യാത്തതിന്റെ ഇരയാണ്, നദിയുടെ വിവിധ ഭാഗങ്ങളിൽ നദിയിലെ ജലം മലിനമാകുന്നു.കർണാടകയും തമിഴ്നാട്ടും തമ്മിലുള്ള ജല തർക്കം നദിയുടെ അവസ്ഥയെ സഹായിച്ചില്ല.1977 നും 1997 ഇടയിൽ വർഷത്തിനിടയിൽ കർണാടകയിലെ നും 20 കൊഡാഗുവിൽ നദിയുടെ തീരത്തുള്ള വനവിസ്തൃതി 2,566 ചതുരശ്ര കിലോമീറ്ററിൽ നിന്ന് 1,841 ചതുരശ്ര കിലോമീറ്ററായി 28 ശതമാനം കുറഞ്ഞു. ജലത്തിന്റെ അളവും മനുഷ്യ മാലിന്യങ്ങൾ നീക്കംചെയ്യലും വർദ്ധിച്ചു, ഇത് കാവേരിയുടെ ജലത്തിന്റെ ഗുണനിലവാരം മോശമാക്കി. ഇന്ന് കാവേരിയില്ലെങ്കിൽ കർണാടകയിലെയും തമിഴ്നാട്ടിലെയും കൃഷിയുടെ പകുതി പോലും നടക്കില്ല.

ദില്ലിയിലെ 19 ദശലക്ഷം നഗരനിവാസികളുടെ പ്രധാന ജലസ്രോതസ്സായ യമുന ഇന്ത്യയിലെ ഏറ്റവും മലിനമായ നദികളിലൊന്നാണ്. യമുന ഇപ്പോൾ ഒരു നദിയല്ല പകരം മലിനജലം, രാസവസ്തുക്കൾ, ഡിറ്റർജന്റുകൾ, വ്യാവസായിക മാലിനൃങ്ങൾ, മലമൂത്ര വിസർജനം എന്നിവയുടെ വിഷലിപ്തമായ ഒരു കോക് ടെയൽ വഹിക്കുന്ന 18 അഴുക്കുചാലുകളുടെ ഒരു ശേഖരമാണിത്. നദിയിലേക്ക് പുറന്തള്ളുന്ന മലിനജലത്തിന്റെ 10% ൽ താഴെ മാത്രമാണ് സംസ്ക്കരിക്കുന്നത്, ഇത് ഉപയോഗിക്കുന്ന ദശലക്ഷക്കണക്കിന വെള്ളം ആളുകളെ രോഗബാധിതരാക്കുന്നു. ഹിന്ദുക്കൾ വിശുദ്ധമായി കരുതുന്ന ഗംഗയുടെ രണ്ടാമത്തെ വലിയ പോഷകനദിയാണ് യമുന. 12 വർഷത്തിലൊരിക്കൽ നടക്കുന്ന മഹാമേളയായ കുംഭമേള മൂലവും ജലം മോശമാകുന്നുണ്ട്.

അഞ്ചു സംസ്ഥാങ്ങളിൽ കൂടി സഞ്ചരിച്ചു രാജ്യത്തെ 26% ഭൂപ്രദേശം ഉൾക്കൊണ്ട്, 500 ദശലക്ഷത്തിലധികം പൗരന്മാർ ജീവിതത്തിനായി നമ്മുടെ ദേശിയ നദിയായ ഗംഗാ നദിയെ ആശ്രയിക്കുന്നു, എന്നിട്ടും അത് ലോകത്തിലെ ഏറ്റവും മലിനീകരിക്കപ്പെട്ട നദിയായി തുടരുന്നു. ഗംഗാ ജലത്തിൽ സാദാരണ ജലത്തേക്കാൾ അധികം ഡിസോൾവ്ഡ് ീഃൃഴലി ഉം ധാരാളം മുലകങ്ങളും ഉള്ളതിനാൽ (ജലം ഒഴുകുന്ന പ്രദേശത്തിന്റെ പ്രതെയ്കത മൂലം) ഭൗതിക-രാസ സ്വത്തവകാശത്തിലും സുക്ഷ്മജീവ വൈവിധ്യത്തിലും ഗംഗയ്ക്ക് സ്വഭാവഗുണമുണ്ടാകുകയും ഗംഗയുടെ ജലത്തിന സ്വയം ശുദ്ധീകരണ സ്വഭാവം ഉണ്ടെന്നു കരുതപ്പെടുന്നു. ഗംഗ ഇതുകൊണ്ടാകാം പുണ്യ നദിയായത്. ഗംഗ മലിനീകരണം മനസിലാക്കാൻ ഇതിനെ മൂന്നായി വിഭജിക്കാം. അപ്പർ ഗംഗാ പ്രദേശം (ഹിമാലയത്തിന്റെ മടിയിൽ നദിയുടെ ഉത്ഭവം) രണ്ട് മധ്യ ഗംഗാ പ്രദേശം (സമതലങ്ങളിലൂടെ ഒഴുകുന്ന നദി, ഏറ്റവും കൂടുതൽ ജനസംഖ്യയുള്ളതും അതുവഴി ഏറ്റവും മലിനമായതുമായ നദിയുടെ ഭാഗം). മൂന്ന് ലോവർ ഗംഗാ പ്രദേശം (നദിയിലെ ഡെൽറ്റ പ്രദേശം ഗംഗാ നദിയുമായി കൂടിച്ചേരുന്നു). ഇതിൽ ഭാഗം ആദ്യത്തെ മനുഷ്യ ശല്യമില്ലാത്തതിനാൽ നന്നായി പോകുന്നു. ബാക്കി സ്ഥലങ്ങളിലെ മനുഷ്യരുടെ പ്രവർത്തികൾ മലിനീകരിക്കപ്പെടുന്നു. മുലം നദി അനന്തമായി വിശ്വാസപരമായി ആളുകൾ ഇപ്പോഴും പുണ്യനദികളെ കാണുന്നത് ഈ മലിനീകരണത്തിന്റെ തോത് വർധിപ്പിക്കുന്നു. മൊത്തം 27 പ്രധാന പട്ടണങ്ങൾ ദിനംപ്രതി ദശലക്ഷക്കണക്കിന ലിറ്റർ മലിനജലവും വ്യാവസായിക മാലിന്യങ്ങളും നദിയിലേക്ക് വലിച്ചെറിയുന്നു. ഗംഗയിൽ ചില മാന്ത്രിക സ്വയം ശുദ്ധീകരണ സ്വഭാവങ്ങളുണ്ടെന്നുള്ള പഴക്കം ചെന്ന വിശ്വാസവും പുണ്യം ലഭിക്കും എന്ന് വിശ്വസിച്ചു നദിയിലേക്കു ശവസംസകാര ചിതകളും പകുതി കത്തിയ ശരീരങ്ങളും വലിച്ചെറിയുകയാണ്. മഹാകുംഭ ദിനത്തിൽ കുട്ടത്തോടെ ആചാരപരമായി കുളിക്കുന്നതിനിടെ ഗംഗാ വെള്ളത്തിന്റെ ബാക്ടീരിയകളുടെ BOD, COD, oxygen (DO), കാഠിന്യം, ടിഡിഎസ്, വിവിധ എണ്ണം, അയോണുകളുടെ അളവ് ഗണ്യമായി വർദ്ധിക്കുന്നതായി കാണുന്നു. ഉത്തർപ്രദേശിലെ കാൺപൂർ-ഉനാവോ വ്യാവസായിക മേഖലയിലെ ടാന്നറികൾ നേരിട്ട് നദിയിലേക്ക് മലിനജലം പുറന്തള്ളുന്നു. കാൺപൂർ ഒരു ഹോട്ട്സ് പോട്ടാണ് കാരണം നദി കറുപ്പിക്കുന്ന ക്രോമിയത്തെ ടാനറി ക്ലസ്റ്റർ നേരിട്ട് നദിയിലേക്കു പുറംതളളുന്നു. ഇവ കൂടാതെ 70 ശതമാനത്തിലധികം മലിനജലം കടലാസ്, പൾപ്പ്, ഡിസ്റ്റിലറികൾ, ടയർ ഫാക്ടറികൾ എന്നിവയിൽ നിന്നാണ്. നാഷണൽ ഗ്രീൻ ട്രിബുണലിന്റെ കണക്കു പ്രകാരം ഏകദേശം 746 തരം വ്യവസായങ്ങൾ ഗംഗയെ മലിനീകരിക്കുന്നു. നദിയിലെ മലിനീകരണത്തെ ചെറുക്കുന്നതിനായി ഒരു ദശാബ്ദത്തിന് മുമ്പാണ് ഗംഗാ ആക്ഷൻ പ്ലാൻ ആരംഭിച്ചത്.എന്നിരുന്നാലും, നദിക്കരയിലുള്ള ആളുകളുടെ അശ്രദ്ധ കാരണം ഇത് പരാജയപ്പെട്ടു. വിജയം കൈവരിക്കാൻ സമൂഹത്തിന്റെ പങ്കാളിത്തം ആവശ്യമാണ്.

ഇനി പറയേണ്ടത് നമ്മുടെ പുണ്യ നദിയായ പമ്പയാണ്. ലോകമെമ്പാടുമുള്ള 50 ദശലക്ഷത്തിലധികം വിശ്വാസികൾ ഓരോ വർഷവും സങ്കേതത്തിലേക്ക് ഒഴുകുന്നു. എല്ലാ ദിവസവും എണ്ണമറ്റ തീർത്ഥാടകർ അവരുടെ പാപങ്ങൾ കഴുകിക്കളയാൻ പമ്പയിൽ കുളിക്കുന്നു. ഇത്രയും ആളുകളെ ഒരുമിച്ചു നദിക്കോ കടുവ സങ്കേതത്തിനോ കൊള്ളാൻ ആ സാധ്യമല്ല. നമ്മുടെ ഭാരതപ്പുഴ മരിച്ചു കഴിഞ്ഞു. പെരിയാർ ആകട്ടെ കൊച്ചിയിലെ വ്യാവസായിക സമ്പർക്കത്തിൽ വിഷമയമായി. അവശേഷിക്കുന്നത് ചാലക്കുടി പുഴയിൽ എന്നാണ് ഡാം പണിയുക എന്നറിയില്ലാത്ത അവസ്ഥയിലാണ്. മണിമല, പമ്പ, അച്ചൻകോവിൽ, കല്പട നദികളിലെ വിവേചനരഹിതമായ മണൽ ഖനനം മൂലം നദികൾ കടുത്ത തകർച്ചയുടെ വക്കിലാണ്. മണൽ നദികളെ കരകവിയ്ക്കുന്നു എന്ന വാദം അപഹാസ്യമാണ്, യഥാർത്ഥത്തിൽ മണൽ ഒരു സ്പോഞ്ജ് പോലെ പ്രവർത്തിച്ച് ജലത്തെ കീഴോട്ട് ഇറക്കി നമ്മുടെ ഭൂഗർഭ ജലത്തിന്റെ അളവ് വർധിപ്പിക്കുകയാണ് ചെയ്യുന്നത്. എല്ലാ നദികളും ഒഴുക്കില്ലാതെ തടഞ്ഞു വെക്കുന്നതും അവയുടെ അന്തസത്തയെ നശിപ്പിക്കുന്നു.

നദിയും മനുഷ്യനും വേര്പിരിയാനാകാത്ത സത്വങ്ങളാണ്. നദി കൂടുതൽ കൂടുതൽ പുരോഗമിക്കുമ്പോൾ അത് വിശാലമാകുന്നു. മാനവികതയുടെ കാര്യവും അങ്ങനെതന്നെ. നദി ഒരു കടലിൽ പതിക്കുന്നത് പോലെ മനുഷ്യൻ ഒരു ആത്മാവിലേക്ക് ലയിക്കുന്നു. ആ ആത്മാവ് നദികൾ തന്നെ എന്ന് തിരിച്ചറിയുക ഒരുപക്ഷെ ഒരു പിടി ചാരമായിട്ടെങ്കിലും.

ഗ്രന്ധസൂചി

- S. P. രവി, സബ്ന A. B., ഒഴുകണം പുഴകൾ, ഡിസി ബുക്സ്, കോട്ടയം 2022.
- ബിശ്വനാഥ് ഗോൾഡർ, നന്ദിനി ബാനർജി, ഇന്ത്യയിലെ നദികളിലെ ജലത്തിന്റെ ഗുണനിലവാരത്തിൽ മലിനീകരണത്തിന്റെ അനൗപചാരിക നിയന്ത്രണത്തിന്റെ സ്വാധീനം, ജേണൽ ഓഫ് എൻവയോൺമെന്റൽ മാനേജ്മെന്റ് 73 (2), 117130, 2004.
- ചന്ദൻ പ്രധാൻ, വിനയ് ചെമ്പോലു, ഋഷികേശ് ഭാരതി, സുബാഷിസ ദത്ത, ഇന്ത്യയിലെ നിയന്ത്രിത നദികൾ: ഗവേഷണ പുരോഗതിയും ഭാവി ദിശകളും,കടഒ ജേണൽ ഓഫ് ഹൈഡ്രോളിക് എഞ്ചിനീയറിംഗ്, 1–13, 2021.
- വിക്രം സോണി, ശശാങ്ക് ശേഖർ, ദിവാൻ സിംഗ്, ഇന്ത്യയിലെ മൺസൂൺ നദികളുടെ ഉദാഹരണമായി ഡൽഹിയിലെ യമുന നദിയുടെ പാരിസ്ഥിതിക ഒഴുക്ക്, കറന്റ് സയൻസ്, 558-564, 2014

10 പ്രസന്നരാജൻ - സഹൃദയനായ നിരൂപകൻ

എം. എസ്. ബിജു

മലയാളവിഭാഗം, ശ്രീനാരായണ കോളേജ്, കൊല്ലം. e-mail: mash.biju@gmail.com

പ്രബന്ധസംഗ്രഹം

സഹൃദയനല്ലാത്തവൻ വിമർശകനാവുന്നില്ല. നല്പ നല്ല പൊതുവെ വിമർശകരെല്ലാം സിദ്ധാന്തങ്ങളിലെ യുക്തിപരമായ തർക്കങ്ങളിലും വിവാദങ്ങളിലുമെല്ലാം താല്പര്യം കാട്ടുന്നവരാണ്. സർഗ്ഗാത്മക വിമർശനത്തിന്റെ സാന്നിധ്യം പലപ്പോഴും വിമർശനത്തിൽ ാകുന്നില്ല. ഉ പ്രസന്നരാജന്റെ വിമർശനം കലാസൃഷ്ടിയുടെ നേരെ മനസ്സും ഹൃദയവും ചേർത്ത് നടത്തുന്ന വിചാരങ്ങൾ ആണ്. പ്രസന്നരാജൻ വച്ചു എന്ന മറുപാഠങ്ങളെ കുറിച്ചാണ് സഹൃദയനായ വിമർശകന്റെ വായനയുടെ ഈ പ്രബന്ധത്തിൽ വിലയിരുത്തുന്നത്.

താക്കോൽ വാക്കുകൾ

വായനയുടെ മറുപാഠം, ഖണ്ഡനവിമർശനം

ചിന്തയുടേയും സൗന്ദര്യബോധത്തിന്റേയും പുതിയ സമവാകൃങ്ങൾ സൃഷ്ടിച്ച വിമർശകനാണ് പ്രസന്നരാജൻ. സത്യസന്ധവും സാഹസികവുമായ സഞ്ചാര പഥങ്ങളെ തുറന്ന് കാട്ടുന്നവയാണ് പ്രസന്നരാജന്റെ വിമർശനങ്ങൾ. വായിച്ചു പഠിച്ചുറപ്പിച്ച സിദ്ധാന്തങ്ങളുടേയും പ്രത്യയ ശാസ്ത്രങ്ങളുടേയും മാത്രം പിൻബലത്തിൽ കലാരചനകളെ സമീപിക്കുന്ന വിമർശകനുമല്ല. കാരണം അർത്ഥചമത്ക്കാരങ്ങളിലെന്നും, പദങ്ങൾക്ക് സ്ഥിരമായ ആസ്വാദകന്റെ അനുമാനമനുസരിച്ച് അത് മാറിക്കൊ ിരിക്കുന്നു-വെന്നുമുള്ള മഹിമഭട്ടന്റെ പക്ഷക്കാരനാണ് അദ്ദേഹം. മഹത്തായ ഒരു കലാസൃഷ്ടി ഒരു പ്രവാഹം പോലെയാണ് വ്യക്തിയുടെ മനസ്സിലൂടെ കടന്നു പോകുന്നത്. അത് സകലതിനെയും രൂപപരിണാമങ്ങൾക്ക് വിധേയമാക്കുന്നു. കടലാസിൽ അച്ചടിച്ചു വരുന്നതല്ല കലാസൃഷ്ടിയുടെ യഥാർത്ഥ രൂപം. അത് വായനക്കാരന്റെ രൂപപെടുന്നതാണ്. വായനക്കാരന്റെ സഹൃദയത്വവും മനസ്സിൽ സംവേദനക്ഷമതയും വാസനകളുമാണ് രചനക്ക് അർത്ഥവും ധ്വനിയും രൂപവും നൽകുന്നത്.

സഹൃദയനായ വായനക്കാരൻ

സഹൃദയനല്ലാത്തവൻ നല്ല വിമർശകനാവുന്നില്ല. കവി സൃഷ്ടിച്ചത് നല്ല പുന:സൃഷിടിക്കുന്നു. വിമർശകരെല്ലാം സഹൃദയൻ പൊതുവെ സിദ്ധാന്തങ്ങളിലെ യുക്തിപരമായ തർക്കങ്ങളിലും വിവാദങ്ങളിലും താൽപ്പര്യം കാട്ടുന്നവരാണ്. കലാസൃഷ്ടികൾ വായനക്കാരിൽ ജനിപ്പിക്കുന്ന അനുഭൂതികളുടെ സർഗ്ഗാത്മക വിമർശനത്തിന്റെ ലോകത്തെ വിമർശകർ മറന്നു പോകുന്നു. സാന്നിദ്ധ്യം വിമർശനത്തിലു പലപ്പോഴും ാകുന്നില്ല. ആവർത്തി-ച്ചുള്ള വായനയിലാടെ കൃതിയെ ചുറ്റിപ്പറ്റി നിൽക്കുന്ന മുൻധാരണകളെയും, 630) അതുൾക്കൊള്ളുന്ന സൗന്ദര്യശാസ്ത്രപരമായ മുല്യങ്ങളെയും ഉടച്ചുവാർത്ത് പുതിയ സൗന്ദര്യശാസ്ത്രത്തിന്റെ സാധ്യതകളെ തുറന്നിടുകയാണ് ഒരു നല്ല റിമർശകൻ ചെയ്യേ ത്. അസ്വാദനത്തിൻെ തലങ്ങളിൽ വലിയ മാറ്റിയെഴുതാൻ നടത്തി സാഹിത്യചരിത്രം നമ്മെ പൊളിച്ചെഴുതലുകൾ പ്രോത്സാഹി–പ്പിക്കുകയും ചെയ്യുന്നു.

ആസ്വാദനത്തിന്റേയും വേളയിലാണ് ഒരു കൃതിക്ക് ജീവൻ വായനയുടെയും ലഭിക്കുന്നത്. സംവേദന ശക്തിയുളള വായനക്കാരനെ ലഭിക്കാത്തിടത്തോളം കാലം സാഹിതൃകൃതികൾ നിർജ്ജീവമാണെന്നാണ് പ്രസന്നരാജൻ കരുതുന്നത്. "വിമലതരമായ ഹൃദയമുള്ളവനാണ് സഹൃദയൻ. ഹൃദയസംവാദക്ഷമതയാണ് സഹൃദയനു ായിരിക്കേ മുഖ്യസിദ്ധി. സഹൃദയനേക്കുറിച്ചുള്ള ഈ കാഴ്ച്ചപ്പാട് വ്യാപ്തിയേറിയ ഒന്നാണെന്ന കാര്യത്തിൽ സംശയമില്ല. സഹൃദയൻ എന്ന പദത്തിന് സമാനമായ പദം ഇംഗ്ലീഷ് ഭാഷയിലില്ല. കാവ്യങ്ങളുമായുള്ള നിരന്തര പരിചയവും, സൗന്ദര്യശിക്ഷണവും സഹൃദയന്റെ ലഭിച്ച ആസ്വാദനതലങ്ങളിലെ-ത്തുമ്പോഴാണ് കവിത അതിന്റെ സർഗ്ഗപരമായ ജീവിതമാ-രംഭിക്കുന്നത്." (പ്രസന്നരാജൻ, 2004:25).

കലാസൃഷ്ടിയുടെ നേരെ മനസ്റ്റാം ഹൃദയവും ചേർത്തുവച്ചു നടത്തുന്ന വിചാരങ്ങൾ മറ്റൊരു കലാസൃഷ്ടിയായി മാറുന്ന സങ്കീർണ്ണമായ പ്രക്രിയയാണ് വാസ്തവത്തിൽ പ്രസന്നരാജന് സാഹിത്യ വിമർശനം. യെർന്ന സൗന്ദര്യബോധവും, സുക്ഷമായി കാര്യങ്ങൾ കാണുന്നതിന് ഉൾക്കാഴ്ചയുള്ള കാര്യങ്ങൾ ശരിയായി കണ്ണുകളും, ക രേഖപ്പെടുത്താനുള്ള സത്യസന്ധതയുമാണ് പ്രസന്നരാജൻ എന്ന വിമർശകന്റെ കൈമുതൽ.

ലീലാകാവ്യം വായിച്ചപ്പോൾ

ലീലാകാവ്യം വീ ും പരിശോധിക്കുമ്പോൾ എന്ന പഠനത്തിന്റെ ആമുഖത്തിൽ പ്രസന്നരാജൻ പറഞ്ഞ വാക്കുകളിൽ ഒരു സഹൃദയന്റെ ശബ്ബമാണുള്ളത്.

എങ്ങനെയോ ലീലാകാവ്യം എന്ന രഹസ്യത്തിൽ ഞാൻ ചെന്നുവീഴുക യായിരുന്നു. കവിയുടെ മറ്റൊരു കാവ്യവും ഇത്രമേൽ എന്റെ സ്വാസ്ഥ്യം കെടുത്തിയിരുന്നില്ല. അതുകൊ ാണ് ലീലാകാവ്യം പഠിക്കുവാൻ ഞാൻ തീരുമാനിച്ചത്. ലീലയെ-ക്കുറിച്ചെഴുതുമ്പോൾ നിർബന്ധമായും പറഞ്ഞിരിക്കേ റൊമാൻറിസിസം, കുമാരമഹാകവി, നാടകീയത എന്നീ കാര്യങ്ങൾ ഞാൻ സ്പർശിച്ചിട്ടു പോലുമില്ല, എന്തിന്, പഠനത്തെ സംബന്ധിച്ചിടത്തോളം എന്റെ ചിന്ത കവിയുടെ മറ്റു കാവൃങ്ങളി-ലേക്ക് വ്യാപിപ്പിക്കരുതെന്നു കൂടി ഞാൻ തീരുമാനമെടുത്തിരുന്നു. ഞാൻ എല്ലാം മറന്നു. ലീലാകാവ്യത്തെക്കുറിച്ച് മാത്രം ഓർത്തു. അതിന്റെ ശക്തിയും പരിമിതികളും ഈ പഠനത്തിലു ്. (പ്രസന്നരാജൻ, 1979:7).

സ്ത്രീ പുരുഷ പ്രേമത്തെപ്പറ്റി കവിക്കു ായ ദർശനം ഏറ്റവും നന്നായി പ്രതിഫലിച്ച കാവ്യം ലീലയാണെന്ന് പ്രസന്നരാജൻ വിലയിരുത്തുന്നു. ലീല രചിക്കുന്ന വേളയിൽ കുമാരാനാശാന്റെ മാനസിക നിലയിൽ വലിയ മാറ്റം സംഭവിച്ചു എന്നാണ് വിലയിരുത്തുന്നത്. "നളിനി രചിക്കുന്ന ഘട്ടത്തിൽ ആശാനിലെ സ്വത്വ വ്യക്തിത്വങ്ങളുടെ സ്വഭാവമല്ല ലീല രചിക്കുന്ന സന്ദർഭത്തിൽ ആശാനിലെ സ്വത്വവൃക്തിത്വങ്ങളുടെ സ്വഭാവം. സാമൂഹിക ജീവിതത്തിലേക്ക് കൂടുതൽ ഇറങ്ങി പെരുമാറിയതിന്റെ ഫലമായി ഭൗതിക വീക്ഷണമാർന്ന വൃക്തിത്വത്തിന്, ലീല രചിക്കുന്ന കാലാമാവുമ്പോഴേക്കും മുൻതൂക്കം സിദ്ധിക്കുന്നു.'' (പണിക്കർ, എം.പി., 1985 : 104).

ചെമ്പകപ്പൂവിന്റെ മാദകഗന്ധം സൂചിപ്പിക്കുന്നതുപോലെ ലീലാകാവൃത്തിലെ പ്രേമത്തിന് വല്ലാത്തൊരു മാദക സൗന്ദര്യത്തിന്റെ പരിവേഷമും ന്നാണ പ്രസന്നരാജൻ പറയുന്നത്. സ്ത്രീ പുരുഷ പ്രേമത്തിന് എത്രമാത്രം ദിവൃത കല്പിച്ചാലും അതിന്റെ രതി സ്വഭാവത്തെ നിഷേധിക്കുന്നത് സത്യത്തിൽ നിന്നുള്ള ഒളിച്ചോട്ടവും കാപട്യത്തിന്റെ പ്രകടനവുമാവും. ദാമ്പത്യ ജീവിതത്തെ ഉലക്കുന്നതും, തകർക്കുന്നതും പലപ്പോഴും ലൈംഗികമായ അസംതൃപ്തിയാണ്. ''സ്ത്രീ പുരുഷ പ്രേമത്തിന്റെ അടിസ്ഥാനം തന്നെ രതി വികാരത്തിലാണ്. ലീലയുടെ സ്രഷ്പാവ് ഭൗതിക ജീവിതത്തിൽ ഒരു സന്ന്യാസി ആയിരുന്നുവെന്നൊരു ധാരണയു ്. പക്ഷെ, സൃഷ്ടിയുടെ വേളയിൽ കാമുക നിന്നിരുന്നത്." (പ്രസന്നരാജൻ, ഭാവമാണ് കവിയിൽ നിറഞ്ഞു 1979:17), ഇത്രമേൽ ഹൃദ്യമായി ആകർഷകമായി മനുഷ്യമനസ്സിലൂടെ പര്യടനം നടത്തിയ കവിയില്ല എന്ന് പ്രസന്നരാജൻ വിലയിരുത്തുന്നു. ദ്വിമുഖ വ്യക്തിത്വമുള്ള കലാകാരൻ ളെളിലുള്ള വ്യക്തിത്വമാണ് പലപോഴും സ്യഷിയിലുടെ വൃക്തിത്വം സൂചിപ്പിക്കുന്നത് ലീലയുടെ പുറത്തുവരുന്നത്. ആ സൃഷ്ടാവ് വെന്നാണ്. രതിവികാരത്തിൽ ആകൃഷ്ടനായിരുന്നു പ്രസന്നരാജൻ എന്ന ആശാന്റെ സഹൃദയനായ നിരൂപകൻ ലീലയിൽ മനസ്സ് കാട്ടിത്തരുന്നു. പ്രത്യയശാസ്ത്രത്തിന്റെ അകമ്പടി കുടാതെ ഒരു നല്ല ആസ്വാദകൻ ലീലയെ പരിചയപ്പെടുത്തിത്തരുന്നു.

വിമർശകന്റെ പ്രതിസന്ധി

നമ്മുടെ ജീവിതത്തിനും സംസ്കാരത്തിനും അത്യന്തം വിപത്ക്കരമായ മാറ്റം സംഭവിക്കുന്നു. നമ്മുടെ രാഷ്ട്രീയത്തിൽ സംഭവിക്കുന്ന ഞട്ടിപ്പിക്കുന്ന അധ:പതനം രാഷ്ട്രീയത്തിന്റേതു-മാത്രമല്ല. നമ്മുടെ മാനസിക ആത്മശുന്യതക-ളുടെയും, ജീവിതത്തിന്റെയും, അധാർമ്മികതകളുടെയും മൂല്യങ്ങളുടെ തിരിമറി ജീവിതത്തിന്റെ ചിഹ്നങ്ങൾ കുടിയാണ്. എല്ലാ ്. ഇന്നത്തെ സാഹിത്യം തേടുന്ന പ്രധാന പ്രശ്നങ്ങളിൽ മേഖലകളിലുമു ഒന്നാണിത്. ജീവിതത്തിന്റെയും, കേരളീയ ജീവിതത്തിന്റെയും ഇന്ത്യൻ സ്വഭാവമായി മാറിക്കഴിഞ്ഞ ഈ പ്രശ്നത്തെ ആധുനിക വിമർശനം തുപോലെ മനസ്സിലാക്കിയിട്ടില്ല എന്ന് പ്രസന്നരാജൻ പറയുന്നു. വോ

ആധുനിക വിമർശകരിൽ പലരും ഇപ്പോഴും സാഹിത്യത്തിൽ വന്നമാറ്റങ്ങൾ കാണുന്നില്ല. മനുഷ്യാസ്തിത്വത്തിന്റെ ദുരൂഹതയും, ഭ്രഷ്ടിന്റെ നാനാർത്ഥങ്ങൾ തിരഞ്ഞും അവർ നടക്കുകയാണ്. കാൽ നൂറ്റാ ുകാലം മുമ്പ് ഉപയോഗിച്ച സിദ്ധാന്തങ്ങളും, സ്വീകരിച്ച നിലപാടുകളും പൂർണ്ണമായും അപ്രസക്തമായിക്കഴിഞ്ഞു. ''സാഹിത്യത്തിലെ പ്രമേയത്തിലും ഭാഷയിലും ആഖ്യാനത്തിലും കാഴ്ചപ്പാടിലും വന്ന മാറ്റമനുസരിച്ച് സ്വയം മാറുവാനും കഴിയുമോ എന്നതാണ് ഇന്നത്തെ സാഹിത്യം ആധുനിക വിമർശകരോട് ഉറക്കെത്തന്നെ ചോദിക്കുന്നത്.'' (പ്രസന്നരാജൻ, 2002 : 50).

നമ്മുടെ സാഹിത്യത്തിൽ പിറവിയെടുത്ത ആധുനികാന്തര–ചിന്തയുടെ വേരുകൾ മലയാളത്തിൽ തന്നെയുെ ന്ന് പ്രസന്നരാജൻ പറയുന്നു. മനുഷ്യൻ, സ്വാതന്ത്ര്യം, രാഷ്ട്രീയം, മതം എന്നിവയെപ്പറ്റി എം. ഗോവിന്ദന്റെ ചിന്തകളിലാണ് അതിന്റെ വേരുകൾ ആഴ്ന്നിറങ്ങിയിരിക്കുന്നത്. മനുഷ്യജീവിതത്തെക്കുറിച്ച് ഉൾക്കാഴ്ച്ചകൾ പകർന്നു തരുന്ന കല നിശ്ചയമായും പാഴ്വേലയല്ല അത് നമുക്ക് ജീവിതത്തെക്കുറിച്ച് വെളിപാടുകളുടെ രൂപത്തിൽ അറിവും അനുഭവവും തരുന്നു. സാഹിതൃത്തിൽ സംഭവിച്ചിട്ടുള്ള മാറ്റങ്ങളെ ഉൾക്കൊ സ്വന്തം സിദ്ധാന്തങ്ങളുടെയും, സൗന്ദര്യസങ്കല്പങ്ങളുടെയും പരിമിതികൾ ലംഘിച്ചു പോകുവാൻ ആധുനിക എന്നതാണ് വിമർശകർ തയ്യാറാകുന്നില്പ വിമർശനം നേരിടുന്ന പ്രധാന പ്രശ്നങ്ങളിലൊന്ന് എന്ന് പ്രസന്നരാജൻ കരുതുന്നു.

വിമർശകൻ അടിസ്ഥാനപരമായും സഹൃദയനായിരിക്കണം എന്ന കാര്യം പ്രബന്ധങ്ങളും, പഠനങ്ങളും എഴുതുന്നവർ പലപ്പോഴും മറന്നു പോകുന്നു. ഒരു കൃതിയെക്കുറിച്ച് ശാസ്ത്രീയമായും വസ്തു നിഷ്ഠമായും പഠിച്ചെഴുതുന്ന പിന്നിൽ സംവേദന പ്രബന്ധങ്ങളുടെ ശക്തിയുള്ള സഹൃദയനു ാകില്പ. പ്രബന്ധങ്ങളിൽ പണ്ഡിതനോ, സെദ്ധാന്തികനോ നഞ്ചുവിരിച്ചു നിൽക്കുന്നതാണ് കാണുന്നത്. ''ഏതു കൃതിയും, മൃദുലമായ ഹൃദയഭാവങ്ങൾ നിറഞ്ഞ ഭാവഗീതം പോലും ഒരു രാഷ്ട്രീയവായനയ്ക്ക് വിധേയമാക്കാം. പക്ഷേ ത്ത നയവ സൈദ്ധാന്തികൻേതാവരുത്. സൗഹൃദയൻേതാവണം. വിമർശനത്തിന് മറുവശത്തേക്ക് വിധേയമാക്കുന്ന കൃതിയുടെ വെളിച്ചം പ്രസരിപ്പിക്കുന്ന സർഗ്ഗാത്മക വിമർശനം ഇപ്പോൾ വളരെയൊന്നും ഉ ാകുന്നില്ല." (പ്രസന്നരാജൻ, 2000 : 135).

ഒറ്റയാന്റെ ഏകാന്തമായ ലോകമാണ് പ്രസന്നരാജൻ എന്ന വിമർശകന്റെത്. കലാസൃഷ്ടിയുടെ നേരെ അയാൾ തന്റെ മനസ്സും ഹൃദയവും ചേർത്തു വയ്ക്കുന്നു. ''ആത്മീയവും ഭൗതികവുമായ ഇരുട്ടിൽ കഴിയുന്ന മനുഷ്യസമൂഹത്തിന് വിദ്യയും വെളിച്ചവും നൽകിയ പ്രൊമിത്യൂസാണ് ഒരർത്ഥത്തിൽ സാഹിത്യവിമർശകൻ.'' (പ്രസന്നരാജൻ, 1995 : 86).

ഒ.എൻ.വി. കുറുപ്പ് വിമർശിക്കപ്പെടുന്നു.

ചങ്ങമ്പുഴക്ക് ശേഷം അപചയത്തിലേക്ക് നീങ്ങിയ കാല്പനിക പ്രവണതകൾ ഏറ്റവും കുടുതൽ കാണുന്നത് ഒ.എൻ.വി. കുറുപിന്റെ കവിതകളിലാണെന്ന് പ്രസന്നരാജൻ സമർത്ഥിക്കുന്നു. ജി. ശങ്കരകുറുപ്പ് വിമർശിക്കപ്പെടുന്നു, എന്ന ഗ്രന്ഥത്തിൽ സുകുമാർ അഴിക്കോട് ജി. ശങ്കരക്കുറുപ്പിലാണ് കാല്പനികതയുടെ അപചയം ദർശിച്ചത്. എന്നാൽ ഭാഷയിലും, ശൈലിയിലും, പദങ്ങളിലും, കല്പനകളിലും താളഘടനയിലുമെല്ലാം ജീർണ്ണിച്ച കാല്പനിക-ഭാവങ്ങൾ ധാരാളമായി നിറഞ്ഞു നിൽക്കുന്നത് ഒ.എൻ.വി കുറുപ്പിന്റെ കവിതകളിലാണെന്നാണ് പ്രസന്നരാജൻ ത്തുന്നത്. ക്ക മാത്രമല്ല തന്റെ ഒന്നാം തരം പ്രശസ്തികൊ ് തന്റെ നാലാം തരം കവിത മൂടിവയ്ക്കുകയും ചെയ്തു. കാല്പനികതയുടെ യാഥാർത്ഥ അപചയം എന്ന ലേഖനത്തിൽ സഹൃദയനായ വിമർശകനെയല്ല നാം പ്രസന്ന രാജനിൽ കാണുന്നത്. ഒരു ഖണ്ഡന വിമർശനമാണ് ഈ ലേഖനത്തിൽ അദ്ദേഹം നടത്തുന്നത്.

ഒ.എൻ.വി കുറുപ്പിന്റെ കവിത കാല്പനികതയിൽ അഭിരമിക്കുമ്പോൾ കരുത്തില്ലാത്ത കാല്പനിക ഭാവങ്ങളുടെ പ്രദർശനശാലയിൽ മനുഷ്യ ആ ജീവിതത്തിലെ തിക്തഭാവങ്ങളുടെ ആഴം കര ത്താൻ കഴിയുന്നില്ല. ഒ.എൻ.വിയുടെ കവിതകളിൽ ചങ്ങമ്പുഴക്കവിതകളുടെ മധുരകോമളകാന്ത പദാവലിയുടെ മുഴക്കമാണ് കേൾക്കുന്നത്.

കാലഘട്ടത്തെ അതിജീവിക്കുകയും, ഭൂതകാലപാരമ്പര്യങ്ങളിൽ നിന്ന് ഊർജ്ജം സ്വീകരിക്കുകയും, വൃത്യസ്തവും നവീനവുമായ കാവ്യപാരമ്പര്യത്തിന് പിറവി കൊടുക്കുന്നവരുമായിരിക്കും യഥാർത്ഥകവികൾ.വൈലോപ്പിള്ളിയുടേയും അയ്യപ്പപ്പണിക്ക–രുടേയും കടമ്മനിട്ടയുടേയും കവിതകൾ പരിശോധിച്ചാൽ ഇക്കാര്യങ്ങൾ ബോധ്യപ്പെടും.

മലയാള കവിതക്ക് ഇടക്കുവച്ച് നഷ്ടപ്പെട്ടു പോയ പുരുഷ പ്രകൃതി വീറെ ടുത്ത പാട്ടുകളിലും വൈലോപ്പിള്ളിയുടെ കാവ്യഭാഷയും, തുള്ളൽ ചാക്യാർക്കൂത്തിലും മറ്റു പ്രാചീന കേരളീയ കലാരൂപങ്ങളിലും നിറഞ്ഞു ഫലിതത്തെ നിൽക്കുന്ന ഈ കാലഘട്ടത്തിനിണങ്ങുന്ന ഒരു തരം കടുത്തഹാസ്യമായി പുനർജ്ജീവിപ്പിച്ച അയ്യപ്പപ്പണിക്കരുടെ മുനകൂർത്ത കാവ്യഭാഷയും, നാടോടി പാട്ടുകളിലും നാടൻ രൂപങ്ങളിലും, കലാ പഴഞ്ചൊല്ലുകളിലും കാണുന്ന പ്രാചീന പദങ്ങൾക്ക് പുതിയ അർത്ഥ പ്രസക്തി നൽകികൊ കടമ്മനിട്ട രാമകൃഷ്ണൻ രൂപം കൊടുത്ത കിരാതമായ കാവ്യഭാഷയും ഓർമ്മയിൽ വരുമ്പോൾ ഒ.എൻ.വിയുടെ മധുര കരുത്തുള്ള കോമളമായ കാവ്യഭാഷ ദുർബ്ബലമാണെന്ന് ആരും പറഞ്ഞു പോകും. ഈ കാവ്യഭാഷയാകട്ടെ അദ്ദേഹത്തിന്റെ രചനയുടെ അപൂർവ്വതയില്ലായ്മയാണ് എടുത്തു കാണിക്കുന്നത്. (പ്രസന്നരാജൻ, 1999:13),

ഒ.എൻ.വി. പ്രയോഗിക്കുന്ന പദാവലികൾ ചങ്ങമ്പുഴയെ അനുകരിക്കുന്നുവെന്ന് നീലോല്പലങ്ങൾ, പ്രസന്നരാജൻ പറയുന്നു. മരാളങ്ങൾ, മ്യണാളം, ആതിരനിലാവ്, കുളിർ സന്ധ്യ, ഇളവെയിലൊളി, തിരുവാതിരത്താരം തുടങ്ങിയ ഭാവങ്ങളുടെ കാല്പനിക അതിമധുരം കലർന്ന ഇടപ്പള്ളിക്കവികൾ ആവേശത്തോടെ ഉപയോഗിച്ച പദങ്ങൾ ഒ.എൻ.വി. അതേ കാവ്യസന്ദർഭത്തിലും അർത്ഥ പ്രസക്തിയിലും ധാരാളമായി ഉപയോഗിക്കുന്നു ്. ഇടപ്പള്ളിക്കവികൾ ആർദ്രതയുടേയും വിഷാദത്തിന്റെയും വാക്കുകൾ ഒ.എൻ.വി പുറത്തുവിട്ട അതേപടി ഉപയോഗിക്കുമ്പോൾ വാടകക്കരച്ചിൽ പോലെ പരിഹാസമായി മാറുന്നുവെന്ന് പ്രസന്നരാജൻ പറയുന്നു.

ഭൂമിയുടെ ദുരന്തത്തെക്കുറിച്ച് ഉൽകണ്ഠയോടെ പാടിയ ഭഭൂമിക്കൊരു ചരമഗീതംഭ എന്ന കവിതയിൽ പോലും ഭീതിദമായ ഒരു മരണ ഗീതത്തിന്റെ രൗദ്രഭാവങ്ങൾ അതിനിണങ്ങിയ പദഘടനയിൽ അവതരിപ്പിക്കാൻ ഒ.എൻ.വി. കുറുപ്പിന് കഴിയുന്നില്ല. കാല്പനികതയുടെ അപചയത്തെ പ്രതിനിധീക-രിക്കുന്ന കവികളിൽ ഏറ്റവും പ്രശസ്തൻ ഒ.എൻ.വിയായതു-കൊ ാണ് അദ്ദേഹത്തിന്റെ കവിതകളെ വിമർശിക്കുന്നതെന്നും പ്രസന്നരാജൻ പറയുന്നു.

ആധുനിക കാലത്തെ ജീവിത ദുരന്തത്തെ ക്രോധവും ഫലിതവും കലർന്ന കാല്പനിക വിരുദ്ധമായ കാവ്യഭാഷയിൽ ചിത്രീകരിക്കുന്ന കവിതകളെയാണ് പ്രസന്നരാജന് കൂടുതൽ ഇഷ്ടം. കവിതയിൽ കലിയും ചിരിയും ഉ ാകണം നിറഞ്ഞ അദ്ദേഹത്തിന്റെ വൈപരീത്യങ്ങൾ എന്നാണ് പക്ഷം. നമ്മുടെ കാവ്യശൈലി കാലത്തിന് ഏറ്റവും ഇണങ്ങുന്ന ജീർണ്ണിച്ച കാല്പനിക ഭാവനയുടേതല്ല, മറിച്ച് മുനകൂർത്ത ചിരിയുടേയും, പരുഷമായ കലിയുടേയുമാണെന്ന് പ്രസന്നരാജൻ ഉറച്ചു വിശ്വസിക്കുന്നു. അതുകൊ ാണ് എം. ഗോവിന്ദന്റെ കവിതയെ പ്രസന്നരാജൻ ഇഷ്ടപ്പെടുന്നത്. എം. ഗോവിന്ദന്റെ കവിതയിൽ ഒളിച്ചുവച്ച ഫലിതത്തോടെ സംസാരിക്കുന്ന നാടോടി ഒരു മനുഷ്യന്റെ സ്വരം ഉയർന്ന് കേൾക്കുന്നതും അതുകൊ ാവാം. ആകാശ സ്വപ്നങ്ങളിൽ നടന്നിരുന്ന മലയാളകവിതയെ ജീവിതത്തിന്റെ അലഞ്ഞു

ുവന്ന നിഷേധിയായ അയ്യപ്പപ്പണിക്കരെ പരുക്കൻ മേഖലയിലേക്ക് മടക്കിക്കൊ പ്രസന്നരാജന് ഇഷ്ടമാണ്. ആധുനിക കാലത്തെ സംസാരിക്കുന്ന സത്യദർശനങ്ങൾ ആവിഷ്ക്കരിക്കുവാൻ ആദിബിംബങ്ങൾ ഉപയോഗിക്കുന്ന കടമ്മനിട്ടയിൽ ഒരു കിരാതന്റെ ക്രോധഗാനം പ്രസന്നരാജൻ കേൾക്കുന്നു. കവിതയെ സർഗ്ഗാത്മകമായി വഴിതെറ്റിച്ച സച്ചിദാനന്ദനെ ഒരു വിവേകിയായ പ്രസന്നരാജൻ കാണുന്നത്. ഓലയുടേയും, നാരായത്തിന്റെ കവിയായാണ് ഒത്താശകൂടാതെ പ്രചരിച്ച ഐതിഹൃങ്ങളിലെ ജീവിതാനുഭവങ്ങൾക്ക് പുതിയ ഈ ലോകത്തിലെ മാലിന്യത്തിന്റെയും നീതി അർത്ഥമാനങ്ങൾ നൽകി കേടുകളുടേയും അഴിമതിയുടേയും ലോകം നമുക്ക് മുന്നിൽ തുറന്നിട്ട ജി. കുമാരപിള്ള ചെയ്തത് പുതിയ ഐതിഹ്യങ്ങൾക്ക് രൂപം കാടുക്കുകയായിരുന്നുവെന്ന് അദ്ദേഹം വിശ്വസിക്കുന്നു. വിനയചന്ദ്രന്റെ കവിതകളിൽ കാട്ടുതേനിന്റെ സ്വാദാണ് പ്രസന്നരാജൻ രൂചിച്ചറിഞ്ഞത്.

ഉപസാഹാരാ

മറ്റുള്ളവരുടെ അഭിപ്രായങ്ങളെ നിഷ്ക്കരുണം പുറന്തള്ളി-ക്കൊ സ്വന്തം നൽകുന്ന ശക്തിയുടെ വെളിച്ചത്തിൽ പുതിയ സൗന്ദര്യബോധം ലോകത്തിലേക്ക് പ്രവേശിക്കുന്നു. മുൻഗാമികളിൽ നിന്നും വൃത്യസ്തമായ നിലപാടുകൾ സ്വീകരിച്ചുകൊ ് വ്യത്യസ്ത വഴികൾ തേടുന്നു. വിമർശകനും തമ്മിലുള്ള പൊരുത്തവും പൊരുത്തക്കേടുമാണ് സാഹിത്യ കൃതിയും വിമർശനത്തിൽ മൗലികമായ കാര്യം. വ്യാപ്തിയേറിയ കലാദർശനം ഉള്ളിൽ സുക്ഷിക്കുന്ന പ്രസന്നരാജൻ എന്ന സഹൃദയനായ വിമർശകൻ താനും കലാസൃഷ്ടിയും തമ്മിലുള്ള സ്വകാര്യബന്ധം വിവരിക്കുമ്പോൾ മൂല്യനിർണ്ണയവും നടക്കുന്നു.

ഗ്രന്ഥസൂചി

- പണിക്കർ, എം.പി., ലീല, മലയാള ഖണ്ഡകാവ്യങ്ങൾ ഒരു പഠനം, കേരള ഭാഷാ ഇൻസ്റ്റിറ്റ്യൂട്ട്, തിരുവനന്തപുരം, 1985.
- പ്രസന്നരാജൻ, അർത്ഥത്തിന്റെ സ്വാതന്ത്ര്യ്യം, പ്രസന്നരാജന്റെ ലേഖനങ്ങൾ, സാഹിത്യപ്രവർത്തക സഹകരണസംഘം, കോട്ടയം, 2014.
- പ്രസന്നരാജൻ, എന്തുകൊ് ചെമ്പകപ്പൂവ്, ലീലാകാവ്യം വീ ും പരിശോധിക്കുമ്പോൾ, നാഷണൽ ബുക്ക്സ്റ്റാൾ, കോട്ടയം, 1979.
- പ്രസന്നരാജൻ, പ്രേമസങ്കല്പം, ലീലാകാവ്യം വീ ും പരിശോധിക്കുമ്പോൾ, നാഷണൽ ബുക്ക്സ്റ്റാൾ, കോട്ടയം, 1979.
- പ്രസന്നരാജൻ, വിമർശകന്റെ പ്രതിസന്ധി, ഉത്തരാധുനിക ചർച്ചകൾ, പ്രഭാത് ബുക്ക് ഹൗസ്, 2002.
- പ്രസന്നരാജൻ, എഴുത്തുകാരനെ പുറത്തുവിടുമ്പോൾ, തിരിച്ചറിവുകൾ, സാഹിത്യ പ്രവർത്തക സഹകരണസംഘം, കോട്ടയം, 2000.
- പ്രസന്നരാജൻ, കാവ്യവിമർശനത്തിലെ വെളിപ്പും കറുപ്പും, തേനും വയമ്പും, ഡി.സി.ബുക്ക്സ്. കോട്ടയം, 1995.
- പ്രസന്നരാജൻ, കാല്പനികതയുടെ യഥാർത്ഥ അപചയം, കേരള കവിതയിലെ കലിയും ചിരിയും, ഡി.സി. ബുക്സ്, കോട്ടയം, 1999.

11

ICDS Software

Lekshmi Surya S. L.

Department of Physics with Computer Application, Sree Narayana College Kollam, India. *e-mail:-lekshmisnc2020@gmail.com*

Abstract

The Integrated Child Development System development programme, aimed at addressing malnutrition, health etc. The present system is manual system. Objective of ICDS Mission is to prevent under nutrition. It Strengthen ICDS as the first village post for health, nutrition and early. It also Focusing on children under 3 years. Focusing on early child care and learning environment. Moving from outlays to child-related outcomes. Fostering decentralisation and community based locally responsive childcare. Strengthen child care, nutrition and health education. It Inform beneficiary group and public about availability of core services. It also Promote social mobilisation and voluntary action

The project is developed using PHP as designing tool and MySQL asdatabase. PHP is a powerful tool for web programming From Microsoft and is the front end of this project with MySQL as backend.

Introduction

Integrated Child Development System has always been a matter of national concern. The various vertical health programmes initiated by the Government of India (GOI) from time to time did not reach out to the target community adequately. India adopted a well-defined national policy for children. In pursuance of this policy it was decided to start a holistic multicentric programme with a compact package of services. The decision led to the formulation of Integrated Child Development Services (ICDS) scheme – one of the most prestigious and premier national human resource development programmes of the GOI.

Improvement in the health and nutritional status of children 0–6 years and pregnant and lactating mothers. Reduction in the incidence of their mortality and school drop out.Provision of a firm foundation for proper psychological, physical and social development of the child.

Enhancement of the maternal education and capacity to look after her own health and nutrition and that of her family Effective co-ordination of the policy and implementation among various departments and programmes aimed to promote child development.

System Analysis:-

Existing System

The present system is manual system. The details of people and the availability of food grains and other items stored in the books of records such as daily stock book, ledger book etc. It cannot work properly and also there is a chance of occurring errors.

Limitations:

- 1. Distribution is not perfect.
- 2. Black markettig and hoarding.
- 3. Malpractice.
- 4. Time consuming.
- 5. More chance of errors.
- 6. Redundancy.
- 7. Paper records can be destroyed due to aging.
- 8. Lack of security

Proposed System

This system helps to avoid black marketing and other malpractices in the present system. The distribution of commodities can be done by using smart cards instead of ration card.By the use of smart card the system can identify username, uid number and other details of each member of family and monthly entitlement of commodities will be stored in the chip of the card. Based on the needs of the user the dealer can provide commodities and the bill.So that the dealer cannot make fake records. Through the system user can purchase items easily. Because in our system we use smart cards

instead of ration card.Each ration shop owner shall be provided with a securitysmart card,which will have the monthly entitlements of each family linked with concerned ration shop.At the end of the month ration shop owner will get his transactions upload to the central database and sending to the supply officer.proposed system gives a facility to get the new schemes by SMS facility for alerting each card holders before the last date of purchasing inventories.And also a complaint register is used to register the complaints fration dealer and whole sale dealer to supply officer.

In our system there are mainly four users. Each of them has there on privilege.

- 1. Thaluk Supply Officer
- 2. Wholesale Dealer
- 3. Ration Dealer
- 4. Card Holders

The public distribution system website is very user friendly and helpful for both card holders and civil supplies department.

Advantages of proposed system

Advantages and Features of Proposed System

- 1. Avoid black marketing and hoarding
- 2. Distribution is easy with smart card
- 3. Avoid chance to errors
- 4. Provide security and accuracy
- 5. High Speed processing
- 6. Avoid Redundancy

System Specification:-

Software Specification

Operating System	:	WINDOWS XP/7
Front End	:	PHP
Back End	:	MySQL Server



Figure: Structure Chart



Figure: Menu Tree

Implementation is concerned with those tasks leading immediately to a fully operational task. It involves programmers, users and operations management, but its planning and timing is a prime function of system analysis. It includes the final testing of the complete system to user satisfaction, and supervision of the initial operation of the new system.

Conclusion:-

Implementation of a system involves people from different departments and system analyst are confronted with the practical problems of controlling the activities of people outside their own data processing departments prior to this point in the project system, system analyst has interviewed department staffs with the permission of their respective managers. The implementation

Holistic Thought

coordination committee should be responsible for a successful implementation. There should be at least one representative of each department affected by the changes and other members should be opted for discussion of specific topic. Training section must aim to give user staff the specific skills required in their new jobs. The training will be more successful if conducted by the supervisor with the system analyst is attendance to sort out any queries, new methods gain acceptable more quickly in this way.

Result:-





	-111 - 24	CO.				4											~
← → ♂ ① localhos	/icds/icd	s/admin_d	strict.php		^	Ŧ								AN Ye	t's	- C	
				-													
admin			11N	Pμ	ANE	L											
номе		dd Di	strict														
DISTRICT&LOCATION >		istrict															
MANAGE CORDINATOR																Save	
MANAGE SCHEME																_	
MANAGE ITEM	Di	strict	List														
REPORT CORDINATOR	SL	NO		DISTR	NONATH								ACT	FION			
COMPLAINTS UNIT	2			ALAP	PUZHA	AI OIGAIII							Ren	nove			
STOCK TO CORDINATOR	3			ERNA	KULAM								Ren	nove			
MANAGE UNIT																	
MANAGE CHILD																	
PRIVACY																	
P Type here to search			0		it 💽	R (a O	0	8				32°	C Light ra	in ^ O	ED ENG 2	14:31 1-04-202
localhost / 127.0.0.1 / childhe	alth ×				×	+										_	0
\rightarrow C (i) localhos	t/icds/ice	ls/admin_c	hildlist.ph	p	~	,								A ^N	പ്പ	Gi (
DMIN			ΛIN	P	ANE	EL .											
_																	
HOME	N	IEW,	ALL C	HIL	D												
DISTRICT&LOCATION			DOB	AGE	FATHER	MOTHER	GENDER	RATION		ADDRESS	HOUSE	FATHER	HEIGHT	WEIGHT	CHILD	CHILD	CHILI
MANAGE CORDINATOR		NO NAM	-		NAME	NAME		TYPE	NUMBER		NUMBER	308			PHOTO	STATUS	HEAL
MANAGE SCHEME		1 Kichu	2019-	3	Jose	Jasmine	Male	APL	123456	Kichu Villa	K-345	Army	122	10		Approved	Good
															Ő.		
MANAGE ITEM >																	
REPORT CORDINATOR		2 Littu	2017-	5	Anil	Athira	Female	BPL	123454	Littu Villa	K-347	Manager	121	8		Approved	Good Cond
COMPLAINTS UNIT															D		
STOCK TO CORDINATOR															and the		
		3 Muth	2020- 10-08	2	Mohan	Moly	Female	RKSY	123454	Muthu Villa	K-345	Farmer	121	12		Approved	Good Cond
															D		
MANAGE CHILD															and the		
PRIVACY																	
			C		≓t 💽	-		0	8				a 3	2°C Light	rain 🔨	🔿 🖬 ENG	14:3 24-04-
Iocalhost / 127.0.0.1 / childhe	alth ×	CDS ICDS			×	+								~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~		- 0	× ×
	c/icus/icu	syadminno	me.pnp											A" 14	5 L=	₩ \$	
DMIN	,		11N	PA	٩NE	L											
номе	velco	ome t	o adr	nın	pann	el											
MANAGETTEM																	
REPORT CORDINATOR																	
COMPLAINTS UNIT																	
STOCK TO CORDINATOR																	
MANAGE UNIT																	
MANAGE CHILD																	
PRIVACY																	
Q Type here to search			0		s i 🕐	-		0	61				32	C Light r	in ne	ENG .	14:30

References:-

Texts

- 1) K.K Aggarwal, Software Engineering, Third Edition, New Age International Publishers, Year 2009
- 2) Rajib Mall, Fundamenals of Software Engineering, Thridedition, PHI Learning Pvt Ltd, Year 2009

Website

- https://www.w3schools.com/php/
- https://www.tutorialspoint/php/
- https://www.phptpoint.com/php-tutorial/
- https://www.mysqltutorial.org/
- https://dev.mysql.com/doc/refman/8.0/en/tutorial.html

A study on Quality of Tourism Services among selected Responsible Tourism destinations in Kerala

Parvathy Mohan^{1,*}

Gireesh Kumar G.S,²

¹ Department of Commerce, Baselius College, Kottayam. ² Henry Baker College, Melukavu. ^{*} *e-mail: parvathymohanan@gmail.com*

Abstract

Responsible Tourism is globally considered as a vector to achieve the United Nation's 2030 Sustainable Development Goals (SDGs) (Musavengane, 2019). The perceived tourism impacts and the overall life satisfaction may vary with tourist seasons (Bimonte & Faralla, 2016). It is relevant to stimulate a satisfying social interaction between residents and tourists to increase the impacts of tourism on residents' quality of life (Carneiro, Eusébio, & Caldeira, 2018). It is evident from previous studies that the Environmentally Responsible Behavior of tourists is greatly influenced by the Environmental Behavior of a tourism destination (Wang, Zhang, Cao, Hu, & Yu, 2019). The relationship between the perceived qualities of a tourist destination and the attachment it has in the minds of tourists is a critical factor shaping the tourists' behavior towards tourism development (Stylidis, 2018). Sustainable Tourism is yet another concept which is always used as a "claim" to alleviate the problems of conventional tourism. In actual parlance, it is often regarded as a marketing campaign by Multi-National Companies to justify their actions and thereby to attract tourists. The tourists are more particular about the conservation of bio diversity and geological features of the destination but are least bothered about the local population (Morrison- Saunders, Hughes, Pope Et.al, 2019). Responsible Tourism always provides a hassle-free travel and tourism experience to tourists and improves tourism benefits to the locals. Kerala has the potential to receive a high rank in the attainment of the globally accepted Sustainable Development Goals (SDGs) by 2030 via Responsible Tourism initiatives. The RT Mission in Kerala is performing exceptionally well that the local population is equipped to earn an additional livelihood, along with what they were already engaged in. (Harold Goodwin, 2019).

Keywords: Responsible Tourism (RT), Destination (Dest), Hotels (Hot), Accommodation and Quality (Acco), Hospitality (Hos), Environment (Env).

1. Introduction

Tourism is considered to be the most remarkable success story of modern times and its journey began in the early 1960s. The industry has grown rapidly and steadily for the past 40 years. The term "Tourism" can have different meanings for different persons. For some it is "travelling for pleasure", for others it is "travelling out of one's comfort zones", and for some others "travelling for education or acquiring new ideas, thoughts and experiences and thereby exploring new avenues" (William F. Theobald, 2005, Global Tourism). Tourism can have a profound impact on holiday destinations, from economic benefits of jobs and tax revenues, to positive and negative impacts on the environment and local communities. The impacts of a thriving tourism industry are seen across agriculture, construction, transportation and export sectors. As more and more governments recognise the importance of tourism in generating foreign exchanges, creation of jobs and contributing to tax revenues, the competition in this sector is becoming even more intense.

Taking Kerala into consideration, Responsible Tourism is an inspiring concept which was put forward by the Tourism Department; to be at par with the Global Tourism Market. Ever since its inception in the year 2008, so many responsible activities have been initiated by the Department and many of them have been a huge success. The concept of Responsible Tourism focuses on the well- being of the local economy, local culture and environment, which tries to fulfil the word that the benefits of tourism are equally accessed and distributed. Both Responsible Tourism and Sustainable Tourism have common goals like social justice, local economic benefits and environmental integrity; but there is an increasing tendency to shift from sustainability to a responsibility driven initiative. This improvement is based on the realisation that everyone is expecting others to be sustainable in their actions, thereby ignoring their own responsibility. Thus, Responsible Tourism puts the task firmly in the hands of everyone involved in tourism like government, community services, local will communities, tourists. etc., which lead to sustainability (www.tourismcapetown.co.za)

2. Literature Review

Morrison. A - Saunders, M. Hughes, J. Pope et. al (2019); Camilleri, Mark Anthony (2018) and Yu, Chia Pin, Cole, et.al, (2018) studied the expectations for Responsible Tourism initiatives in tourism destinations. A comparative analysis is made with respect to the expectations of South African visitors and other International visitors. They studied the positive and significant association between the perceived ease of use and perceived usefulness of digital media, which explores the perceived impact of tourism on the host community. Local residents play a crucial role in the development of sustainable tourism practices in a destination. They reveal that both socio- cultural and environmental benefits contribute to the living experience of the host community. Rezhen Harun, Gabriela O. Chiciudean, Kawan Sirwan, Felix H. Arion and Iulia C. Muresan (2018); Vikneswaran Nair (2018); Yu, Chia Pin, Cole, et.al, (2018); Ottilie Geiger (2017), tries to analyse the relationship between sustainable tourism developments in a destination with the stakeholder expectations of that destination.Local residents play a crucial role in the development of sustainable tourism practices in a destination. Resident support is inevitable for the better health of tourism industry and for the successful community development. The results showed that the local residents are encouraging tourism prospects in their area as it leads to various positive impacts regardless of some negative effects like pollution. Paul V. Mathew, Sreejesh. S (2017); Joobi V.P and Dr. Satheesh E.K (2016); M. Jeon, M. Kang, E. Desmerais (2016); Wantanee Suntikul, Stephen Pratt, Wallace I Kuan e.tal. (2016); Athula C. Ganapala, Thusara Pradeep Karunathilaka (2016); Muhammed Hafiz, Hanafiah, Inoormaziah Azman, Norliza Aminuddin, Muhammed Raziff Jamaluddin (2016), Tanja Mihalic (2016); Yaping Liu, Linlin Nie, Fuqiang Wang and Zhulan Nie (2015) tries to link the quality of life of local people with the responsible tourism initiatives of their respective regions. They try to connect the term "Responsible Tourism" with "Sustainable Tourism" and accordingly a new term called "Responsustable Tourism" has been suggested. They try to explore community perception and their involvement in tourism development activities. They also studied the influence of seasonal attributes on residents' perception of tourism impacts.

3. Materials and Methods

Any form of tourism that gives its priority to local community by way of fair and equitable distribution of tourism benefits to them simultaneously by safeguarding the ecology can be called as Responsible Tourism. It is synonymous with Ethical tourism, Sustainable tourism, Ecotourism and Pro- poor tourism. There exists a direct relationship between ethics and responsibility in Responsible Tourism. According to the definition of World Watch Institute, 2005, Responsible Tourism is defined as "any tourism that maximises the benefits for local community and minimises the negative impact on the environment and local culture" (Fennell, 2008). A major portion of tourism benefits goes to local population in the form of economic impacts as tourism is directly benefitting locals by creation of new jobs, opportunity to increase income and savings and thereby improving the standard of living of people (Mohd Bakri, Jaafar, & Mohamad, 2014). One of the revolutionary approaches taken by the Department of Tourism of Kerala Government is the implementation of Responsible Tourism in selected destinations. Sustainability in tourism is the goal, which can only be accessed by imparting responsibility to the tourists and local community.

The study uses both primary and secondary data and is both descriptive and analytical in nature. Primary data is collected through direct interviews with Tourism Department officials, tour operators, hotel staffs, home stay operators, tourists and local community in the selected Responsible Tourism destinations. Secondary data is collected from various published and unpublished sources, websites of Tourism Departments, like, Department of Tourism (DOT), Government of Kerala, District Tourism Promotion Councils (DTPCs), United Nations World Tourism Organisation (UNWTO), International Centre for Responsible Tourism (ICRT), Department of Environmental Affairs and Tourism (DEAT), Pacific Asia Travel Association (PATA), World Travel Mart (WTM), World Travel and Tourism Council (WTTC), etc. As the study requires in depth information from the sample respondents, a structured interview schedule is prepared after going through various stages. As the first step, the variables for the interview schedule are identified by thoroughly reviewing the available literatures, both printed and online sources. A closed- ended interview schedule is developed to collect data as it is easier for the researcher to get the responses.

The redrafted interview schedules are pre-tested in Kumarakom, one of the famous Responsible Tourism destinations in Kerala. Before going for a Pilot survey, a method is adopted to identify whether the instrument is self-explanatory or not. In light of the above, the instrument is again redrafted for pilot testing. A sample of 100 respondents of tourists are selected for

pre- testing the interview schedule. The collected data are tested for reliability and validity.

The Sampling Area for the study includes Kovalam (beach destination), Kumarakom (backwater destination), Wayanad (wildlife destination) and Thekkady (hill station destination) in Kerala. The population comprises of all types of tourists, whether, domestic or foreign; inbound or outbound, who are visiting the selected Responsible Tourism destinations. Here, it is not known beforehand that who or how many visitors would make up the population. The number of tourists visiting the destination will vary from year to year. Due to the peculiarity of the study phenomenon, it is not possible to get the sampling frame. Thus, the use of Probability Sampling method is not feasible for the study related to Tourists. Hence, Convenience Sampling; a Non- Probability Sampling method is used for selection of samples related to Tourists.

Out of the 250 respondents approached, only 182 is willing to participate in the interview in Kovalam; 165 in Kumarakom; 112 in Wayanad and 153 in Thekkady. As the respondents in Kovalam are always in a hurry to visit the places, the responses obtained from them are not meeting the demands of the researcher. Some of the responses are biased, some left the site prior to the completion of interview, providing incomplete information. This led to the rejection of 100 interview schedules and the remaining were only 82 schedules with requisite information. Same is the case with Kumarakom, Wayanad and Thekkady. In Kumarakom, only 82 out of 165 responses can be selected for the study. Wayanad is the area which created many problems for data collection as the place was hit by floods and rains. With the post flood activities taking place in some locations, it was a tiresome procedure to collect the relevant data. Only 75 responses can be obtained from Wayanad out of 112. In Thekkady, the researcher could collect only 85 samples out of 153. Thus, a sample of 324 tourists are collected from the four selected destinations.

Data reliability is tested using Cronbach's Alpha. The reliability of the constructs so identified are checked and verified with confirmatory factor analysis and discriminant analysis. Descriptive statistics of each constructs so identified are also analyzed. An Exploratory Factor Analysis (EFA) with a principal component method is conducted to identify the scale dimensionality. Correlation Analysis, Factor Analysis and Multiple Regression Analysis is used to attain the stated objective.

The study intends to realise the following specific objective.

- To explore various dimensions of Quality of Tourism Services in selected Responsible Tourism destinations in Kerala.
- To study the Quality of Tourism services across selected Responsible Tourism destinations in Kerala.

2. Results

Exploratory Factor Analysis of the questions regarding Quality of Tourism services is conducted to identify the factor loadings. The reliability of the constructs so identified is further tested and verified with Confirmatory Factor Analysis. Exploratory Factor Analysis (EFA) is conducted on 34 measures (items) to validate the constructs that will help to analyze the questionnaire responses and to evaluate factors influencing Quality of Tourism Services.

Kaiser-Meyer-Oklin Measure of Sampling Adequacy	0.869
Bartlett's Test of Sphericity Approx. Chi-Square	22038.25
Degrees of Freedom	1953
P Value	<0.001**

Table No. 1: KMO and Bartlett's Test

Source: Authors' calculation

**Denote Significant at 1 percent

According to Kaiser, a measure greater than 0.9 is marvelous, greater than 0.80 is meritorious, greater than 0.7 is middling, greater than 0.6 is mediocre, greater than 0.50 is miserable and less than 0.5 is unacceptable. In this case, 0.869 is far above 0.80 and therefore can be treated as meritorious which means that the sample is enough to do factor analysis.

The seven factors identified are **Destination (Dest)**, **Hotels (Hot)**, **Accommodation and Quality (Acco)**, **Hospitality (Hos)**, **Environment (Env)**, **Value (Val) and Transportation (Tran)**.

A Reliability Test is carried out using Cronbach's Alpha, which measures the internal consistency of research constructs. The Alpha values for all the seven factors are above 0.70, the threshold suggested by Nunnally (1978). Thus, it is concluded that the scale has internal consistency and reliability. In other words, the items that are used in it measures what is intended to measure.

Sl No	Factors (Constructs)	Number of Items	Cronbach's Alpha
1	Destination (Dest)	5	.840
2	Hotels (Hot)	7	.898
3	Accommodation and Quality (Acco)	4	.769
4	Hospitality (Hos)	6	.953
5	Environment (Env)	5	.921
6	Value (Val)	4	.884
7	Transportation (Tran)	3	.928

Table No. 2: Cronbach's Co-efficient Alpha

Source: Authors' calculation

Confirmatory Factor Analysis (CFA) is a multivariate statistical technique that is used to experiment on how well the measured variables denote the number of constructs. The 7 identified factors resulted in EFA is further validated through confirmatory factor analysis (CFA).

Table 3: Goodness of Fit Indices – Quality of Tourism Services CFA

Goodness of Fit Indices	Fit Criteria	Measurement Model
χ^2 /df (Normed Chi-square) χ^2 – 4921.929, df-518	<5	3.242
GFI (Goodness of Fit Index)	>0.90	.905
AGFI (Adjusted Goodness of Fit Index)	>0.80	.832
CFI (Comparative Fit Index)	>0.95	.954
NFI (Normed Fit Index)	>0.90	.913
Standardized Root Mean Square Residual (SRMR)	<0.08	.058
RMSEA (Root Mean Square Error of Approximation)	<0.08	.054

Source: Authors Calculation

In addition to the model fit indices, standardized regression weights, and Critical Ratio (CR) estimates are also used to evaluate the 7-dimension model. Besides, the psychometric properties of the model in terms of reliability, convergent validity, and discriminant validity are also evaluated. Reliability and convergent validity of the factors are estimated using Composite Reliability Co-efficient (CRC) and Average Variance Extracted (AVE) which is calculated using the methodologies suggested by Hair et al. (1998).

The variation in Quality of Tourism Services among various groups are studied with the help of One- way analysis of variance (ANOVA) and Independent Sample t- test. The statistically significant differences between the means of two or more independent (unrelated) groups are tested with ANOVA and the mean differences between two groups are tested with Independent Sample t- test. Here it is tried to reconnoiters the variance in the Quality of Tourism Services constructs Destination (Dest), Hotels (Hot), Accommodation and Ouality (Acco), Hospitality (Hos). Environment (Env), Value (Val) and Transportation (Tran) amongst various Responsible Tourism Destinations in Kerala.

2.1 Quality of Tourism Services (Destination) based on RT Destinations

Destination plays a crucial role in determining the quality of tourism services of tourists.

The destination-based quality of tourism services across selected RT destinations are studied and analysed with the help of the statistical test called one-way analysis of variance (ANOVA). The results are depicted in the table 4.

RT Destinations	Ν	Mean	SD	F value	P value
Kovalam	82	20.5366	1.84722		
Kumarakom	82	22.4146	3.23542		
Wayanad	75	19.6533	2.59153	18.435	.000**
Thekkady	85	21.9882	2.74076		
Total	324	21.1883	2.85973		

 Table 4: ANOVA (RT Destinations on Destination Tourism Services)

Source: Compiled by Researcher (Primary data)

**Significant at 0.01 level

It is realized that, as the P value is less than 0.01 the mean differences across RT destinations are significant at 1% level of significance. Based on the mean scores, it is understood that the Quality of Tourism Services vary significantly across selected RT destinations. Quality of Tourism Services are found to be high in Kumarakom as its mean value is highest, followed by Thekkady, Kovalam and Wayanad.

2.2 Quality of Tourism Services (Hotels) based on RT Destinations

The quality of tourism services on account of Hotel facilities across RT destinations are tested using One- way analysis of Variance (ANOVA). The table 5 shows the ANOVA test results.

RT Destinations	Ν	Mean	SD	F value	P value
Kovalam	82	23.6341	3.49784		
Kumarakom	82	25.3780	4.55864		
Wayanad	75	22.8485	2.87826	9.999	.000**
Thekkady	85	25.6353	3.58186		
Total	324	24.4635	3.87065		

 Table 5: ANOVA (RT Destinations on Hotels Tourism Services)

Source: Compiled by Researcher (Primary data)

**Significant at 0.01 level

It is evident from the analysis that the P value is less than 0.01 which is significant at 1% level of significance. The results imply that there exist significant mean differences across selected RT destinations based on Hotel services in the area. That is the quality of tourism services on account of Hotel service vary significantly from destination to destination. It is also found that the Quality of Tourism services with respect to Hotels are more in Thekkady, as the mean value is high, followed by Kumarakom, Kovalam and Wayanad.

2.3 Quality of Tourism Services (Accommodation and Quality) based on RT Destinations

The quality of tourism services across RT destinations based on Accommodation and Quality is tested with the help of One- way analysis of Variance (ANOVA). The results are shown in table 6

RT Destinations	Ν	Mean	SD	F value	P value
Kovalam	82	15.6585	2.18423		
Kumarakom	82	16.5488	2.56834		
Wayanad	75	15.5758	2.09072	3.423	.081
Thekkady	85	16.9529	2.00538		
Total	324	16.2222	2.29264		

 Table 6: ANOVA (RT Destinations on Accommodation and Quality Tourism Services)

Source: Compiled by Researcher (Primary data)

It is evident from table 6 that the P value is more than 0.05. It reveals that the mean difference across destinations are not significant at 5% level of significance. Hence, it is concluded that there is no statistically significant difference Quality of Tourism Services based on Accommodation and quality across selected RT destinations in the study.

2.4 Quality of Tourism Services (Hospitality) based on RT Destinations

Hospitality shown by the hotel staffs and local community is a decisive factor in determining the tourism quality in tourist destinations. The hospitality driven Tourism quality is assessed by using the test statistic ANOVA and the details are given in table 7.

RT Destinations	Ν	Mean	SD	F value	P value
Kovalam	82	25.0488	4.36570		
Kumarakom	82	25.7561	4.31924		
Wayanad	75	22.5909	2.94032	13.757	.000**
Thekkady	85	26.7059	4.11682		
Total	324	25.1651	4.26414		

Table 7: ANOVA (RT Destinations on Hospitality Tourism Services)

Source: Compiled by Researcher (Primary data)

**Significant at 0.01 level
It is evident that the P value is less than 0.01, which is found to be significant at 1% level of significance. So, the results convey that there exists statistically significant mean variation across selected RT destinations on account of the Hospitality services provided to the tourists. Thus, the quality of tourism services based on Hospitality differ significantly from destinations to destinations. It is also found that Thekkady is having better Tourism Quality based on Hospitality as the mean value is higher, followed by Kumarakom, Kovalam and Wayanad.

2.5 Quality of Tourism Services (Environment) based on RT Destinations

Environment and scenic beauty in the destination plays an influencing role in the Quality of Tourism Services of Tourists. The extent of influence environment can have on different selected RT destinations are analysed with the help of One- way analysis of variance (ANOVA) and the details are given in table 8.

RT Destinations	Ν	Mean	SD	F value	P value
Kovalam	82	21.3049	3.06992		
Kumarakom	82	21.7195	2.51059		
Wayanad	75	20.7333	2.87737	6.757	.000**
Thekkady	85	22.3529	2.57602		
Total	324	21.5525	2.81312		

 Table 8: ANOVA (RT Destinations on Environment Tourism Services)

Source: Compiled by Researcher (Primary data)

**Significant at 0.01 level

It is identified that the mean differences are statistically significant across selected RT destinations, as the P value is found to be lesser than 0.01 at 1% significance level. Thus, there is significant difference in the quality of tourism services based on environment across selected tourist destinations. Thekkady is found to have better quality of tourism service with respect to environment as its mean value is high, followed by Kumarakom, Kovalam and Wayanad.

2.6 Quality of Tourism Services (Value) based on RT Destinations

The Quality of Tourism services on account of the Value attributable to the destination are analyzed by One- way analysis of variance (ANOVA). The details are shown in table 9.

RT Destinations	Ν	Mean	SD	F value	P value
Kovalam	82	16.4024	2.37195		
Kumarakom	82	16.9756	3.43538		.000**
Wayanad	75	16.7200	1.82001	8.419	
Thekkady	85	18.2118	1.94014		
Total	324	17.0957	2.56798		

 Table 9: ANOVA (RT Destinations on Value Tourism Services)

Source: Compiled by Researcher (Primary data)

**Significant at 0.01 level

As per the analysis, the mean differences are significant at 1% level of significance since the P value is less than 0.01. Thus, it is realised that, based on the mean score, there exists a significant difference in quality of tourism services on account of value attributable by tourists across selected RT destinations. It is also found that the Quality of Tourism Services based on Value is more in Thekkady, followed by Kumarakom, Wayanad and Kovalam

2.7 Quality of Tourism Services (Transportation) based on RT Destinations

Quality of Tourism services to a great extent is influenced by transportation facilities in the destination. As and when tourists feel comfortable in their mobility in different tourist spots, there will be tourism quality. The transportation-based tourism quality across selected RT destinations are analysed by One- way (ANOVA) as shown in table 10.

RT Destinations	Ν	Mean	SD	F value	P value
Kovalam	82	12.6220	1.74016		
Kumarakom	82	12.3902	1.85762		.000**
Wayanad	75	11.9467	2.25349	6.812	
Thekkady	85	12.9294	1.42083		
Total	324	12.4877	1.85458		

 Table 10: ANOVA (RT Destinations on Transportation Tourism Services)

Source: Compiled by Researcher (Primary data)

**Significant at 0.01 level

Since the P value is less than 0.01, the mean difference is significant at 1% significance level. Thus, it is realised that there is a significant difference in Transportation based Quality of Tourism services across selected RT destinations. The results also state that Thekkady has better quality of tourism services with respect to transportation facilities (with highest mean score), followed by Kovalam, Kumarakom and Wayanad.

3. Conclusions

Tourism development is having its rigid footing on the quality of tourists' attractions in a particular destination. Attractions can be either natural, cultural or man- made (Kencana, E.N & Darmayanti, T. 2017). Tourist satisfaction plays the key role in the success of any tourism industry (Aliman, N.K, et.al. 2016). Satisfaction is the end result of a continuous and constant comparison of customers or tourists with respect to their expectations of performance and perceptions of performance. Whenever these expectations exceed beyond a particular tolerance zone, extreme satisfaction is resulted (Rivera, D.E. et.al. 2019). This study deals with analysing the intricacies of Responsible Tourism Initiatives in Kovalam, Kumarakom, Wayanad and Thekkady from tourists' point of view. The study of (Stanciu, P & Arionesei, G, 2014) proved that there is a positive relationship between Quality of Tourism Services and Tourist satisfaction in a destination. However, both (Jeya Nithila, C.R, 2014) and (Mendes, J; Guerreiro, M & Matos, N, 2016) states that tourism guality services lead to tourist satisfaction and tourist satisfaction eventually will leads to better tourism experience. As tourists feel more satisfied with varied quality services, it leads to Revisit Intention of tourists. (Haghkhah, A. 2011). The positive impact of Tourism Quality Services on individual tourist satisfaction constructs and overall tourism satisfaction of respondents in the destination are successfully established by (Al- Ababneh, N. M. 2013). The findings of the study (Ebrahimpour, Alireza and Haghkhah, Azam. 2010) showed that tourist satisfaction does have a concomitant relationship with varied tourism quality services in the destination, which do influence their intention to return, which will again lead to the development of tourism industry.

References

- Amin R.M (2016). Domestic tourists' mindset towards Responsible Tourism Management: A case study on Cox's Bazar, Bangladesh. *International Journal of Tourism Cities*.
- Andreck, K. L., Valentine, K. M., & Vogt, C. A. (2005). Residents perceptions of Community Tourism Impacts. Annals of Tourism Research, 32, 1056-1076.
- Androitis, K. (2004). The perceived impact of Tourism development by Cretan residents. *Tourism and Hospitality Planning and Development*, Routledge publications. 1 (2). 123-144.
- Anter, M & Attia, M.A. (2017). Layoff policies in Egyptian Tourism Sector: The relation between Economic benefit and Employees' loyalty. *Journal of faculty of Tourism and Hotels*, Research Gate publications, 8 (2).
- Archer, B., Cooper, C., & Ruhanen, L. (2005). The positive and negative impacts of tourism. *Global Tourism*.
- Ardahaey, F.T (2011). Economic Impacts of Tourism Industry. International Journal of Business and Management. Published by Canadian Center of Science and Educatuion. 6 (8).
- Broderick, J. (2012). Understanding carbon budgets and the safe climate space for responsible tourism. New Delhi: Ashish publishing house.
- Brougham, J. E., & Butler, R. W. (2002). A segmentation analysis of Resident attitudes to the Social Impact of Tourism. *Annals of Tourism Research*, 8(4), 569-590.
- Broun, T., Churchil, G., & Peter, P. (1993). Improving the measurement of Service Quality. *Journal of Retailing*, 69(1), 127-139.
- Budeanu, A; Miller, G; Moscardo, G; et. al. (2016). Sustainable Tourism, progress, challenges and opportunities: An introduction. *Journal of Cleaner Production*, Vol. 111.
- Elizabeth, O. (2013). The impact of economic growth on employment in Nigeria. *International Business and Management*, Research Gate publications, 6 (1), pp. 113-119.
- Eraqui, I. M. (2007). Local Communities' Attitude towards Impacts of Tourism Development in Egypt. *Tourism Analysis*, 12, 191-200.
- Feruzi, K. J. (2012). An Evaluation of Responsible Tourism practices in the Tanzanian tourism industry. Peninsula University of Technology.

- Filosofova, T & Apostolov, D (2016). Effects of tourist satisfaction: Influence on the touristic flows of Bulgeria in Russia. *Tourism Highlights*, pp. 1-10.
- Forsyth, T. (2018). Environmental responsibility and Business regulations: the case of Sustainable Tourism. *The Geographical Journal*, *163*, 270-280.
- Goodwin, H. (2017). The challenge of Overtourism. *Responsible Tourism Partnership.*
- Goodwin, H., & Font, X. (2012). *Progress in Responsible Tourism*. United Kingdom: Goodfellow publishers.
- Joobi V.P., & Satheesh E.K. (2017). Local community participation in Responsible Tourism-A case study of Kumarakom Grama Panchayath. *International Journal of Current Research in Multidisciplinary* (*IJCRM*), Vol. 2, No. 11, pp. 5-11.
- Jurdana, D.S & Frleta, D.S. (2016). Satisfaction as a determinant of tourist expenditure. *Current Issues in Tourism*, Routledge publishers.
- Jurdana, D.S & Frleta, D.S. (2016). Factors affecting the expenditure of domestic and foreign tourists: The evidence from Rijeka and Opatija, Croatia. *Tourism and Hospitality Industry, Congress* proceedings, pp. 418- 431.
- Keat, W. K., & Musa, N. (2014). Responsible Tourism System Dynamic Planning Model for Rural area. *Journal of Hospitality and Tourism*.
- Kencana, E.N & Darmayanti, T. (2017). Causality between Frequency of visit with Tourist Satisfaction: A multi- group analysis. Udayana Journal of Social Sciences and Humanities, Research Gate Publications, Vol. 1, No. 2.
- Musavengane, R. (2019). Small hotels and responsible tourism practices: Holeliers' perspectives. *Journal of Cleaner Production*, Vol.220.
- Mustelier Puig, L.C; Anjum, A & Ming, X (2018). Interaction quality and satisfaction: An empirical study of international tourists when buying Shanghai tourist attraction services. *Cogent Business & Management*, pp. 1- 20.
- Thett, K. K. (2012). Responsible Tourism in Myanmar: current situation and challenges. *Ministry of foreign affairs of the Czech Republic within its transition promotion program.* Burma Centre Prague Publishers.

- Venu, V., & Goodwin, H. (2008). The Kerala Declaration on Responsible Tourism, Thiruvananthapuram. Department of Tourism, Government of Kerala.
- Wang, Chang; Zhang, Jinhe; Cao, Jingjing; et. al, (2019). The impact of behavioural reference on tourists' responsible environmental behaviour. *Science of the Total Environment*.
- Zhuang, X; Yao, Y & Li, J.J. (2019). Socio- Cultural Impacts of tourism on Residents' of World Cultural Heritage Sites in China. *Sustainability*. pp. 2-19.

Secularism In India: Challenges And Responses

Preetha G. S.

Department of Political Science Sree Narayana College, Kollam *e-mail: preethags2013@gmail.com*

Abstract

Secularism plays a major role for the protection of state order. There is an inseparable linkage between secularism and democracy in India. Development of the nation not only depends on economic development but also in preserving secular nature. Today our political culture is infected with casteism and communalism. Religion plays a major role in Indian society and is mixed in the blood of people, which in turn creates the Indian secular tradition complicating.

Secularism in India

India is a country which is host to all conceivable religions and ways of life. India has followed the principle of *unity in diversity*. This unity is based on democracy, federalism, tolerance and secular character of state. The key to India's success as a federal democracy is the recognition of its diversities. Acceptance of all religions and different ways of life is the cornerstone of the Indian Culture, heritage and polity. Secularism is a very popular word in the Indian political system next to democracy. The term secularism was coined by the British Reformer George Jacob Holyoake in 1851.

The concept of secularism which came to India, from the East and West, implies a separation that exists between the state and the religion. As per the concept, no religion will be considered as the state religion and no one will be discriminated against on the grounds of religion. Secularism in India means a state that is neutral in nature and respects all religions equally. In the original constitution, the word secularism was not mentioned. Yet, the philosophy of Indian Constitution was secular. The term secular was modified and brought in to the preamble in the 2nd amendment

of 1976. The insertion of the word *secular* to the preamble lead to serious debates in the constituent assembly.

In spite of the fact that India is considered and invariably accepted as a secular state, yet secularism is not a settled issue. The present paper purports to examine and analyze the concept of secularism in the content of India with reference to the constitution and also analyzing its current status. Thus, both secularism and democracy are constitutive of a just state; a state that ensures equality of status between individuals as well as between religious communities. This research paper would be useful to know about the hidden or discovered aspects of secularism in the content of the constitution of India and Indian Society. This research paper is also helpful to identify the various problems faced by Indian Secularism and its current status. Moreover, by identifying these problems we can formulate measures for the improvement of secularism in India.

Historical Background of Indian Secularism

Indian culture is based on the blending of various spiritual traditions and social movements. Secularism in India goes back to the times of great Ashoka, Harshavardhana and Akbar. They provide equal rights and freedom to all religious communities. Ellora Caves in Maharashtra are one such example. The Ellora Caves, which were built between 5th and 10th century, have caves of various religions which show the harmony and co- existence between them. But with the arrival of Mughals the concept of secularism was destroyed. They demolished temples of non-Muslims religions and impose tax, called *jizya* on them.

India is a country where religion is very central to the life of people. India's age- old philosophy as expounded in Hindu scripture called Upanishad is *Sarva Dharma Samabhavana* which means respect to all religious system. Tolerance and harmony is, a wave through Indian philosophy, culture and society since ages. The basic trait of *Sanadana dharma* was allowed to develop as a holistic religion by welcoming different spiritual traditions and trying to integrate them into common mainstream. India has not been a mono religious country for over two million of Hindu nationalist school of thought, indeed, *Sanadana dharma* being the spirit of India. The history of the Indian secularism begins with the protest movement in the 5th century BC. The three main protest movement, Buddhism and Jainism. All these rejected the Vedas and any importance of

belief in a deity. In the 18th century, the idea of secularism began to have impact on Indian mind, that when the British East India Company began to gain total control over India. In the Indian context, the secular ideology arose to unite the people of India and oppose the colonial rule. It was a larger part of making it into a nation state.

During the colonial era, the nationalist and the Indian national congress never took up the religious issue nor did it object the British for being promoting the Christianity. The Indian nation state at Independence was confronted with the task of creating a unified national and political society out of a formidable diversity of regional, linguistic and caste identities. India being a plurality state faced many challenges in the post independent era. According to a famous historian, Bedpan Chandra, the policies followed by the colonizers threatened the unity and integrity of India. The partition and the granting of freedom to India were a sheer confidence, when the secular ideology, which was to profoundly argued in spite of the representing in the form of the communal award of Mac Donald. Further, the two-nation theory, propagated by Mohammad Ali Jinnah, gave birth to Pakistan. Leaders namely Dadabhai Naroji, Pherozeshah Mehta and Gopal Krishna Gokhale, shared this view. Mahatma Gandhi shared this notion of secularism and advocated that there should be any discrimination between the religious beliefs of different people. The religion is its demonical form, religion in its secularism form, religion not as a code of conduct, which engulfs all religions including atheists, not as a dharma or a code of morality, but a religion in the sense of Hinduism, Islam and Christianity must be kept as a private affair. In his journal Harijan, Gandhi visualized a secular Indian state in the spite of the problems that India encountered in the post independent era especially the communal problems pertaining to the partition of India.

Thus, Indian freedom movement was characterized by secular traditions and ethos from the start. In India, there is no wall of separation between religion and the state. Indeed, it means the state is neutral to all religions.

Constitutional Provisions Regarding Indian Secularism

The hallmark of any democratic state is its ability to ensure that all the people who constitute that state has freedom of conscience so that persons of different faith have the same rights and responsibilities and no discrimination between them exists. Secularism is known as this process of growth of reason, which is the basis of any secular and democratic state. The word secularism was into placed in the Indian constitution when it was first promulgated in 1950 in fact, it was added by the 42nd Amendment act 1976 and which came in to an effect on January 3, 1977. After the Amendment, India was described as a *Sovereign Socialist Secular Democratic Republic* in the preamble to the constitution. The idea of secular state was always there in the minds of the constitution makers, for the same reason the right of freedom of religion was kept as a fundamental right under part III.

Constitutional Provisions

There is a clear incorporation of all the basic principles of secularism into various provisions of constitution:

- 1. Article 15 enlarges the concept of secularism to the widest possible extent by prohibiting discrimination on grounds of religion, race, caste, so or place of birth.
- 2. Article 16 (1) guarantees equality of opportunity to all citizens in matters of public employment and reiterates that there would be no discrimination on the basis of religion, race, caste, sex, place of birth and residence.
- 3. Article 25 provides 'freedom of conscience', that is all persons are equally entitled to freedom of conscience and right to freely profess, practice and propagate religion.
- 4. As per Article 26, every religious group or individual has the right to establish and maintain institutions for religious and charitable purposes and to manage its own affairs in matters of religion.
- 5. As per article 27, the state shall not compel any citizen to pay any taxes for the promotion or maintenance of any particular religion or religious institution.
- 6. Article 28, freedom as to attendance at religious instruction or religious worship in certain educational institutions.
- 7. Article 29 and Article 30 provides cultural and educational rights to the minorities.

The Status of Secularism in Today's World

As one of the world's diverse countries, India has always been home to many different religious groups. Secularism is the soul of Indian constitution. Indian brand of secularism is designed to hold the country's desperate communities together under one roof. India's composite culture was one of its greatest strengths. Today the word secularism of the constitution still remains unaltered but its souls are mangled and unlocked. It seems to have accepted that India is no longer the secular country born on the legacy of India's freedom struggle, but a majoritarian Hindu country. India has inherited multi- religious pluralism since ancient times. There are many religious cultures in India. Due to multiculturalism India has a unique identity in the world. For a nation to be created, there must be one language, one culture, one history and one religion. But in India this is an exception. In India, people of different religions, different cultures together. Along with multiculturalism, social tolerance is the live backbone of the society. Even though people behave according to their religion and culture, the religion and culture of each other is respected. In India, everyone has the right to spread and promote religion and culture. Religion has become an integral part of Indian Society. After independence, the Indian constitution has worked to maintain national unity and social tolerance by keeping together this pluralistic society. Historically, India has been a land with powerful sects including Hindus, Muslims, Buddhists, Jains and Sikhs. So religious tolerance has been one of the traditional values in the country. Ashoka, the great original religion Buddhism was preached but he gave equal rights and opportunities to all religions. During the Mughal era too, Akbar did not consider other religion any less than Islam and give equal respect to all religious and no one should be treated differently on the basis of their religion. Thus, Indian has a long history of Secular tradition.

Secularism is Indian context means first '*Dharma nirapekshata*" or impartially to religion and secondly '*Sarva Dharma Sama bhavana*' or equal respect to all religions based on the principle of accommodation of all religions. Like other ideas of democracy, socialism, India secularism developed as a response to the actual historical needs of Indian Society. Secularism is a part of the basic structure of the constitution. Yet, the philosophy of Indian constitution was secular though the word secularism was not mentioned in the original constitution. It was added by the 42nd amendment act of 1976. This means that no particular religion is considered as the religion of the state in India. The insertion of the word 'secular' to the preamble led to serious debates in the constituent assembly. Nehru along with the B.R.Ambedkar, Patel, Radhakrishna and countless

others opposed the idea of including 'secular' in the preamble of the constitution, because secular foundations already existed in the preamble. But the members like K.T.Shah, Tajamul Hussain, M.Masani strongly demanded for the inclusion of the word *secular* in the preamble.

Indian constitution mandates that the Indian state be secular. According to the constitution only a secular state can realize its objectives to ensure the following:

- One religious community did not dominate others.
- Some members do not dominate other members of the same religious community.
- The state does not enforce any particular religion or take away the religious freedom of individuals.

In a multi religious country like India, the spirit of secularism is to be developed in order to maintain the unity and integrity of the nation. However, if we analyze the recent governance we can say that in India, the secularism concept is not followed properly. If secularism has been followed in its true sense, there would not have been any cases of communal riots, any communal mob lynching and any kind of communal protests. Indian secularist traditions are now facing serious challenges. Increasing interference of religion in politics is a major challenge facing the secular state. Political parties have been using religion as a ground to gain votes. Candidates selected for elections are given votes on the basis of religion. In politics, votes are cast in front of religious sentiments. Therefore, the right people do not get elected and this will in turn lead to the feeling of insecurity in religious minorities. Instead of making equal laws for all communities, political parties indulge on religion-based politics. They make laws which benefit a particular community and affect the rights of other religious communities.

Secularism in India has been largely compromising in the last few years. Thus, it is under the question that how long will India's secular constitution remain intact, guaranteeing freedom of religion and expression to all citizens. Secularism has alternative options in a multicultural nation like India, therefore the constitution adopted secularism. People of different languages and religions live in Indian union. They needed secularism to keep them together. Thus, the scope of secularism in India is enormous. It is the only medicine which can bring this country out of the cancerous effects of religious politics and violence. Secularism is the thread which binds a democratic nation.

Development of the nation not only depends on economic development but also in preserving the secular nature of this nation. It also has a larger scope in the upliftment of the religious backward classes and the minorities groups to make sure that do not feel alienated from mainstream Indian way of life. The peace of a country can only be obtained and preserved by the spreading and sharing of secular values and values systems. Today the Indian secularism is under threat. The radical Hindu groups in India want to strip the constitution of its commitments to secularism. Thus, it is a time to rebuild India's great secularist tradition and the maintenance of secular nature is the objective of every Indian citizen. India is built of a wellfounded constitution. That can neither be demolished. Thus, by virtue of education and other means we can overcome these challenges and thus maintain our secular foundations.

To conclude this study is helpful in identifying the nature of secularism in India and how dramatically the nation of secularism as envisaged by our constitutional farmers will change into the recent paradigm by our political system. Impartially or non-interference in matters of religion by the government is the principle of Indian Secularism. In this perspective, the application of the idea of secularism in practice will be a great failure today. Deep religious sentiments prevailing among the different religious communities is responsible for the entire difficulties. In India, the religion is deep rooted in the minds of the people. Religious rituals are performed even on state functions and pose serious doubts about how long India remains secular since secularism has been declared as a part of the basic structure of the constitution governments must be made accountable for implementing it and it is also the duty of every citizen to upload secular values and maintain communal harmony and thus by protecting democracy.

Bibliography

Books

- [1] Anuradha Dingwany Needham Rajeswari Sunder Rajan, *The crisis* of Secularism in India, Duke university press, 2007.
- [2] Domenic Marbaniang, *Secularism in India: A Historical Analysis*'. Lulu.com publications, 2011.
- [3] Gautham Maitra, Hindutva and Secularism, Create space

independent publications, 2014

- [4] Ghosk S. K, *Secularism in India: The conceptand practice*, A.P.H public corporation, New Delhi 2000
- [5] M.M.Shankdhar, *Secularism in India*, *Dilemmas and challenges*, Deep and Deep publications, 1992
- [6] Pratham Bal Acharya Gajendragadkar, *Secularism and the constitution of India*, University of Bombay publishers. 1971.
- [7] Pantham Thomas, *Indian Secularism and itscritics*: Some Reflections' Cambridge University press (1997).
- [8] Rajeev Bhargava, *Secularism and its critics* 7nd edition, Oxford University Press, New Delhi. 1999.
- [9] Shriram Yeramkar, *Secularism in India*: *Theory and practice*, Adhyayan publishers, 2006

Websites

- www.the hindu.com
- www.insightsindia.com
- www.cherum.irmonteral.com
- www. Legal services.com
- <u>www.gk.today.in</u>
- <u>www.outlook.india.com</u>
- www.indiaforum.in
- www.bbc.com
- www.cambridge.org
- https://indianexpress.com
- https://wapbusiness-standard.com
- https://m.economctimes.com
- https://hindustantimes.com

GRAPHENE - "THE WONDER MATERIAL"

Aromal R. S. ^[a], Neelima G. S. ^[b], Sumayya L. ^[b], Gopakumar G. ^[a], S. Anas ^[a]

[a] Post Graduate and Research Department of Chemistry,
T.K.M. College of Arts and Science, Karicode, Kollam, Kerala, India
[b] Post Graduate and Research Department of Chemistry,
Sree Narayana College, Kollam, Kerala, India *e-mail: anas@tkmcas.ac.in*

Abstract

Carbon-based compounds form the basis of all known life on Earth, and the carbon- nitrogen cycle provides some of the energy produced by the Sun and other stars. The past decade has been witnessing incredible growth in the field of graphene-based nanocomposites due to the exceptional mechanical, electrical, thermal, and barrier characteristics of graphene. Because of these qualities, graphene is becoming a viable substitute for many conventional materials in a variety of applications. 2D graphene may be produced using a variety of techniques, some of which are already scalable and others are still feasible only in laboratories. Here, we discuss some of the methods of synthesis, frequently employed to create these graphene analogues. Also, their properties as well as applications in various fields are discussed. This article will give an understanding of the synthesis, structure and physiochemical properties of graphene and its derivatives.

Introduction

Graphene is being explored as a wonderful material since the discovery of its presence in the 1940s. In 2004, Geim and co-workers introduced a very easy methodology to produce single layer graphene who were awarded with the 2010 Nobel Prize in Physics for research on graphene [**Error! Reference source not**



Fig. 1- Structure of graphene

found.]. Graphene, which is an allotrope of carbon with structure consisting of single layer of carbon atoms, is a modern wonder material with excellent properties [2]. Graphene is the parent form of all graphitic structures of carbon. Graphite is a three-dimensional crystal consisting of relatively weakly coupled graphene layers; nanotubes—fullerene may be represented as scrolls of graphene; and buckyballs are spherical molecules made from graphene with some hexagonal rings replaced by pentagonal rings. The functionalization of graphene using both covalent and non-covalent approaches is also important as it enhances graphene's properties. [3, 4].

Graphene, structurally, is a sheet of sp^2 carbon atoms joined by sigma bonds in a honeycomb pattern that is atomically thin and two-dimensional (2D), as shown in fig 1. [3, 5]. Each lattice contains three strong linkages that combine to form a sturdy hexagonal structure. Graphene's high electrical conductivity is due to the π - bond, which is positioned vertically to the lattice plane. The tightly packed carbon atoms in graphene and the sp² hybridization of the orbitals s p_x and p_y to form the σ -bond give the material its exceptional stability. The π -bond is created by the remaining p_z electron. The π -band and π *-bands created by the π -bonds combining, especially the half-filled band that allows free-movement of electrons, are responsible for the remarkable electrical features of graphene. [6]. Graphene is only 0.35 nm thick, which is 1/200,000 of that of human hair [6].

Graphene shows excellent electrical and optical properties, thermal properties, mechanical properties, high surface area, etc. Owing to its excellent conducting properties, graphene and related materials are mainly used as semiconducting materials [4,7]. By isolating graphene from graphite by micromechanical cleavage, the first free-standing single-layer graphene was produced in 2004. Later, owing to the substantial demand for graphene, several manufacturing techniques were proposed which can be divided into 2 categories; top-down {chemical methods} and bottom-up {physical methods} approaches. Bottom-up synthesis is difficult to scale up and has been found to take a long time (for example, chemical vapor deposition and epitaxial growth on silicon carbide wafers, micromechanical exfoliation of pyrolytic graphite—the Scotch tape method, etc.). The various synthetic methods are summarised in Fig. 2. These methods would produce extremely pure graphene, and its composition and properties are of

high quality. Due to the difficulties of the aforementioned methods, chemical methods are preferred as they are simpler, less costly, and produce significant quantities of graphene. [3,4,8,9]. In chemical methods, graphite is first strongly oxidised and then reduced to graphene by reducing agents.

Pristine graphene is graphene in its original, pure, unoxidized form. But its lack of abundance holds back the development of graphene based functional devices. Hence reduced graphene oxide, which is almost similar to graphene with respect to its structure as well as properties, obtained by the reduction of graphene oxide is an alternative for pristine graphene. When we mention about graphene, it is actually referring to graphene oxide which has been reduced to yield graphene. The presence of oxygen can make the material easier to work with, but this graphene is not pure, or 'pristine'. Colloidal graphene (also known as highly reduced graphene oxide, HRG), which may be processed in large quantity, is mostly produced by reducing aqueous or organic dispersions of graphene oxide (GO). GO can be taken as the precursor for the manufacturing of bulk quantity of graphene. During the reduction process, GO may be converted into reduced graphene oxide (rGO). During the production of rGO, the surface functional groups of GO are eliminated, restoring a structure equivalent to pure graphene [8,10].



Fig 2:- various routes for the synthesis of graphene

Graphene Oxide

Graphene oxide (GO) is a nonconducting hydrophilic carbon compound which is a highly oxidised derivative of graphene with a variety of oxygencontaining functional groups such as hydroxy (-OH), alkoxy (C–O–C), carbonyl (C=O), carboxylic (-COOH) and other oxygen-containing functional groups, as shown in fig:-3. These groups, found on both the edge and basal of the nanosheets. plane sp^2 convert the -bonded graphene network to а combination of sp^2 - and sp^3 hybridized carbons. These sp^3



defect sites distort the intrinsic conjugated π system and lower the overall strength as well as conductivity. Nevertheless, these groups make graphene oxide highly attractive as a multifunctional material for a wide range of applications, as it can be readily modified with several functional groups [3,10,11]. Both GO and graphene have hexagonal carbon structures [3].

Several functional groups in GO make it hydrophilic, readily dispersible, and stable. GO is an excellent agent for efficient drug attachment through - interaction due to its high surface area and various functional groups present on its surface.[12]

In conclusion, it has been a challenge to determine the precise molecular structure of GO due to its nonstoichiometric chemical composition. The variation in the degree of oxidation, which may be due to the difference in graphite source and oxidation protocol, can cause substantial changes in the structure and properties of GO. Some theoretical studies showed that the exact identity



Fig 4: - Structure of rGO

depended strongly on the extent of coverage. It also revealed that the ratio

of epoxides to alcohols increases with an increasing degree of oxidation, and complete oxidation is less thermodynamically favored than partial oxidation [13]. One of the most popular methods to obtain graphene oxide is Hummers' method (Offeman and Hummers, 1958) involving oxidation of graphite. Every technique that alters or enhances the synthesis route given by Hummers is referred to as a "modified Hummer's method". Alternative techniques involving the oxidation of graphene are Improved Hummers method, Staudenmaier method, Brodie method, Tour method, and so on [3,14].

Reduced Graphene Oxide (rGO).

By eliminating the oxygen-containing groups and recovering a conjugated structure, GO may be (partially) reduced to sheets resembling graphene, which is called reduced graphene oxide [15]. Its approximate structure is given in Fig 4. Chemically altered graphene, chemically converted graphene, functionalized graphene, and reduced graphene are further names for rGO [16]. Reduced graphene oxide (rGO) often has functional groups connected to the basal plane. Its structural flaws not only destroy the conjugation but also localise the π -electrons, which frequently leads to a reduction in carrier mobility and carrier concentration. In order to restore the conjugated network of the graphitic lattice, the reduction of GO also aims to remove the oxygenic functional groups attached to graphene and atomic-scale lattice defects [17].

The quality of the reduction process is because the quality of the rGO created by reducing GO has a significant bearing on the closeness of the structure of the resulting rGO to that of pristine graphene. Recently, a variety of techniques to prepare rGO have been presented via the reduction of GO using chemical reagents (eg: - hydrazine hydrate, sodium borohydride, mixture of NaBH₄ and CaCl₂, etc...), bio-reductants (eg: -L-Ascorbic acid), irradiation reduction (eg:- photocatalytic reduction, microwave reduction, etc.), electrochemical reduction, etc [14,18]. Some of these techniques are successful in producing very high-quality rGO similar to pristine graphene, but they may be complex or time-consuming to perform. The majority of the sp³ carbons in GO are turned back into sp² carbon in rGO by reducing the material thermally, chemically, or electrochemically. Although there are some variations due to partial reduction and defect formation, rGO recovers some of graphene's

characteristics and becomes an excellent electrical and thermal conductor with a low oxygen concentration [18].

Synthetic Approaches of Go & rGO

The typical procedures for chemically preparing GO are discussed here.

i. Brodie's Method

It is the first chemical method for synthesizing graphene oxide by using a mixture of graphite and potassium chlorate taken in a ratio of 1:3[14]. Here, nitric acid is used as an oxidant as well as an intercalating agent. The reaction is carried out at 60° C in which graphite undergoes multiple oxidations giving GO. But nowadays this method is rarely used due to the release of toxic gases like NO₂/N₂O₄ and explosive ClO₂. Also, it takes a long reaction time (3–4 days), the yield is very low, and the obtained GO is soluble in water [14, 19, 20].

ii. Staudenmaier Method

In this method, graphene oxide is synthesized by adding 5g of graphite powder to a mixture of 27 ml of fuming HNO₃ and 87.5 ml of H₂SO₄ at a ratio of 1:3 with continuous stirring by retaining the solution in an ice bath to obtain a homogeneous dispersion. Then HClO₄ is added slowly to the mixture followed by 55g of potassium chlorate to the mixture in order to reduce the emission of explosive gases, and it is diluted with a large amount of DI water. To remove sulphate ions, GO is washed with 5% HCl. After repeated centrifugation followed by redispersion in DI water, a slurry of GO is obtained. It takes a long reaction time, releases explosive and toxic gases, and damages the structure of graphite layers [14, 20, 21].

iii. Hummer's Method

This is the most common method for synthesizing GO which gives a largescale production as compared to modified Hummer's method and improved Hummer's method where the degree of oxidation is comparatively low. Here, 5g of graphite is mixed with 2.5 g of NaNO₃ and added to 115 ml of H₂SO₄ with stirring in an ice bath. To the mixture, 15g of KMnO₄ is added over a period of 2 hours and then the solution is removed from the ice bath and allowed to stand for 30 minutes at room temperature. After adding 250 ml of DI water, the solution is warmed again to 70°C. To remove unreacted KMnO₄ and MnO₂, hydrogen peroxide (3%) is added. By repeated centrifugation, we get GO where the yield is very low as compared to the graphite source [3, 14, 19, 21].

iv. Tour Method

Tour method is the most widely used and less hazardous method for synthesizing GO by a mixture of H_2SO_4 and ortho H_3PO_4 at a ratio of 9:1 in the presence of an oxidizing agent like KMnO₄. The acid mixture is added to 0.50 g of graphite powder and 4.5 g of KMnO₄. It is heated to 50°C with continuous stirring for 12 hrs until a paste is obtained. It is cooled to room temperature and 250 ml of distilled water is added to stop the reaction. Then, 10 ml of H_2O_2 is added to reduce KMnO₄ to soluble MnSO₄, resulting in the formation of a yellow colour which indicates high oxidation. Then it is filtered to obtain graphite oxide and it is washed with 5% HCl aqueous solution to remove sulphate ions. The obtained GTO is exfoliated to produce single-layer graphene oxide [2,20]. The main advantages of this method are the usage of a mixture of H_2SO_4 and H_3PO_4 which could reduce the emission of toxic gases and increase the amount of hydrophilic and oxidized GO.

V. Modified Hummer's Method

It is the common method for preparing GO by exfoliation of graphite and reducing the obtained GO by hydrazine hydrate and ascorbic acid. It differs from Hummer's method by the usage of H_2SO_4 and H_3PO_4 instead of NaNO₃. If there is any change in the reaction condition of Hummer's method, then it is called a modified Hummer's method. It has many advantages like it produces more hydrophilic GO, reduces the emission of toxic gasee, and offers a low exothermic reaction. The chemical reduction of graphene oxide gives a large-scale production of rGO [3, 9, 11, 14, 22]

vi. Improved Hummer's Method

Improved Hummer's method is more advantageous than Hummer's method. Here H_3PO_4 is used instead of NaNO₃ and increased the amount of KMnO₄. So, it reduces the evolution of toxic gases. The obtained graphene oxide (IGO) is more oxidized than Hummer's GO [3, 11].

Green Synthesis of Reduced Go

The GO obtained is reduced by different techniques to obtain reduced graphene oxide (rGO). There are a number of ways, based on

chemical, thermal, or electrochemical means, in which reduction can be achieved. Some of these techniques are able to produce very highquality rGO almost similar to pristine graphene. Chemical reduction of GO is a very scalable method; unfortunately, the rGO produced has often resulted in relatively poor yields in terms of surface area and electronic conductivity. Researchers were able to reduce GO using UV light in presence of TiO₂ catalyst. Thermally reducing GO at temperatures of 1000 °C or more creates rGO that has been shown to have a very high surface area, close to that of pristine graphene. Recently a number of green reducing agents such as ascorbic acid, sugars, amino acids, and even microorganisms have been developed. GO can be reduced using ascorbic acid by heating GO suspension with L-Ascorbic acid at 60° C for 30 min [2].

Properties of Graphene

Physical properties

I. Mechanical properties

The excellent mechanical characteristics of pure monolayer graphene have been thoroughly documented. The breaking strength of graphene is found to be 55 N/ m which equals to the intrinsic strength of 130 GPa and a Young's modulus of $E = 1.0 \pm 0.1$ TPa (due to long-range π conjugation) by assuming the thickness of graphene as 0.335 nm. Also, the in-plane stiffness at room temperature was discovered to be between 20 and 100 N/m. According to reports, graphene has a poor fracture hardness of around 4.0 ± 0.6 MPa [26]. The benefits of graphene's mechanical qualities make it simple to construct and process graphene-based nanocomposites for devices with a variety of applications [7]. To accomplish these qualities, GO and rGO mixes are created with values varying based on the number of surface groups and defects left over from oxidation or other processing steps. For the GO monolayer, the effective Young's modulus is 207.6 \pm 23.4 GPa. Similarly, the rGO monolayer has Young's modulus of 250 \pm 150 TPa [3, 28].

II. Magnetic properties

Yet, because of a delocalized π -bonding network, perfect graphene is fundamentally nonmagnetic and lacks localised magnetic moments. As is well known, the majority of carbon allotropes have diamagnetic susceptibilities (χ d) between 10⁻⁵ and 10⁻⁷ emu/gOe. Even though pure

graphene is naturally nonmagnetic, many researchers reported that graphene showed positive magnetic signals (paramagnetic and/or ferromagnetic). The theoretical possibility is that the point defects in graphene such as vacancies, zigzag edges, and chemical doping of foreign atoms might cause localized magnetic moments, which is the first step toward the development of ferromagnetic ordering [29]. Graphene shows ferromagnetic nature due to some defects in the lattice plane. Several researchers believe that graphene's magnetism is caused by its zigzag edges [30].

III. Electrical properties

Graphene is a semi-metal and a semiconductor with zero gaps. One of graphene's most advantageous characteristics is that it is a zero-overlap semimetal with extremely high electrical conductivity, in which both holes and electrons serve as charge carriers [23]. Each carbon atom in graphene is bonded to three other carbon atoms in the two-dimensional plane, leaving one electron free for electrical conduction in the third dimension. This free electron is π electron and is localized as above and below the plane. The carbon-carbon bonds in graphene are reinforced by the overlap of these pi orbitals. Essentially, these π orbitals' bonding and antibonding (the valance and conduction bands) determine the electrical characteristics of graphene [23].

As an electrically conductive substance with a high electron mobility, graphene has a volumetric electron mobility of 25 m² /v/s [31, 32], and an estimated electrical conductivity of 6500 Sm⁻¹ [3]. Its electrical conductivity is similar to that of copper. In the process of creating GO, the sp² bonding orbitals of graphene are disrupted and a lot of surface groups are added, which reduces the material's electrical conductivity and makes GO electrically resistant with linear resistance of $1.64 \times 10^4 \Omega$ m [3].

IV. Thermal properties

Graphene also has very high mechanical and thermal conductivities. A thermal conductivity of about 3000-5000 W/m/K has been found for singlelayer graphene (pure defect-free graphene), making it one of the materials with the greatest in-plane thermal conductivities, which is 10 times higher than the thermal conductivity of copper (401 W/m/K). However, for supported graphene, the conductivity is ~600 W/m/K [3,33,34]. This was extracted from the G band of the Raman spectra where it has been evident that strong temperature dependency may be seen at the Raman spectra G peak location. To measure the increase in local temperature, one can use the change in the location of graphene's G peak [34].

Chemical properties

The only form of carbon that has every atom exposed to chemical reactions on both sides is graphene, due to its 2D structure. Graphene is the material with the largest proportion of edgy carbon atoms, and it is known that the carbon atoms near the edges of graphene sheets have a unique chemical reactivity [23]. Moreover, the heavily crumpled graphene displays *superhydrophobicity* and variable wettability. It is possible to increase graphene's chemical reactivity by creating structural flaws caused by dangling bonds by the attachment of hydroxyl, carboxyl and other groups to vacancy-type defects. The resultant graphene materials are *hydrophilic* and more reactive because of the addition of oxygenation groups to the sp^2 hybridized surfaces [24].

As already mentioned, the graphene C-C bond has a bond length of approximately $1.42A^{\circ}$ and is weakly bonded between layers overall though it is strongly bonded inside a given layer. A single sheet of graphene has a specific surface area of 2630 m²/g [25]. The band gap of graphene is approximately 0-0.25 eV [26].

Applications

Recent years have seen drastic change in the interest towards the field of graphene because of its intriguing features, which are anticipated to improve the functionality of many applications. Also, the unique features of GO and rGO make a revolutionary effect in varies fields like transport, electronics, energy and defense. They have been utilized for applications in electronics, semiconductors, gas absorbers, sensors, solar cells, fuel cells, optic devices and composites due to their outstanding properties.

1. As Catalyst

The high degree of hydrophilicity and chemical activity of oxygencontaining functional groups in GO surfaces make GO a highly effective catalyst with low environmental consequences. These functional groups provide a site for a large number of active catalysts [35]. The large surface area provided by GO/rGO nanoparticles also contribute to its catalytic activity.

2. In Electronic Devices.

GO is used as a starting material for the manufacturing of several electronic devices. For example, in graphene-based field effect transistors (FET) in which rGO as chemical sensors and also used as biosensors. Some graphene composite is used as a coating material for enhancing the activity of touching screens of tablets and phones, the distinctive thinness of graphene led to its use as a semiconductor, and it can conduct electricity at room temperature, so it also used in computer chips [36]. It can be used to detect hormonal catecholamine molecules, avidin and DNA.

3. For Water Purification [Filter]

The distinct interlayer distance of GO makes the purification of water. The permeation rate and diffusion rate for water in GO-based membranes are 0.1 mg/min/cm² and 1cm/h respectively ie; the GO membranes act as an ideal barrier when they deal with liquid and gases. This barrier effectively isolates organic solvent from water [37]. GO membranes were studied actively in the 1960s for the desalination of water. Retention rates greater than 90% were reported in this study. They could be used in the filtration of sea water. Helium cannot pass through the pores in humidity free conditions. Dry laminates are vacuum-tight however when immersed in water they behave as molecular sieves

4. In Sensors

There are several uses for graphene sensors, including as gas and biosensors, in environmental monitoring and public security. Graphene can be either electron-doped (NH3) or hole-doped (H₂O, NO₂) depending on the kind of adsorbed component. Since there is no gap in the density of states of graphene, even a slight mismatch in the chemical potential of the adsorbate is enough to produce an active donor or acceptor level, in contrast to semiconductors, where the discrepancy in chemical potential must be greater than half the gap energy to produce doping. Hence, graphene shows greater sensitivity than conventional semiconductor sensors [4, 37]. Since GO and rGO is a fluorescent material it could be used for bio- sensing applications, for early detection of diseases and for assisting in finding cures for cancer and detecting biologically important

molecules. GO has been applied as a fluorescence quenching material in biosensors which make use of the fluorescence resonance energy transfer (FRET) effect.

5. In Biomedicals

GO finds applications in the biomedical field particularly in the drug delivery systems. GO has many advantages as compared to the other anticancer drugs because it doesn't affect healthy cells and is having low toxicity. Polyethylene glycol (PEG)- functionalized GO with SN38, a camptothecin derivative which was used as a water-soluble source of the drug. Pristine graphene sheets, graphene oxide and few layer graphene flake are creatively employed in biomedical fields due to their adaptable properties. The thinness flexibility surface activity make suit it for design competence which make utilized for drug delivery and ultra-sensitive biosensors and health testing kits. Active GO nanocomposite is used in target delivery of anticancer drugs and some of them are used as water soluble and serum soluble drugs. Fluorescent based biosensors are widely used for the detection of DNA and proteins for the diagnosis of HIV [36].

6. In Super Capacitors

Owing to the high surface area of GO and rGO they are used as electrode materials in batteries, double layered capacitors, solar as well as fuel cells.

Nanocomposites of rGO_ is employed in lithiumion batteries. GO is able to store hydrogen and hence may be used for storage of hydrogen gas in hybrid cars. Due to their quick charge/ discharge rates, lengthy cycle lives, and highdensities. power supercapacitors (SCs) are regarded as one of the most promising_ electrochemical energy charges that have collec





the capacitance for EDLCs. Materials having a high specific surface area, large pore size, and high electrical conductivity are required to obtain high storage capacity. Moreover, in the pseudo-capacitors, electrons are moved to or from the valence bands of the redox cathode or anode reagent in fast Faradic reactions [4]. [36].

Conclusion

In this article, we provide a summary of current developments in the synthesis, derivatives, characteristics and the interesting applications of graphene and composites connected to those features. A wide variety of mechanical, electrical, and thermal characteristics are exhibited by both GO and rGO because of their highly adjustable nature. Graphene provides a substrate that makes metal oxide nanoparticles accessible to the environment, allowing them to better perform their functions. Graphene improvises conductivity of oxides enabling their applications in super capacitor electrodes and batteries. Transition metals and their varieties proved as potential materials to be used as energy storing devices. Despite of all their advantages they are having some flaws such as low electrical conductivity. pulverization during electrochemical reactions and considerably low ion diffusion. Nanocomposites of electrochemically active metal oxide structures introduced into the graphene lattice provides outstanding electrical and electrochemical properties which may be the icons of future of advanced materials.

References

- 1. Ge, S., Lan, F., Yu, F., & Yu, J. (2015). Applications of graphene and related nanomaterials in analytical chemistry. New Journal of Chemistry, 39(4), 2380–2395. doi:10.1039/c4nj01783h
- Habte, A. T., & Ayele, D. W. (2019). Synthesis and Characterization of Reduced Graphene Oxide (rGO) Started from Graphene Oxide (GO) Using the Tour Method with Different Parameters. Advances in Materials Science and Engineering, 2019, 1– 9. doi:10.1155/2019/5058163
- 3. Smith, A. T., LaChance, A. M., Zeng, S., Liu, B., & Sun, L. (2019). Synthesis, properties, and applications of graphene oxide/reduced graphene oxide and their nanocomposites. Nano Materials Science, 1(1), 31–47. doi:10.1016/j.nanoms.2019.02.004

- 4. Ghany, N. A. A., Elsherif, S. A., & Handal, H. T. (2017). Revolution of Graphene for different applications: State-of-the-art. Surfaces and Interfaces, 9, 93–106. doi:10.1016/j.surfin.2017.08.004
- Ickecan, D., Zan, R., & Nezir, S. (2017). Eco-Friendly Synthesis and Characterization of Reduced Graphene Oxide. Journal of Physics: Conference Series, 902, 012027. doi:10.1088/1742-6596/902/1/012027
- 6. Zhen, Z., & Zhu, H. (2018). Structure and Properties of Graphene. Graphene, 1–12. doi:10.1016/b978-0-12-812651-6.00001-x
- Bai, S., & Shen, X. (2012). Graphene–inorganic nanocomposites. RSC Adv., 2(1), 64–98. doi:10.1039/c1ra00260k
- Jana, A., Scheer, E., & Polarz, S. (2017). Synthesis of graphene– transition metal oxide hybrid nanoparticles and their application in various fields. Beilstein Journal of Nanotechnology, 8, 688– 714. doi:10.3762/bjnano.8.74
- Ickecan, D., Zan, R., & Nezir, S. (2017). Eco-Friendly Synthesis and Characterization of Reduced Graphene Oxide. Journal of Physics: Conference Series, 902, 012027. doi:10.1088/1742-6596/902/1/012027
- Owen C. Compton,[†], Bonny Jain,[†] Dmitriy A. Dikin,[§] Ali Abouimrane,[‡] Khalil Amine,[‡] and SonBinh T. Nguyen(2011) Chemically Active Reduced Graphene Oxide with Tunable C/O Ratios ACS nano, 5(6), 4380-4391 https://doi.org/10.1021/nn1030725
- Marcano, D. C., Kosynkin, D. V., Berlin, J. M., Sinitskii, A., Sun, Z., Slesarev, A., ... Tour, J. M. (2010). Improved Synthesis of Graphene Oxide. ACS Nano, 4(8), 4806–4814. doi:10.1021/nn1006368
- Radhakrishnan, S., Sudeep, P. M., Park, J. H., Woellner, C. F., 12. Galvao, Maladonado, K., D. S., ... Ajayan, P. M. (2017). Multifunctional Hybrids Based on 2D Fluorinated Graphene Oxide and Superparamagnetic Iron Oxide Nanoparticles. Particle & Systems Characterization, Particle 34(11), 1700245. doi:10.1002/ppsc.20170024
- Boukhvalov, D. W., & Katsnelson, M. I. (2008). Modeling of Graphite Oxide. Journal of the American Chemical Society, 130(32), 10697– 10701. doi:10.1021/ja8021686
- Feng, J., Ye, Y., Xiao, M., Wu, G., & Ke, Y. (2020). Synthetic routes of the reduced graphene oxide. Chemical Papers, 74(11), 3767– 3783. doi:10.1007/s11696-020-01196-0
- 15. Pei, S., & Cheng, H.-M. (2012). The reduction of graphene oxide. Carbon, 50(9), 3210–3228. doi:10.1016/j.carbon.2011.11.010

- Eda, G., & Chhowalla, M. (2010). Chemically Derived Graphene Oxide: Towards Large-Area Thin-Film Electronics and Optoelectronics. Advanced Materials, 22(22), 2392–2415. doi:10.1002/adma.200903689
- Zhang, Q., Yang, Y., Fan, H., Feng, L., Wen, G., & Qin, L.-C. (2021). Roles of water in the formation and preparation of graphene oxide. RSC Advances, 11(26), 15808–15816. doi:10.1039/d0ra10026a
- Liu, W., & Speranza, G. (2021). Tuning the Oxygen Content of Reduced Graphene Oxide and Effects on Its Properties. ACS Omega, 6(9), 6195– 6205. doi:10.1021/acsomega.0c05578
- Hernández-Hernández, E., J. Hernández-Belmares, P., A. Ceniceros-Reyes, M., S. Rodríguez-Fernández, O., & González-Morones, P. (2020). Graphite Oxide: A Simple and Reproducible Synthesis Route. Graphene Production and Application. doi:10.5772/intechopen.89636
- Brisebois, P., & Siaj, M. (2019). Harvesting Graphene Oxide- Years: 1859 to 2019: A Review of its Structure, Synthesis, Properties and Exfoliation. Journal of Materials Chemistry C. doi:10.1039/c9tc03251
- Poh, H. L., Šaněk, F., Ambrosi, A., Zhao, G., Sofer, Z., & Pumera, M. (2012). Graphenes prepared by Staudenmaier, Hofmann and Hummers methods with consequent thermal exfoliation exhibit very different electrochemical properties. Nanoscale, 4(11), 3515. doi:10.1039/c2nr30490b
- Sharma, N., Sharma, V., Jain, Y., Kumari, M., Gupta, R., Sharma, S. K., & Sachdev, K. (2017). Synthesis and Characterization of Graphene Oxide (GO) and Reduced Graphene Oxide (rGO) for Gas Sensing Application. Macromolecular Symposia, 376(1), 1700006. doi:10.1002/masy.201700006
- 23. A PROPERTIES OF GRAPHENE Tarun M Radadiya
- 24. Yang, G., Li, L., Lee, W. B., & Ng, M. C. (2018). Structure of graphene and its disorders: a review. Science and Technology of Advanced Materials, 19(1), 613–648. doi:10.1080/14686996.2018.1494493
- Stoller, M. D., Park, S., Zhu, Y., An, J., & Ruoff, R. S. (2008). Graphene-Based Ultracapacitors. Nano Letters, 8(10), 3498– 3502. doi:10.1021/nl802558y
- Zhang, Y., Tang, T.-T., Girit, C., Hao, Z., Martin, M. C., Zettl, A., ... Wang, F. (2009). Direct observation of a widely tunable bandgap in bilayer graphene. Nature, 459(7248), 820–823. doi:10.1038/ nature08105

- Papageorgiou, D. G., Kinloch, I. A., & Young, R. J. (2017). Mechanical properties of graphene and graphene-based nanocomposites. Progress in Materials Science, 90, 75–127. doi:10.1016/j.pmatsci.2017.07.004
- Suk, J. W., Piner, R. D., An, J., & Ruoff, R. S. (2010). Mechanical Properties of Monolayer Graphene Oxide. ACS Nano, 4(11), 6557– 6564. doi:10.1021/nn101781v
- Tang, N., Tang, T., Pan, H., Sun, Y., Chen, J., & Du, Y. (2020). Magnetic properties of graphene. Spintronic 2D Materials, 137– 16
- 30. Rao, C. N. R., Matte, H. S. S. R., & Subrahmanyam, K. S. (2012). Synthesis and Selected Properties of Graphene and Graphene Mimics. Accounts of Chemical Research, 46(1), 149–159. doi:10.1021/ar300033m
- Novoselov, K. S., Fal'ko, V. I., Colombo, L., Gellert, P. R., Schwab, M. G., & Kim, K. (2012). A roadmap for graphene. Nature, 490(7419), 192–200.
- Singh, V., Joung, D., Zhai, L., Das, S., Khondaker, S. I., & Seal, S. (2011). Graphene based materials: Past, present and future. Progress in Materials Science, 56(8), 1178–1271. doi:10.1016/j.pmatsci.2011.03.003,
- 33. Zhen, Z., & Zhu, H. (2018). Structure and Properties of Graphene. Graphene, 1–12. doi:10.1016/b978-0-12-812651-6.00001-x
- Yan, Z., Nika, D. L., & Balandin, A. A. (2015). Thermal properties of graphene and few-layer graphene: applications in electronics. IET Circuits, Devices & Systems, 9(1), 4–12. doi:10.1049/iet-cds.2014.0093
- 35. An Update on Graphene Oxide: Applications and Toxicity* https://doi.org/10.1021/acsomega.2c03171
- 36. Applications of Graphene and Graphene-Oxide Based Nanomaterials, Sekhar Chandra Ray Department of Physics, College of Science, Engineering and Technology, University of South Africa, Private Bag X6, Florida, 1710, Science Campus, Christiaan de Wet and Pioneer Avenue, Florida Park, Johannesburg, South Africa.
- Vijayaraghavan, A. (2013). Graphene Properties and Characterization. Springer Handbook of Nanomaterials, 39–82. doi:10.1007/978-3-642-20595-8_2
- Singh, V.; Joung, D.; Zhai, L.; Das, S.; Khondaker, S.I.; Seal,S., Graphene based materials: Past, present and future,ProgressinMaterialsScience,2011, 56, 1178-1271

Production of Indole Alkaloids in Adventitious Root Cultures of *Rauvolfia Hookeri* S. R. Sriniv & Chithra, A Rare and Endemic Medicinal Plant

15

Reshmi S.

Department of Biotechnology, Sree Narayana College, Kollam *e-mail: reshmirajesh1233@gmail.com*

Abstract

Rauvolfia hookeri, belongs to the family Apocynaceae and it is commonly used in traditional medicine to treat a various nervous ailments like anxiety, epilepsy, schizophrenia etc. The roots of the plant are a rich source of antihypertensive and tranquiliser alkaloids. Adventitious root culture is used to isolate the secondary metabolites from the medicinal plants thereby offering an alternative means for the collection and propagation of medicinal plants. The current study focussed on the production of indole alkaloids in adventitious root cultures of R.hookeri. Adventitious roots were induced from the hypocotyls explants in solid WPM supplemented with 0.5 mgl⁻¹ IBA and 0.2 mgl⁻¹ NAA after 8 days and subcultured in liquid WPM supplemented with reduced concentration of IBA (0.5 mgl^{-1}) and NAA (0.2 mgl⁻¹). The highest regeneration rate (89.23 ± 0.06 %), number of roots (33.11 ± 0.03) and root length $(4.12 \pm 0.09 \text{ cm})$ were recorded in WPM supplemented with 0.2 mg1⁻¹ IBA and 0.1 mg1⁻¹ NAA respectively. The concentration of indole alkaloids in adventitious roots were analyzed (reserpine - 0.030 % ajmaline - 0.032 % and ajmalicine 0.064 %) after 8 weeks and were more during the peak period of growth.

Key Words: Rauwolfia hookeri, indole alkaloids, adventitious root, in vitro

Introduction

Medicinal plants play an important role in keeping the healthcare, economic, social and cultural status of human beings globally. The tremendous attention globally on medicinal plants during the past six to seven decades is due to its wide array of utility as traditional medicines, neutraceutical, cosmetic products, total herbal extracts and individual bioactive molecules (Ramawat *et al.*, 2004). The major reason for the attention on traditional systems of medicine and products is due to the growing recognition of its less side effect and easy availability at affordable prices. Moreover, they are mostly a combination of medicinal constituents derived from more than one medicinal plants coupled with minerals, vitamins and have benefits over synthetic ones (Hussain, 2007).

Rauvolfia hookeri is a perennial woody shrub distributed at high elevations of southern Western Ghats in India. In traditional system of medicine (Ayurveda) R.hookeri is used as a substitute of R. serpentina to treat a various nervous ailments like anxiety, epilepsy, schizophrenia (Chipiti et al., 2021). The roots of the plant are a rich source of antihypertensive and tranquiliser alkaloids like ajmalicine, ajmalicine, reserpine, serpagine, reserperline and serpentine (Alagesaboopathi, 2009).). Limited distribution, endemicity, low population in accessible area and several anthropogenic activities on forests lands are the various factors for its present rare and endemic status of R.hookeri (Sahu, 1979). The conventional propagation R. hookeri is difficult due to poor seed viability, low germination, of scanty and delayed rooting of seedlings and poor vegetative propagation. Rauvolfia hookeri is becoming more rarer because of commercial over exploitation (Mohanan and Sivadasan, 2002). Reserpine content in the roots of six Rauvolfia species analysed and reported that R. hookeri contains reserpine (Bindhu et al., 2014).

Biotechnological approaches specifically, plant tissue cultures are found to have potential supplement to traditional agriculture in the industrial production of bioactive plant metabolites (RamachandraRao and Ravishankar, 2002). Production of bioactive molecules under *in vitro* method is an alternative mode of conservation. Callus culture and adventitious root cultures were used to gather phytochemicals from the medicinally important plants, thereby offering an alternative way to collection and propagation of medicinal plants. Moreover the adventitious roots shows elevated growth rates and production of pharmaceutically important metabolites under sterilized condition with optimized plantgrowth regulators in culture media.

Materials and Methods

The fully ripened fruits collected from 10 year old plants grown in the medicinal plant garden of Jawaharlal Nehru Tropical Botanic Garden and Research Institute (JNTBGRI) were washed and removed the pulp. Subsequently, they were washed with 1% Teepol (v/v) for 30 min and repeatedly washed under running tap water to remove the traces of detergent. The surface sterilization was done using 0.1% HgCl₂ for 15 min and rinsed with sterile distilled water for 4-5 times. Thereafter, the micropylar end of the seeds were chipped using sterile surgical blade, removed the seed coat particles by a wash and soaked for overnight (16-17h) in 0.5 mg1⁻¹ GA₃ solution under continuous shaking (60 rpm) using a gyrotory shaker (New Brunswick Scientific, Co, USA.) at $24^{\circ}C \pm 2^{\circ}C$ under dark condition. Thereafter the seeds were washed with sterile distilled water twice to remove the traces of GA₃, blotted and placed on halfstrength MS agar (0.6% w/v) medium with or without 0.5 mg1⁻¹ GA₃ and incubated in room $(27^{\circ}C \pm 2^{\circ}C)$ and culture room $(24^{\circ}C \pm 2^{\circ}C)$ condition under total dark. The germinated seeds after 30 days were transferred from GA₃ containing medium to half-strength (Murashige and Skoog) MS basal medium and incubated under 16-h photoperiod at a photon flux density of 20-50 μ molm⁻²s⁻¹ from day light fluorescent tubes at 24°C ± 2°C for 4-5 weeks.

For the preliminary experiment on root induction, cotyledon and hypocotyl explants (1-2 cm) of 4 weeks–old seedlings were inoculated in full-strength and half-strength WPM agar medium supplemented with different concentration ($0.2 \text{ mg} - 2.0 \text{ mg1}^{-1}$) of PGRs (NAA and BA). The half-strength WPM was failed to induce adventitious roots therefore, full strength WPM agar medium were used with different concentration ($0.2 \text{ mg} - 0.5 \text{ mg} 1^{-1}$) and combinations of auxins for root inductions. After inoculation, the cultures were incubated under total dark. Growth was noticed and biomass increment of root culture was determined in terms of fw (after blotting) and dw (dried under room condition) using three replicates after 8 wks. For each treatment, fifteen explants were used and the experiments were repeated twice. PGRs for subculture of root culture

was optimised using the respective basal media supplemented with reduced concentrations of PGRs by keeping the best PGR combination obtained during the induction step as control. To increase the biomass, approximately, 100 mg root segments (0.8–1.0 cm) were separated from the hypocotyl explants and repeatedly subcultured in WPM liquid medium with optimised PGRs (0.2 mg 1^{-1} IBA and 0.1 mg 1^{-1} NAA) in 250 ml Erlenmeyer flasks. The root cultures were kept under shaking at 100 rpm and both cultures were incubated under dark condition. A time–course study was performed to determine the growth kinetics (GI) of cultures by measuring fw and dw at 2 week intervals for 10 weeks. GI was calculated as per the formula given below. The pH of the medium was adjusted to 5.8 and autoclaved at 121° c and 108 kPa for 20 min

GI = <u>Final dry weight –initial dry weight</u> Initial dry weight

Roots grown in the optimized PGRs were used for phytochemcial analysis using HPLC. The dried powder (3 g) of both cultures extracted with 15 ml methanol/ammonia (98:2 v/v) in a 100 ml Erlenmeyer flask under continuous shaking for thrice. The extracts were then combined and evaporated to dryness under vacuum at 40°C using a rotary evaporator to get the crude alkaloid portion. It (HeidolphLaborota 4000, Germany) was dissolved in 10 ml methanol and acidified with 0.1 N HCL and adjusted pH 7.2 using ammonium hydroxide to isolate the weak basic fraction as per the method of Iwu & Court (1977). This fraction was extracted with chloroform (25ml×3), washed with distilled H₂O, dried over anhydrous sodium sulphate and evaporated to dryness under reduced pressure at 50°C using rotary evaporator. The qualitative and quantitative determination of indole alkaloids (reserpine, ajmaline and ajmalicine) was done using HPLC which was performed on a 600 series waters HPLC Pump, 7725 Rheodyne injector, C18 Column (Reprobond-4.6x250mm), 2487 Waters dual wavelength UV detector. The mobile phase was 0.5%(v/v) triethylamine-water: acetonitrile (50:50 by vol.) with flow rate, 1ml min⁻¹ and detected at 285 nm. The qualitative analysis was further confirmed by spiking the specific extract with the reference compounds. A standard curve obtained using the reference compound was used for the quantitative analysis.

Results and Discussion

Chipping of the micropylar end of the seeds was inevitable for seed germination and it was enhanced by soaking in GA₃ solution. The more germination percentage (92%) was recorded with chipped seeds that were soaked in GA₃ solution and thereafter inoculated on half-strength MS medium with 0.5 mgl⁻¹ GA₃ and incubated at room condition under total dark condition than those kept in culture room (54 %). The favourable effect of GA₃ to enhance the seed germination of *R.hookeri* might be due to the breaking of non–deep physiological dormancy as reported in *R.serpentina* and *R.tetraphylla* (Hussain *et al.*, 2014). Temperature was also influenced germination in the present system.

Between the two explants used, hypocotyl was found best for root induction than cotyledon. This explants responded rapidly (8 days) (Fig. 1a) at high frequency while cotyledon were slow responding (14 days) for root cultures in various treatments. Besides, the requirements of PGRs were different for cotyledon and hypocotyl explants. Among the different PGRs treatments tried for normal root induction, it was observed that 80 % hypocotyls responded in the optimum concentration 0.5 mgl⁻¹ IBA and 0.2 mgl⁻¹ NAA in WPM after 8 days. Subculturing in reduced auxin combination at reduced level (0.2 mg1⁻¹ IBA and 0.1 mg1⁻¹ NAA) in liquid WPM was best to vield maximum biomass after 8 weeks (Plate 1a and 1b). On the other hand the same combination in solid WPM showed poor regeneration with less number of roots. The highest regeneration rate (89.23 \pm 0.06 %), number of roots (33.11 \pm 0.03) and root length (4.12 \pm 0.09 cm) were recorded in WPM supplemented with 0.2 mg1⁻¹ IBA and 0.1 mg1⁻¹ NAA respectively (Fig.1b) (Table.1) similarly in *R.serpentina* the highest regeneration rate and number of roots was reported when inoculated in IBA and NAA supplemented medium. Many previous studies been reported that the combinations of two auxins enhances the rooting ability of many plant species the present findings corroborate with the findings in Chicory leaf explants (Nandagopal and Ranjitha Kumari, 2007) and Cephaelis ipecacuanha.(Jha et al., 1991). It has to be noted that the production of adventitious roots is responsible for the enhancement of biomass in a system. The reduced root growth might be due to the accumulation of endogenous auxins during the period of each subculture.

Plant C Regul (mg	Frowth ators 1^{-1})	eneration oonse (%)	of roots/ xplants	ot length (cm)	srpine (%)	jmaline (%)	malicine (%)	
IBA	NAA	Reg	No. e	Ro	Rese	Ă,	Aj	
0.05		-	-	-	-	-	-	
0.1		6.03 ± 0.01^{i}	3.54 ± 0.04^i	1.23 ± 0.03^{e}	-	-	-	
0.2		$11.17\pm0.03^{\rm e}$	$5.22\pm0.01^{\rm g}$	$1.06\pm0.06^{\rm f}$	-	-	-	
	0.05	8.17 ± 0.11^g	4.19 ± 0.03^{gh}	2.43 ± 0.03^d	-	-	-	
	0.1	10.22 ± 0.03^{ef}	$7.17\pm0.07^{\rm f}$	2.16 ± 0.01^{de}	-	-	-	
	0.2	7.42 ± 0.03^{h}	10.55 ± 0.08^{e}	2.44 ± 0.02^{cd}	-	-	-	
0.05	0.1	21.32 ± 0.09^d	$23.05{\pm}0.15^{c}$	3.02 ± 0.07^{c}	$0.001{\pm}0.001^d$	0.004 ± 0.002^{d}	0.002 ± 0.001^{d}	
0.1	0.1	41.94 ± 0.11^b	$26.32\pm0.11^{\text{b}}$	3.27 ± 0.01^{b}	$0.003 \pm 0.001^{\circ}$	0.002 ± 0.002^{c}	$0.005 \pm 0.001^{\circ}$	
0.2	0.1	89.23 ± 0.06^a	33.11 ± 0.03^{a}	$4.12 \ \pm 0.09^{a}$	0.030 ± 0.001^a	0.032 ± 0.005^{a}	0.064 ± 0.002^{a}	
0.3	0.1	$38.22\pm0.12^{\rm c}$	12.04 ± 0.01^{d}	3.22 ± 0.03^{bc}	0.011 ± 0.005^{b}	0.020 ± 0.011^{b}	0.021 ± 0.001^{b}	

Table 1. Effect of growth regulators in liquid WPM on root regeneration from hypocotyls explant of *R*. *hookeri* (mean \pm SEM)

Each value represents mean \pm SE. Values with the same letter footnote in each column were not significantly different (P \leq 0.05).



Fig.1. Response of hypocotyls explants of *R.hookeri* a. root induction in solid WPM supplemented with 0.5 mgl⁻¹ IBA and 0.2 mgl⁻¹ NAA after 8 days b. Establishment of adventitious roots in liquid WPM supplemented with 0.2 mgl⁻¹ IBA and 0.1 mgl⁻¹ NAA after 8 weeks
The concentration of alkaloids analyzed (reserpine - 0.030 % ajmaline - 0.032 % and ajmalicine 0.064 %) were more during the peak period of growth. More concentration of weak basic fraction and alkaloids was observed in the root cultures of *R. hookeri* (Table 1). The results showed that the liquid WPM is optimum for root induction from the hypocotyls explants of *R. hookeri*. On the other hand, solid WPM inhibited the percentage of regeneration, root growth, root length and alkaloid content. These results suggest that normal root cultures of *R. hookeri* are promising for large-scale biomass production in suspension cultures.

Conclusion

The present study optimized the establishment of aseptic seedling of *R*. *hookeri* which will be useful genetic transformation studies. It was found that hypocotyls are the best explants for the successfully induced normal root cultures. The best result on root culture was obtained in half- strength WPM medium. More concentration of weak basic fraction and alkaloids observed in the root cultures indicated that the organogenesis is required for the production of bioactive compounds. The results suggested that the type and quantity of phytohormones supplemented to the hypocotyls explants affected the rate of regeneration and the production of secondary metabolites in the system.

References

- Alagesaboopathi, C. (2009). An investigation on the antibacterial activity of *Rauvolfia tetraphylla* dry fruit extracts. *Ethnobotanical Leaflets*, *5*, 11-12.
- Bindu, S., Rameshkumar, K. B., Kumar, B., Singh, A., & Anilkumar, C. (2014). Distribution of reserpine in *Rauvolfia* species from India–HPTLC and LC–MS studies. *Industrial Crops and Products*, *62*, 430-436.
- Chipiti, T., Viljoen, A. M., Cordero-Maldonado, M. L., Veale, C. G., Van Heerden, F. R., Sandasi, M., & Enslin, G. M. (2021). Antiseizure activity of African medicinal plants: The identification of bioactive alkaloids from the stem bark of *Rauvolfia caffra* using an in vivo zebrafish model. *Journal of Ethnopharmacology*, 279, 114282.

- Hussain, F., Shah, S. M., & Sher, H. (2007). Traditional resource evaluation of some plants of Mastuj, District Chitral, Pakistan. *Pakistan Journal of Botany (Pakistan)*.
- Iwu, M. M. and Court, W.E., 1977. *Planta Med*, 32, .88.
- Jha S, Sahu N.P, Sen J, Jha T B, & Mahato S B. (1991) Production of emetine and cephaeline from cell suspension and excised root cultures of Cephaelis ipecacuanha. Phytochemistry, *30*, 3999-4003
- Mohanan N & M Sivadasan (2002). Flora of Agasthyamala. Bishen Singh Mahendra Pal Singh Publishers, Dehra Dun, India. 65.
- Nandagopal S, Ranjitha Kumari BD. Effectiveness of auxin induced in vitro root culture in Chicory. J Cent Eur Agric 2007;8:73-80.
- Ramawat, K. G., Sonie, K. C., & Sharma, M. C., 2004. Therapeutic potential of medicinal plants: an introduction. *Biotechnology of medicinal plants: vitalizer and therapeutic. Science Publishers. Enfield*, pp 1-18.
- Sahu, B.N. 1979. Taxonomy of Indian species- Rauvolfia serpentina. Today and Tomorrow's Printers and Publishers, New Delhi, Vol II: pp. 70-71.

विश्वमानविकता का सन्देशः श्रीनारायण गुरुदेव की कविताएँ

16

महेष. एस

हिंदी विभाग, श्री नारायण कॉलेज, कोल्लम e-mail: karthikamahe@gmail.com

सारांश

केरलीय नवजागरण के अग्रदुत श्री नारायण गुरु द्वारा विरचित कविताओं की प्रासंगिकता वर्तमान दौर में बढ़ती आ रही है। आप का दर्शन सर्वमान्य तथा सार्वकालिक है। सुदृढ विचार, मौलिक दर्शन, महत्वपूर्ण जीवन आदि गुरु की विशेषताएँ थीं। मलयालम, संस्कृत और तमिळ में आप की कई रचनाएँ उपलब्ध हैं। गुरुदेव के निजी स्वरूप का सही शाब्दिक चित्रण इनमें दर्शनीय है। गुरुदेव को समझने केलिए आप के संसारिक जीवन एवं आप की रचनाएँ एक समान अध्ययन करना चाहिए। वास्तव में गुरु का जीवन ही है आपका दिव्य दर्शन। आप के महत् धार्मिक आदर्शों का एक ही लक्ष्य रहा, वह है मनुष्य जाति की उन्नति। मानव-मानव के बीच परस्पर विश्वास तथा सौहार्द बढ़ाने से ही विश्वबन्धुत्व का सपना साकार होगा। 'आत्मोपदेशशतकम्', 'दर्शनमाला', 'शिवशतकम्', 'अरिवृ', 'स्वानृभवगीति', 'अद्वैतदीपिका', 'जननी नवरत्नमंजरी', 'दैवदशकम', 'कुण्डलनीपाट्ट' आदि गुरुदेव-क्रतियाँ इस संसार केलिए एक वरदान है। विश्वमानवता का सन्देश ही ये प्रदान करते हैं। साधारण कवियों जैसा कुछ न कुछ लिख सुरक्षित रखने की आदत गुरु को नहीं थी। अक्सर आप कविता कह देते थे आप के शिष्य उन्हें लिख देते थे। गुरु की राय में ''यदि आठ-दस लोग कविता लिख लेने केलिए हमारे सामने बैठे तो भी हर एक को अलग-अलग पक्तियाँ बता देने में हमें कोई दिक्खत नहीं था''। प्रस्तत लघ शोध-लेख का उद्देश्य आप के इस उत्कृष्ट काव्य-कला को विशाल हिन्दी क्षेत्र को परिचित कराना तथा इसके संदेश को विस्तृत जन समूह तक पहुँचाना है।

विश्वमानविकता का सन्देश

गुरु केलिए कविता मन का सीधा प्रसारण रहा। नैसर्गिक सहजता की चाँदनी उनके काव्य में समग्र रूप में सदा विद्यमान रही। कुमारनाशान की दृष्टि में विलक्षण प्रतिभा के साथ अनुपम सरस्वती प्रसाद गुरु की कविताओं की विशेषता है। लिख लेने केलिए कितने ही लोग सामने बैठें तो भी उन सब को उसी दम अलग अलग कविताएँ बता देने में कोई धिक्कत महसूस न होने की बात गुरु देव ने ही बतायी थी। महाकवि उल्लूर परमेश्वरन के अनुसार सैकडों क्रिया-कलापों और व्यस्तताओं के बीच उभर आयी थी गुरु की कविता। ये कविताएँ आनन्ददायक, सांस्कृतिक मूल्यों से ओत-प्रोत तथा आध्यात्मिक-भौतिक जीवन केलिए सच्चा मार्गनिर्देशन देनेवाली थीं। आत्मविश्वास, स्वतंत्रता-बोध, करुणा, प्यार, उद्बोधन, आध्यात्मिक भाव से भरी कविता मानविकता के समग्र-भाव को वहन करती है। तमिळ, मलयालम, संस्कृत आदि भाषाओं में गुरु का विपुल ज्ञान इन कविताओं केलिए ठोस धरातल बनाने में सहायक बना। भाव-रूप सामंजस्यपूर्ण और अनायास बहकर आनेवाली काव्य-गंगा मन को निर्मल तथा अनुभूतिपरक बना देती है।

कवि मुलूर ने काव्यकार श्रीनारायण गुरु को रामायणकर्ता वात्मीकी का स्थान दिया है। इस जगत् में प्रत्यक्ष दिखनेवाली सारी चल-अचल वस्तुएँ चिर नहीं ऐसा अटल विश्वास, कविता रचना में सहज प्रतिभा, हृदय-कारुण्य भरा मौन-भाव को भूषण बनाकर परम शिव-भक्ति से अर्जित पुण्य आदि विशेषताओं ने मूलूर की राय में गुरु को वात्मीकी के स्थान में बिठाया। आध्यात्मिक-भौतिक जीवन का समकालीन स्थिति की जैसी पहचान गुरु ने पायी थी उसी प्रकार समकालीन कविता को भी पहचान लिया। उस समय १७ साल के कुमारनाशान को ढूँढ लिया तथा उनकी प्रतिभा को पहचानकर शृंगार पद रचने से दूर रहने का उपदेश भी दिया। शृंगार पदों के रचनाकार बनकर प्रेमाख्यानों का उत्तराधिकारी बनने से बचकर आधुनिक कविता के आचार्य पद अलंकृत करने का भाग्य गुरु शिक्षण स्वीकारने से ही कुमारनाशान को प्राप्त हुआ। काव्यकार गुरु का गौरव रहा महाकवि कुमारनाशान। ऐसा कहना भी उचित है कि गुरु की काव्य-यात्रा की सफलता थी कुमारनाशान।

स्तोत्रों के रचनाकार के रूप में गुरु को कवि जाना जाता है। भगवद् कीर्तनों द्वारा पिछडे समाज केलिए भक्ति का एक नया आदर्श रचा गया। उन दिनों लोग हिंसा तथा शराब में अधिष्ठित एक प्रकार की नीच उपासना में फंसे थे। वे उस समय मल्लन, माडन, मरुता, अरुमकोला, भूत-पिशाच, करिंकाली आदि के उपासक रहे। वर्ण-भेद से संजात असामंजस्य ईश्वर उपासना में भी प्रकट रहा। सभ्य देवताओं की उपासना का एकाधिपत्य ऊँचे वर्ण के लोगों ने अपने कब्जे में रखा था। नीच उपासना का अंत तथा समसामायिक ईश्वर अपासना को सुधारना दोनों गुरु की इच्छा थी। इसलिए उत्तम तरीके में अनुष्ठित ईश्वर उपासना का महत्व, शुद्ध हिन्दू धर्म के सगुण-निर्गुण धाराओं के प्रचार- प्रसार आदि के लिए गुरु तैयार हुए। अन्धविश्वासों की नींव पर खडे रहे मन्दिरों को पूर्ण रूप में तोड-फोडकर वहाँ नये मन्दिरों का निर्माण किया।

गुरु द्वारा विरचित स्तोत्र कृति सगुणोपासना केलिए अत्यन्त सहायक रहा। इन स्तोत्र कृतियों की अन्तःवस्त साधारण लोगों की पकड के बाहर रही, तोभी उनकी सरल शैली, गीतात्मकता ने उनके हृदयों को सहलाया। सनातन विचारों का एक गहरा दिव्य सागर इन कविताओं में समाया गया है। आवागमन का साक्षी बनकर खडा संसार नश्वर है, स्तोत्रों में निहित यह पहचान मानव को अपना पाप मिटाकर आत्मज्ञानी बनने का अवबोध भी दिलाती है। गुरु का लक्ष्य मायामय इस सांसारिक जीवन को धन्य बनाने में आवश्यक शक्ति को प्राप्त कराना था। उनके द्वारा संपर्ण विश्व को संचालित तथा नियंत्रण में रखनेवाले ईश्वर की स्तुति से भक्ति का रोचक माहौल बनाया गया। संपत्ति, शरीर, संतान, सख-भोग इन सब को विचार-विमर्श करते हुए उनकी व्यर्थता को सब के सामने व्यक्त किया। लौकिक सुख-सुविधा के वश में पडे मन को आस्तिकता की ओर मोडकर संस्कृति की महत्वपूर्ण-शक्ति का प्रसार किया। सांसारिक जीवन को आनन्ददायक बनाने लायक ईश्वरीयता का ही गुरु ने प्रचार किया। गुरु ने स्तोत्र रचनाओं द्वारा वाणी, मन, बुद्धि को चेतनता प्रदान करनेवाला बहुमूल्य वैचारिक तत्व प्रस्तुत किया। चपल इन्द्रिय-सुख और विषय-वासना को रोककर मनको आनन्द, शान्ति तथा चैन देनेवाला ईश्वरीय अवबोध जीवन को धन्य बनाता है। मनुष्य-मन के मैल को हटाकर सर्वव्यापी ईश्वर साक्षात्कार केलिए प्रार्थना द्वारा भव-सागर तरण कराने और शान्ति तट पर पहुँचाने केलिए मानव-मन को रूपान्तर करनेवाला आध्यात्मिक विचार गुरु के पास है।

गुरु की स्तोत्र कृतियाँ सांसारिक सच्चाई की ओर अग्रसर करनेवाली सफल तीर्थयात्रा ही है। प्रापंचिक सत्य का खुलासा करके आम जनता को कर्मोन्मुख बनाना-यही है यथार्थ गुरुधर्म। ज्ञान, आनन्द तथा अनुभूति का वास्तविक संसार गुरु ने हमें समझाया। आध्यात्मिकता रूपी हिमवान के उत्तुंग शृंग पर टहलाते समय लौकिक-स्वच्छन्दता भी गुरु के मन में सदा जागृत रही।

श्री वासुदेव, सरसीरुहपाञ्चजन्या-

कौमोदकीभयनिवारणचक्रपाणे,

श्रीवत्सवत्स, सकलामयमूलनाशिन्

श्रीभूपते, हर हरे, सकलामयम् मे। (श्रीवासुदेवाष्टकम् -१)

इस प्रकार श्रीवासुदेवाष्टक में भक्ति में तल्लीन होकर प्रार्थना करते समय इसके साथ कण्ठ मिलानेवाला किस सांसारिक भक्त का आमेय यानि पाप मिट न जाएगा? अति भौतिकता से आत्मानुभूति परक निर्वृति तक पहुँचानेवाले ऐसे स्तोत्र सत्य की गहराई का प्रकाशन करता है।

नमदेववृन्दम् लसद्वेदकन्दम्

शिरःश्रीमदिन्दुम् श्रितश्रीमुकुन्दम्

बृहच्चारुतुन्दम् स्तुतश्रीसनन्दम्

जटाहीन्द्रकुन्दम भजे f भीष्टसन्दम् (विनायकाष्टकम् -१)

शिव शंकर, शर्व, शरण्य, विभो

भवसंकटनाशन, पाहि, शिव (शिवप्रसादपंचकम् -१)

कालीनाटकम्, विनायकाष्टकम्, सुब्रह्मण्य कीर्तनम्, शिवप्रसादपंचकम् आदि प्रदान करनेवाला असीम आनन्द किसी भी हृदय को निर्मल बनाने केलिए काफी हैं। देवी, विनायक, सुब्रह्मणय, शिव आदि को अपनी कविता के ऐंद्रिक प्रभाव द्वारा अभिव्यक्त करते हुए पिछडे विभाग को देवी चेतन के शक्ति-सौन्दर्य से दीप्त बनाया। उनके मन में छायी गयी उग्र मुर्तियाँ जैसेः मल्लन, चुडलमाडन, करिंकाली आदि को उनके हृदय से निर्वासित बनाकर ईश्वर उपासना का संशोधित एवं सौम्य भाव को प्रतिस्थापित करते हैं। साथ ही साथ मानविकता की विपत्ति का दमन तथा शान्ति पाने का एक सार्थक प्रार्थना गीत भी बन जाता है। मानव को अपने वश में प्राप्त मुक्ति की पहचान देनेवाला शिवशतकम्, चिज्जड चिन्तनम्, स्वानुभवगीति, पिण्डनन्दि, चिदंबराष्टकम्, गुहाष्टकम्, षण्मुखस्तोत्रम, षण्मुखदशकम, भद्रकालीयाष्टकम, देवीस्तवम, मण्णन्तलादेवीस्तवम, सदाशिवदर्शनम. अर्धनारीश्वरस्तवम्, नवमंजरी, मननातीतम, इन्द्रियवैराग्यम, तेवारप्पतिकम, इन सब को पावन ईश्वर नमन के महत्व से तथा ज्ञान-साक्षात्कार से ओत-प्रोत करके व्यावहारिक जीवन को भी भावपर्ण बना देता है।

बहुदेवता उपासना से जुडी इन कीर्तनों की अन्तर्वस्तु का स्रोत पहुँचाता है गुरु का सहज सिद्धि- वैभव अद्वैत पर। भक्ति का अमृतरस सबों को एकप्रकार चखने तथा रसास्वादन करने केलिए उपयुक्त अद्वैतभाव का प्रत्यक्ष रूप है दैवदशकम। देवी, वासुदेव, शिव, सुब्रह्मण्य, गणपति आदि इस एकेश्वर में विलिप्त रहकर हमारी रक्षा करते हैं। महादेव मानव के दैनिक जीवन को धन्य बनाने लायक आवश्यकताओं की पूर्ति करता है। "सांसारिक जीवन को धन्य बनानेवाले प्रभु ही यथार्थ दीनबन्धु ईश्वर हैं। एक सत्यान्वेषी का सत्य-साक्षात्कार है 'दैवदशकम'। मलयालम भाषा में उपनिषद्-सत्य अद्वैत पर इतना गंभीर विचार देनेवाली संक्षिप्त कृति अन्यत्र कहीं नहीं है। दस चरणों में सिद्धान्त, साधना, साक्षात्कार तथा अनुभूति का अपूर्व माधुर्यमय सामंजस्य इसमें है। गुरुदेव की प्रस्तुत कृति केरलीय जनता की जर्जरता को मिटाकर यौवन का नवचैतन्य सत्य साक्षात्कार के साथ परोसा जाने केलिए तैयार किया गया दिव्यामृत है।'' प्रोफ.जी. बालकृष्णन नायर दैवदशकम् के बारे में ऐसा कहते समय सत्य-दर्शन की ओर बढ़ने का राज-पथ ही खुलता है। गुरु की अद्वैत रूपी दिव्य ज्योति में बसने के शाश्वत सुख, एक समाज के नवजागरण का सुख बन जाता है। गुरु ने मानवता उस सुख में निमग्न होने की आशा प्रकट की ।

तेरे अथाह ज्योतिर्मय दिव्य सागर की गहराई में निमग्न हो हम, बसें वहाँ बसें सदा, बसें सख (दैवदशकम१०)

भक्ति के क्षीरसागर से प्लावित गुरु की काव्य-शोभा समाज के प्रति गहरी निष्ठा तथा नवीन प्रत्यय-शास्त्र के निर्माण की ओर सन् १८८८ में मुडता है। अरुविप्पुरम में हुए शिवलिंग प्रतिष्ठा-कर्म गुरु की कविता को सामाजिक बल प्रदान करता है। कविता का नया मार्ग धार्मिकता रहा। शोक से जन्मा श्लोक एक पुराण ग्रंथ क सृजन कारण बन जाना वाल्मीकि से जुड़ी कहानी है। वाल्मीकि से समानता रखनेवाला एक प्रसंग गुरु के जीवन में भी विद्यमान है। वाल्मीकि के शोक का कारण एक निषाद द्वारा मारा गया क्रौंच पक्षी और उसकी जोडी का दु:ख है। वहाँ शोक से उत्पन्न श्लोक का रूप शाप का था। गुरु का शोक गुरु द्वारा समाज में प्रत्यक्ष में देखा गया शोक था। ब्राह्मण-बर्बरता के बाण लगने से तडपकर गिरनेवाले असंख्य अशरण मानव चेहरों को ही गुरु ने सामने देखा था। वाल्मीकि के समान गुरु भी घायल बने। तब भी श्लोक बर्बरता के विरुद्ध उठा शाप नहीं रहा। शाप से भी तीखा दृढ़ प्रत्युत्तर था। वह मानविकता के सभ्य और संस्कृति से संपन्न निर्णय की शाब्दिक अभिव्यक्ति थी। जाति और धर्म से उत्पन्न आतंक के विरोध में उठायी गयी उज्ज्वल ऐलान भी था। धार्मिकता को एक नया रास्ता देना ही परंपरा को तिरस्कृत करते हुए किया गया प्रतिष्ठ कर्म और इसके तुरंत पीछे निकले श्लोक। ये दोनों महत्वपूर्ण ऐतिहासिक सत्य का गवाह है।

176

जाति भेद, धर्म विद्वेष इन सब के बिना सभी, जहाँ भाईचारे से रहते हैं, वही आदर्श क्षेत्र है यह।

ये पंक्तियाँ केरल के तत्कालीन सामाजिक धरातल पर ज़ोर से पटका वज्रपात निकला। मानवता के साक्षात्कार केलिए गूँज उठी विद्युत गर्ज। शिवलिंग प्रतिष्ठा रूपी त्रयंबक को साध लिया तो सवर्ण उरगों जैसे चौंक उठे। पिछडे वर्ग ने तो मोर की भाँति खुशी मनायी। जाति-भेद या धर्म-विद्वेष के बिना सभी भाईचारे से रहनेवाले आदर्श क्षेत्र के आचार्य केलिए कविताएँ अपने सामाजिक नवजागरण लक्षित विचारों का शाब्दिक अभिव्यक्ति रही। कविता गुरु को अपने प्रत्यय शास्त्र प्रचार केलिए खींची तलवार थी। तब भी कविता में शहद के समान मिठास भरी रही। सामाजिक नवजागरण की आवश्यकता जतानेवाली ये कविताएँ आधुनिक संसार केलिए सामाजिक उपनिषदु ही है।

> ''मनुष्याणाम् मनुष्यत्वम् जातिर्गोत्रम् गवाम् यथा न ब्राह्मणादिरसैवम् हा ! तत्वम् वेत्ति को∫पिना।'' (जातिनिर्णय १)

''एक जाति, एक धर्म एक ईश्वर मानव का। एक योनि, एक आकार नहीं कोई भेद इनमें।।'' (जातिनिर्णय २)

मलयालम काव्य के इतिहास में इन पदों की भाँति दुहराया गया, प्रशंसित तथा एक संपूर्ण समाज की जागृति केलिए रची गयी पंक्तियाँ और कहीं होंगी ऐसा सोचना केवल शंका की ही बात है। 'जातिनिर्णय' शीर्षक कविता अपने मत प्रचार-प्रसार केलिए रची गयी कविता थी, जो अपनी शक्ति तथा ओज को प्रकट करती है। जाति की निरर्थकता को स्थापित करनेवाली कविता है 'जाति-लक्षणम्'। जीव-जन्तुओं का नसल एक खास बात ही है। यही उन्हें परस्पर एक दूसरे से पृथक करनेवाली चीज़, सच में आपस में आलिंगन-बद्ध होकर बच्चा पैदा करनेवाले ज़रूर एक नसल का है नहीं तो दूसरे प्रकार का नसल है।

ज्ञानी स्रष्टा ने रचा, रूप ली नसल मानो-रूप से रूप बदल आयेंगे, सब फिर से। (जाति-लक्षणम् ९)

सृष्टि के निगूढताओं में ले जानेवाली गुरु की कविताएँ समकालीन बुराइयों का विरोध करते हुए एक नए सामाजिक प्रणाली के विकास केलिए आदेश दे रही है। अनुकंपा के महत्व का वर्णन करनेवाली 'अनुकंपादशकम्', जीव-कारुण्य की आवश्यकता जतानेवाली 'जीव-कारुण्य पंचकम्', अहिंसा पर लिखी गयी 'अहिंसा', पारिवारिक जीवन का धुर शील-गुण संपन्न पत्नि है समर्थन देनेवाली कविता 'भार्याधर्मम्'। शिष्टाचार का महत्व व्यक्त करनेवाली रचना है 'सदाचारम्'। दान दी गयी संपदा को वापस लेने की बात पर व्यंग्य करनेवाली कविता है 'दत्तपहारम'। ये कविताएँ गुरु का जीवन-दर्शन व्यक्त करती हैं। व्यष्टि-समष्टि दोनों की सांस्कृतिक जगृति तथा उत्कर्ष की आवश्यकता की ओर इशारा देनेवाली ये कविताएँ केरलीय मनोभाव पर जो प्रभाव उत्पन्न करती हैं, वह थोडा नहीं है। इन कविताओं ने जो हलचल मचाया था वह निचले वर्ग पर ही नहीं बल्कि समस्त केरल समाज की विचारधारा में नवजागरण का ज्वार लाया।

गुरु की राय में ज्ञान ही ईश्वर है। उस ज्ञान तक पहुँचना है मानव-धर्म। ईश्वर की तरह ज्ञान भी अनन्त है। चमत्कारपूर्ण इस ज्ञान के महिमा-विस्मय को स्तुति करनेवाली रचना है 'अरिव'। गुरु के असीम ज्ञान का सहज प्रभाव है प्रस्तुत कविता। पूरा संसार ज्ञान से भरा है। ज्ञान के बिना इस संसार में कुछ भी बाकी नहीं है। ब्रह्मांड का अन्तर्वस्तु ही ज्ञान है। यह ज्ञान आनन्द भी है। तू सत्य-ज्ञान-आनन्द इसप्रकार दैवदशकम् में गुरु कहते हैं। ज्ञान नहीं है तो ज्ञेय (जो जाना जाता है) भी नहीं। ज्ञान से उभरनेवाला सपना भी ज्ञान है। पूर्णता का प्रतीक ज्ञान सर्वव्यापी रहता है, इसलिए जो कुछ भी ज्ञान नहीं है उसे इस संसार में स्थान नहीं है। ज्ञान का स्वरूप बोध है। ज्ञान के आगे और पीछे ज्ञान के अतिरिक्त कुछ भी नहीं है।

ज्ञानी के ज्ञान में स्थित

ज्ञान-सुध भी हम हैं ज्ञान-स्रोत पर मनन करें तो ज्ञान से भिन्न क्या है! (अरिव ११)

इस प्रकार ज्ञान के असीम क्षेत्रों के बारे में गुरु कहते हैं। प्रस्तुत ज्ञान सांसारिक जीवन के आन्तरिक महत्व को पर्दाफाश करनेवाला अनन्त और शाश्वत सत्य बन जाता है। इस सत्य दर्शन का प्रकाशन करनेवाला 'अरिव' आध्यात्मिकता का परमानन्द देनेवाली एक खास मलयालम कविता है।

सांसारिक जीवन की उलझनों में पडे मानव के श्रेय केलिए यत्न करनेवाले गुरु ने वेद-वेदान्त आदि को धार्मिक जीवन केलिए अनुपेक्षणीय देखा। भारतीय दार्शनिकता के परम सत्य को गुरु मानते हैं लेकिन कालान्तर में उसके साथ जोडे गये असत्यों का निषेध भी किया। वेद, आगम तथा उपनिषद् द्वारा प्रस्तुत किये गये अद्वैत को गुरु ने पुजनीय माना। इन्द्रिय, बुद्धि, चित्त, शरीर, प्राण, अहं आदि के पार ब्रह्म हैं, वही शाश्वत है। इस ब्रह्म को जाननेवाला कभी सांसारिक उत्पीडन का शिकार नहीं बनता है। आनन्द की परकाष्ठा में सत्य साक्षात्कार प्राप्तकर महत-ज्ञान में विलीन हो जाना है। ''शुद्ध और अखण्ड सत्य को जाँच-परख करके यह समझ लिया कि सभी धर्म का परम उद्देश्य एक ही है। इसलिए विभिन्न धर्म के आपस में झगडने में कोई मतलब नहीं है'' -गुरु के प्रस्तुत मत को सार्थक बनानेवाली कृति है 'आत्मोपदेशशतक'। गुरु यहाँ जिस सत्य का दर्शन देना चाहता है लौकिक जीवन में भी इसका खास स्थान है। अज्ञान में पडे व्यक्ति केलिए आस-पास दिखनेवाले प्रपंच-दुश्य सत्य लगता है। इस विचार में व्यावहारिक जीवन बिताते समय जीवन में भेद-चिन्ता उत्पन्न होती है। सोना, उठना, फिर सोना, भोजन तथा दांपत्यसुख प्राप्त करना आदि सोच में पडे रहने पर सत्य-दर्शन असाध्य बन जाता है। ज्ञान बढने पर परम स्थिति में ब्रह्म ज्ञान सिद्ध होता है। वह स्थायी आनन्द का भी कारण बन जाता है।

ज्ञान-दूध चखे भाग्यवान को लगे दस हज़ार साल थोडा सा बुद्धि-भ्रम में पडे अज्ञानी को लगे आधा लम्हा हज़ार साल। (आत्मोपदेशशतकम् -१५) यह सत्यदर्शन गुरु द्वारा प्रस्तुत किया गया है, यह जीवन में विजय का अनिवार्य संदेश भी है। संसार के अन्य लोगों को जो अच्छा लगे, वही हमारा भी प्रिय रहे। हमारा तात्पर्य अन्य लोगों को भी प्रिय लगे तो वह धर्म बन जाता है, मानव का पहला कर्म भलाई देना ही है।

पराये केलिए अर्हानेश श्रम कृपणता छोड, कृपालु करते कृपण उल्टे मुख स्वार्थ-सिद्धि करते कर्म दु:ख-हेतु बनते। (आत्मोपदेशशतकम् -२३)

स्वर्थता को परित्याग करके भले कर्म दूसरों केलिए दिन-रात करनेवाला है कृपालु। अज्ञानी केवल स्वार्थपूर्ति केलिए प्रयत्न करता है, वह स्वयं तथा समाज केलिए दुख का कारण बन जाता है।

सोच ले यह-वह जाननेवाला सर्वस्व भूमि पर आदि सत्ता की ही चेतना जो-जो हम स्वान्तः सुखाय करें, वो सब पराये को भी सख दे।। (आत्मोपदेशशतकम -२४)

गुरु ने स्पष्ट किया कि वह-यह आदि संबोधन करते हुए भिन्न-भिन्न समझे जानेवाला सब कुछ एक परमात्मा का ही रूप-भेद है। इसलिए एक व्यक्ति जो कुछ भी निज सुख को लक्ष्य बनाकर करता है, वास्तव में वह सब कुछ अन्य लोगों के सुख का कारण अवश्य बन जाए। एक को सुख और दूसरे को दुःख पहुँचानेवाला कर्म कभी भी आध्यात्मिक उन्नति का कारण नहीं बनता। मन रूपी फूल लेकर महेश पूजा करनेवाले को दूसरे किसी भी प्रकार की साधना अपेक्षित नहीं है। जो इस प्रकार की साधना में लग नहीं सकते वे वन-फूल अर्पण करते हुए ईश्वर नाम जप से मन पवित्र रख सकते हैं तथा इससे मिलनेवाले आनन्द से सांसारिक दुःख को पार सकते हैं। अनन्त शक्तिवाला ज्ञान ही एकत्व की ओर हमारी यात्रा में सहायक रहता है। अविद्या को पराजित कर विद्या से आत्मीयता निभाते समय ही हम इस महत्वपूर्ण एकत्व में पहुँचते हैं। यही सत्य-साक्षात्कार है। सभी धर्म का सार तत्व एक ही है। एक धर्म का तत्व अन्य धर्मवाले व्यक्ति को अपूर्ण लगेगा यह इसलिए कि इन मतभेदों का गुप्त सत्य एकत्व के बारे में वह बिलकुल अनभिज्ञ है। समस्त मानव स्वान्तसुख हेतु समग्र-यत्न में लीन रहते यहाँ। सदा सत्य जगती पर यही मत, सोचें शांत पाप कर्म से दूर रहें। (आत्मोपदेशशतकम् -४९)

अहं को त्यजकर सत्-चित्-आनन्द स्वरूप परमात्मा को मन में उजागर करते हुए एकाग्रता के साथ पूर्ण-वैरागी बनकर ब्रह्म के प्रतीक ॐकार की उपासना करते हुए मृदु-भाव से धीरे-धीरे अखण्ड सत्य में लीन होकर उसमें एकाकार होते समय आत्म-साक्षात्कार प्राप्त होता है। यही आत्मसाक्षात्कार गुरु का जीवन साक्षात्कार ही है।

मुक्ति-दायक है 'सत्य' और सत्य का साक्षात्कार देनेवाला परमतत्व है 'ब्रह्म'। इस संपूर्ण ब्रह्माण्ड की आत्मा रूपी ब्रह्म 'मैं' और 'तुम' का संगम करानेवाला अद्वैत बोध है। इस प्रकार गुरु ने 'ब्रह्मविद्या पंचक' में कहा है कि ''मिट्टी का घर, मिट्टी का बर्तन दोनों मिट्टी का ही रूपान्तर है।'' जिस विशेष शक्ति का व्यापन इस संसार में है, जिस तत्व से आत्मा का स्फुरण होता है, जिस तत्व का नाश प्रलय में भी नहीं होता, मुक्ति प्राप्त करने केलिए ऋषिगण भी जिसका आश्रय लेते हैं, वही नित्य सत्य है ब्रह्म। वही ब्रह्म, सत्-चित-आनन्द स्वरूप, अद्वैत तथा सर्वव्यापी हैं।

'निर्वृतिपंचकम्' में गुरु कहते हैं जिनकी बुद्धि में भेद-चिन्ता नहीं है, उन्हीं को ही निर्वृति परक शांति प्राप्त होती-

ज्ञाताज्ञातसमः स्वान्या-भेदशून्यः कुतो भिदा इत्यादिवादोपरतिर-यस्य तस्यैव निर्वृतिः। (निर्वृतिपंचकम् -५)

अद्वैत विषय पर गुरु द्वारा रची गयी कृति है 'अद्वैतदीपिका'। सांसार-सागर में पड़कर तड़पनेवाले मानव को आध्यात्मिक ज्ञान की ओर बढ़ावा देनेवाली कृति है यह। संसार और जीवन को खुली आँखों से देखने का उपदेश गुरु दे रहे हैं-

बाहरी आँखें खुलते ही, मूँदते अन्धे भीतर समाया ज्ञान, न प्रकट तभी। ज्ञान प्रकाश न मिले, अयत्न कभी दीप्त रखें साफ प्रकाशित ये आँखें।। (अद्वैतदीपिका -१९)

गुरु का ही आत्मसाक्षात्कार का भीतरी तत्व है यह। 'दर्शनमाला' सत्यदर्शन की उत्कृष्ट अभिव्यक्ति है। उपनिषदों में ऋषिवर्यों द्वारा प्रस्तुत किया गया अद्वैत दर्शन का सार तत्व गुरु ने इधर रोचक ढंग से व्यक्त किया है। अध्यारोप, अपवाद, असत्य, माया, दान, कर्म, ज्ञान, भक्ति, योग, निर्वाण जैसे दर्शन इसमें सम्मिलित है। माया जगत् से आत्मविद्या द्वारा सच्चे स्वरूप को पहचानकर आत्मानुसंधान द्वारा शाश्वत निर्वाण तक पहुँचना गुरु दर्शन का उदात्त भाव है। ज्ञानी लोगों को अद्वैत स्वरूप ब्रह्म को जानने केलिए भेद-चिन्ता त्यजना चाहिए, तब प्राप्त होनेवाला अद्वैतभाव ही है शाश्वत निर्वाण।

एकमेवाद्वितीयम् ब्र ह्यास्ति नान्यन्न संशयः इति विद्वान निवर्त्तत द्वैतान्नावर्त्तते पुनः। (दर्शनमाला - निर्वाणदर्शनम -१०)

आध्यात्मिकता को सुकुमार-अनुभूति प्रदान करनेवाली है गुरु की कविताएँ। जगत-सत्य की ओर पकडा गया आईना है यह। आईने में प्रतिफलित छाया के समान है यह जगत्। सब कुछ दिखा देनेवाली आँखें हमें स्वयं प्रकट नहीं होती हैं। 'आत्मविलास' नामक गद्यकृति में गुरु कहते हैं-

''आँखों के सामने आईना पकडने पर आँख उसमें प्रतिफलित होती है। तब आँख आईना और छाया दोनों को देखते हैं। छाया बिलकुल जड़ है।''

गुरु पुरुष-लक्षण भगवान में पाते हैं। भगवान बिना आँखों का देखनेवाला, बिना कान सुननेवाला, बिना चर्म स्पर्श पहचाननेवाला, बिना नाक गंध लेनेवाला, बिना जीभ चखनेवाला चित-पुरुष है। ईश्वर से तादात्म्य प्राप्त करने की प्रेरणा देनेवाली रचना 'आत्मविलास' वास्तव में आनन्द विलास बन गयी। यहाँ दिखाई देनेवाली सारी वस्तुएँ स्थूल, सूक्ष्म, कारण जैसे स्वरूपों में समाहित है, ये तीनों परमात्मा से निकलकर परमात्मा में ही लीन होनेवाली अद्वैत दीप्ति का अंश है। परमात्मा ही शाश्वत सत्य है। सब कुछ एक सपने के समान प्रतीत होनेवाले इस सांसारिक जीवन में, परमात्मा-ध्यान और उसमें से प्राप्त परमानन्द ही हमारा ध्येय बनना चाहिए। जन्म-मृत्यु, गरीबी, रोग, पीड़ा आदि से परमात्मा कभी ग्रस्त नहीं होता है। मेरा सांसारिक जीवन शांत तथा सौम्य रूप में बिना कष्ट बिताने और अंत में तुम्हारा परम-पद को प्राप्त करने केलिए हे भगवान! तेरा आशीर्वाद मेरे ऊपर सदा रहना चाहिए। इस प्रकार गुरु प्रार्थना करते समय यह हरेक की निजी प्रार्थना के रूप में रूपान्तरित हो जाती भी है। शांत, सौम्य और बिना कष्ट का जीवन हरेक व्यक्ति को परमपद पर पहुँचा ही देगा। ऐसा यत्न मानव को उठाना है। प्रस्तुत प्रार्थना कारुण्य का पथ-प्रदर्शक है।

चित्-जड, सत्-असत्, सुख-दुःख आदि के बिना अनिर्वचनीय स्थित ब्रह्म से होनेवाले सृजन कर्म का अनोखा महत्व अर्ध-ज्ञानी आत्मा पहचान नहीं कर पाती है। इसको साफ स्पष्ट किया गया है-'चिज्जड़चिन्ता' में हमारे आँखें, नाक, इन्द्रिय आदि से लेकर ब्रह्म तक फैला है 'चित्' और मिट्टी से लेकर अज्ञान तक फैला है 'जड़'। 'दैवचिन्तन' में दुष्ट-देवताओं को त्यजकर शिष्ट-देवताओं को नाम स्मरण द्वारा प्रसन्न बनाने की बात कही गयी है ताकि इनके आशीर्वाद से लौकिक सुख-भोगों का पर्याप्त आस्वादन मिले और तुष्ट बनने पर सुख-भोगों में से वैराग्य प्राप्त कर ब्रह्म-ज्ञानी बन जाने का मौका भी लें। सांसारिकों को ऊपर उठाने का गुरुमंत्र है यह। इससे एक समाज की प्रगति लक्षित है। गुरु ने गद्य रचनाओं द्वारा सांसारिक तथा आध्यात्मिक जीवन को पावन बनाने और ब्रह्म-ज्ञान दिलाकर नित्य आनन्द को याथार्थ्य बनाने की कोशिश की है। सांसारिक जीवन को छोडकर एक आध्यात्मिक जीवन या आध्यात्मिक जीवन को छोडकर एक सांसारिक जीवन का संकल्प असाध्य है। दोनों सफल रहेंगे तो

गुरु का जीवन दर्शन और दार्शनिकता पर गहरा प्रभाव डालनेवाली कृतियाँ हैं-'ईशोवास्योपनिषद्' तथा 'तिरुक्कुरल'। इन दोनों कृतियों को मलयालम में अनुवाद करने को गुरु उद्यत हुए। अन्य संन्यासी लोगों की भाँति वैयक्तिक धार्मिक ज्ञान का प्रसार गुरु ने अपना लक्ष्य नहीं बनाया रखा। अपने जीवनकाल में कभी भी एक लंबा आध्यात्मिक भाषण देनेकेलिए गुरु तैयार नहीं हुए। श्री शंकराचार्य की भाँति वेदान्तों का मौलिक व्याख्या भी नहीं दी। गुरु ने एषुत्तच्चन की तरह भक्ति के परम शिखर पर चढ़कर अवतार कथाओं का वर्णन नहीं किया। मेलपत्तूर और पून्तानम की तरह भक्ति के उन्माद में रमकर न जिए। सोने की थाली से ढके हुए सत्य के मुख दिखाने केलिए उस थाली का मुख अच्छी तरह खुलकर रखने का काम ही गुरु ने किया था। संस्कृत से अनभिज्ञ लोगों केलिए उपनिषद् सत्य के बारे में समझने केलिए गुरु का अनुवाद सहायक है। सरल मलयालम भाषा में भाव नष्ट हुए बिना 'ईशोवास्योपनिषद्' रचयिता के आत्मप्रकाश को प्रस्तुत करके शान्ति तथा लोक मंगल के सन्देश को गुरु ने लोगों तक पहुँचाया। सर्वव्यापी ईश्वर गुरु संकल्पना का एकेशवर ही है। अंत समय तक कर्म को निभाते हुए निर्लिप्त रहना ही मानव केलिए उचित है। गुरु ने अपने ही कर्मपथ द्वारा इसकी सार्थकता व्यक्त किया। अर्धार्मिक कुरीतियों को मिटाने की कोशिश में रहकर ईशावास्यकार की नैतिकता गरु ने निभाया। विषयवासना को दर ठहराकर अर्जित ज्ञान ही है जीवन।

अपने से अभिन्न नहीं संपूर्ण दृश्य-जगत जानो। तब से कैसा माया-मोह, शोक उस एकत्व-दृक को। (ईशोवास्योपनिषद्-८)

प्रस्तुत एकत्व दृष्टि गुरु का जीवन दर्शन है। क्लिष्टतापूर्ण व्याख्या से नहीं सरल अनुवाद द्वारा गुरु ने जीवन का आन्तरिक सार व्यक्त किया।

'ईशावास्य' के समान 'तिरुक्कुरळ' का अनुवाद भी सरल भाषा में किया है। तमिळ साहित्य तत्व-दर्शन से संबन्धित ग्रन्थ है 'तिरुक्कुरळ'। यह सार्थक जीवन का मार्गदर्शक है। तिरुवळ्ळुवर की माधुर्यपूर्ण सृजन-प्रतिभा का अनुसरण बना है गुरु का अनुवाद। 'तिरुक्कुरळ' की विशेषता यह है इसमें मुक्ति का प्रतिपादन नहीं हुआ है। धर्म, अर्थ और काम की विशद व्याख्या तिरुवल्लुवर दे रहे हैं। धर्मकाण्ड, अर्थकाण्ड, कामकाण्ड आदि तीन भागों में १३३० पद्य इसमें हैं। उसमें से कडवुळ वाष़त्त (नाम-स्मरण), वान चिरप्प(वर्षा-वर्णन), नीरत्ताल पेरुमै (संन्यासी महिमा) आदि तीन कुरळ का ही गुरु ने अनुवाद किया है।

ईश्वर तेरे महिमा पद की स्तुति करनेवाले अन्धेरा-जनित दो विपदों में कभी न फँसे पाँचों द्वार विजित जन के साथ सत्य-धर्म के मार्ग में सदा बढ़ें, सुदीर्घ सफल जीवन जिये। (तिरुक्कुरळ ५-६)

ऐसी गुरु-वाणी से ओत-प्रोत तिरुक्कुरळ ने मलयालियों को जो भावुकत्व प्रदान किया वास्तव में वह गुरु दर्शन का साक्षात्कार रहा।

गुरु काव्य-रचना में सिद्धहस्त रहे इसका एक और प्रमाण है तमिळ रचना तेवारप्पतिकंङ्ळ। नवीं तथा दसवीं शताब्दी में तमिल जनता को भक्ति में उन्मत्त करनेवाले शैव-सिद्ध नायनार की उदात्त रचना है-तेवारपाट्टुकळ। भक्ति की लहर मचाकर निम्न लोगों को संस्कृति और सभ्यता के शिखर में पहुँचाने का उद्देश्य इस कृति में भी था। अद्वैतदर्शन का आविष्कार इसमें गंभीर रूप से हुआ है। अरिमानूर नायिनार प्रतिष्ठा की स्तुति में रचा गया प्रस्तुत काव्य केरल के सांस्कृतिक पैतृक का द्योतक है। ऐसी प्रार्थना द्वारा सजीव ईश्वर-बोध भरे स्वच्छ मानव मन की सृष्टि करते हुए उनमें करुणा, आनन्द और शुद्ध बोध का प्रसार करते हैं।

गुरु की कविता रोशनी है। ऋषि बने कवि का सर्जनात्मक प्रकाशन में समय का मुहर लगा है, बदलाव की नगाडा-ध्वनि है, सत्य-ज्ञान-आनन्द का सौन्दर्य देनेवाली ऊर्जा है। एक कर्मयोगी के सतत प्रयत्न से मिले सद्फल को पहचानते समय तथा उनके अद्वैत-चिन्तन में लीन होते समय नवजीवन की ऊर्जा भर जाती है। गुरु चिन्ता की लहर से जनित मंगलदायक रोशनी धार्मिकता से संपन्न चैतन्य है। ज्ञान की आग को प्रज्वल करनेवाली है गुरु की कविता-

ज्ञान को अच्छादित, अनित्य माया-रूपी

अंधकार को छेद, दीप्त हों आदि-सूर्य। (आत्मोपदेशशतकम् -३५)

संदर्भ सूचि

- 1. https://www.youtube.com/watch?v=8Wq_4K2y-W0(orsearch 'daivadasakam in hindi' on youtube)
- 2. http://ml.wikipedia.org/wiki/ Daivadasakam
- Sreenarayana Gurudevan Kuttikalkkayulla Laghu Jeevacharithram Prof M.K. Sanoo - May 2012
- 4. Sree Narayana Guru Ariyendathellam Mangad Balachandran Dec 2011
- 5. Viswamaha Gurudevan Peroor S Prabhakaran July 2009
- Sreenarayanaguru Navothanathintey Pravachakan P Parameswaran -August 2008
- 7. Guru M.Chandrababu March 2007
- 8. Sreenarayana gurudevakrithikal sampoorna vyakhyanam-1 by Prof G Balarkrishnan Nair - 2003
- 9. Narayanaguru Daivadasakam vyakhyanam Nithya Chaithanya Yathi 1964
- 10. Sreenarayana Gurudevakrithikal Sivagiri Madam Publications Dec 1951

നവമാധ്യമങ്ങളിലെ സ്ത്രീസ്വത്വനിർമ്മിതി

സ്മിതാ പ്രകാശ്

മലയാള വിഭാഗം എസ്.എൻ.കോളേജ്, കൊല്ലം e-mail: smithaanuvinda@gmail.com

പ്രബന്ധസംഗ്രഹം

ഇന്നത്തെ ജീവിതസാഹചര്യങ്ങളിൽ മനുഷ്യൻറെ സാമൂഹിക–സാംസകാരിക

വൈകാരിക ജീവിതത്തിന്റെ സമസ്തമേഖലകളിലും നവമാധ്യമങ്ങൾക്കുള്ള സ്വാധീനം കാണാം. യുവ തലമുറയിൽപെട്ട നവമാധ്യമ കേന്ദ്രീകൃത ജീവിത ശൈലിയിലേക്ക് മാറിയിരിക്കുന്നു. നവ മാധ്യമങ്ങളുടെ കടന്നുകയറ്റം മലയാള കഥാ സാഹിത്യത്തിലും പ്രകടമായിട്ടുണ്ട്. നവമാധ്യമങ്ങളുടെ സ്വാധീനം ചന്ദ്ര മതി, ധന്യരാജ്, ടി. സി. രാമകൃഷ്ണൻ, ശ്രീകുമാരി രാമചന്ദ്രൻ എന്നിവരുടെ കഥകളിൽ എപ്രകാരം അടയാളപ്പെടുത്തിയിരിക്കുന്നു എന്ന വിശകലനമാണ് ഈ പ്രബന്ധത്തിൽ നടത്തിയിരിക്കുന്നത്.

നവമാധ്യമങ്ങളിലെ സ്ത്രീസ്വത്വനിർമ്മിതി

ഇലക്ട്രോണിക് സാങ്കേതികവിദ്യരൂപപ്പെടുത്തിയ ഒരു മായികലോക ത്താണ് നാം ജീവിക്കുന്നത്. സൈബർ അധിഷ്ഠിത നവമാധ്യമങ്ങൾ സമൂഹത്തിന്റെ സർവമേഖലകളിലും വ്യാപരിച്ച് നമ്മുടെ സംസ്കാര ത്തിലും സാമൂഹികമൂല്യങ്ങളിലും ജീവിതരീതിയിലുമെല്ലാം പുതുസ ങല്പനങ്ങൾ നെയ്തു കൊണ്ടിരിക്കുന്നു. കമ്പ്യൂട്ടറുകളും ടാബ്ലെറ്റു കളും മിനി കംപ്യൂട്ടറുകളായ പുതു മൊബൈൽ ഫോണുകളും വിപുലമായ വിനിമയലോകത്തേക്ക് നമ്മെ കൂട്ടിക്കൊണ്ടുപോകുന്നു. സർവമേഖലകളിലും അത്ഭുതാവഹമായ കടന്നുകയറ്റം നടത്തിക്ക ഴിഞ്ഞ ഇവർ, എഴുത്തിന്റെയും വായനയുടെയും മേഖലകളിൽ പുതു നിർവചനങ്ങൾ തീർത്തു. ഈയൊരു പശ്ചാത്തലത്തിൽ നിന്നു കൊണ്ടു വേണം നാം സൈബർ സാഹിത്യത്തിലേക്ക് കടക്കേണ്ടത്. മലയാള ചെറുകഥാലോകം നവമാധ്യമ ഇടപെടലുകളാൽ സമ്പന്ന മാണ്. ഇന്റർനെറ്റ് എന്ന സാങ്കേതികവിദ്യ നമ്മുടെ ജീവിതപരിസര ങ്ങളിൽ ചേക്കേറിയ കാലം മുതൽ തന്നെ അതിന്റെ പ്രതിഫലനം സാഹിത്യത്തിൽ ദൃശ്യമാകുന്നുണ്ട്. ആദൃമലയാള സൈബർകഥ 1995–ൽ സേതു എഴുതിയ 'തിങ്കളാഴ്ചകളിലെ ആകാശം' ആണ്. തുടർന്ന് ടി.വി.കൊച്ചുബാവയുടെ 'കൊക്കരണി', സി. രാധാകൃ ഷ്ണന്റെ 'സന്തോഷിന്റെ സങ്കടങ്ങൾ', സേതുവിന്റെ 'അടയാളവാകൃ ങ്ങൾ', മറ്റൊരു ഡോട്ട്കോം സന്ധ്യയിൽ, വിനു എബ്രഹാമിന്റെ 'ചില പ്രീമോസേൺ ഇടപെടലുകൾ', ചന്ദ്രമതിയുടെ 'വെബ്സൈറ്റ്', മുരളിയുടെ 'ചാറ്റൽമഴയിലെ ഏകാകി' തുടങ്ങി നിരവധി ബി സൈബർകഥകൾ മലയാളത്തിലുണ്ടായിട്ടുണ്ട്.

നവമാധ്യമങ്ങളുടെ കടന്നുകയറ്റം സമകാലിക ചെറുകഥകളിൽ സ്ത്രീസ്വത്വത്തെ എപ്രകാരം അടയാളപ്പെടുത്തിയിരിക്കുന്നു എന്ന അന്വേഷണമാണ് ഈ പ്രബന്ധത്തിൽ നടത്തുന്നത്. നവമാധ്യമ ഇട പെടലുകളെ പ്രശസ്തകഥാകാരി ചന്ദ്രമതി ഇപ്രകാരം രേഖപ്പെടു ത്തിയിരിക്കുന്നു : ''നവമാധ്യമങ്ങളെ അടിസ്ഥാനമാക്കിയുള്ള കഥ കൾ ബോധപൂർവ്വം രചിച്ചതാണ്. സാങ്കേതികവിദ്യയുടെ കുതിച്ചു ചാട്ടം വളരെ പെട്ടെന്നായിരുന്നു. അതിനനുസരിച്ച് ഞാനും സ്വയം നവീകരിക്കുന്നു. കാലത്തിന്റെ മാറുന്ന അവസ്ഥകളെ എഴുത്തുകാ രൻ/ എഴുത്തുകാരി കൃതൃമായി തിരിച്ചറിയണം. പഴയകാലത്തിന്റെ മാത്രം വക്താവായിരിക്കുന്നത് ശരിയായൊരു നിലപാടല്ല. കാല ത്തിന്റെ മാറ്റങ്ങളോടൊപ്പം സഞ്ചരിക്കുവാൻ എഴുത്തുകാർക്കു കഴി യണം.'' എഴുത്തുകാരുടെ നൂതന സഞ്ചാരപഥത്തിൽ സ്ത്രീസ്വത്വം പലവിധത്തിൽ നിർണ്ണയിക്കപ്പെടുന്നുണ്ട്.

താനൊരു ഫെമിനിസ്റ്റല്ല എന്നുറക്കെ പ്രഖ്യാപിച്ചു കൊണ്ട് എഴു ത്തിന്റെ ലോകത്തേക്ക് കടന്നു വന്ന എഴുത്തുകാരിയാണ് 'ചന്ദ്രമതി'. എന്നാൽ സ്ത്രീ ജീവിതത്തിന്റെ സമസ്താനുഭവങ്ങളെയും പ്രതിഫ ലിപ്പിക്കാൻ അവർക്ക് കഴിഞ്ഞിട്ടുണ്ട്. സ്ത്രീകളുമായുള്ള വിനിമയ ങ്ങളെ ആവിഷ്കരിക്കുന്ന ചന്ദ്രമതിയുടെ ചെറുകഥകളിൽ സ്ത്രീകൾ സ്വത്വപ്രഖ്യാപനത്തിനായി നവമാധ്യമങ്ങളെ ആശ്രയി

'വൈറസ്'- ൽ തന്റെ ക്കുന്നതായി കാണാം. ഒഴിവു നേരങ്ങൾ കമ്പ്യൂട്ടറിനു മുന്നിൽ ചിലവഴിക്കുന്ന സുനന്ദയെയാണ് നാം കാണു ന്നത്. വീട്ടുജോലിയും ശിശുസംരക്ഷണവും അടങ്ങുന്ന അവളുടെ വിവാഹ ജീവിതത്തിൽ യാതൊരു പുതുമയുമില്ല. അങ്ങനെയിരിക്കെ യാണ് കമ്പ്യൂട്ടറിൽ 'I love You' എന്ന സന്ദേശമെത്തുന്നത്. വിവരമ റിഞ്ഞ ഭർത്താവ്, അത് വൈറസാണെന്നും അതിലേക്ക് നോക്കരു തെന്നും മുന്നറിയിപ്പ് നൽകുന്നു. എന്നാൽ സ്വന്തം ഭർത്താവിൽ നിന്ന് അന്യമായ സ്നേഹ സന്ദേശം അവൾ സ്വീകരിക്കുകയായിരു 'ഒരു മനുഷ്യന്റെ സങ്കടങ്ങളിൽ' മുരളികയുടെ ന്നു. പലക സോഷ്യൽ നെറ്റ് വർക്കുകളിലെ ഇടപെടലുകൾ സ്ത്രീസ്വത്വത്തിന്റെ പുതിയമാനങ്ങളെ അവതരിപ്പിക്കുന്നുണ്ട്. നവമാധ്യമവിനിമയങ്ങളി ലുടെ മുരളിക നേടുന്ന സാമുഹികബന്ധങ്ങളും ആത്മവിശ്വാസവും കമ്പ്യൂട്ടർ നിരക്ഷരനായ ഭർത്താവ് സിൽവസ്റ്ററെ പ്രകോപിപ്പിക്കുന്നു. എന്നാൽ ആണിന്റെ ഇടമായി പൊതുവെ കരുതപ്പെടുന്ന നവമാധ്യമ ങ്ങളിൽ പെണ്ണിന്റെ ഇടം കണ്ടെത്തി അത് ആഘോഷിക്കുകയാണ് ചെയ്യുന്നത്. പുരുഷാധിപതൃവൃവസ്ഥയോട് മുരളിക കലഹിച്ച് സൃഷ്ടിച്ചെടുക്കുന്ന പുതുതലമുറയിലെ സ്വന്തമായ സ്വത്വം സ്ത്രീയെയാണ് നാം മുരളികയിൽ കണ്ടെത്തുന്നത്.

'പ്രയോജകരെയും കാത്ത്' എന്ന കഥയിൽ സമകാലിക ടെലിവി ഷൻ ചാനൽപരിപാടികളുടെ സംസ്കാരം സ്ത്രീശരീരത്തെ പരിഗ ണിക്കുന്ന പ്രതിലോമതലത്തെ അനാവരണം ചെയ്യുന്നു. ചാനൽപ്രേ ക്ഷക കൂടിയായ ഇന്ദുകുമാരിയെ പ്രോഗ്രാം ചിത്രീകരണമാണെന്ന അപഹരിച്ചു കൊണ്ടുപോകുമ്പോൾ നിസ്ലംഗതയോടെ വ്യാജേന നിൽക്കുന്ന സമൂഹത്തെയാണ് നാം കാണുന്നത്. എല്ലാം കച്ചവടക്ക ണ്ണോടെ വീക്ഷിക്കുന്ന പുതുതലമുറയുടെ മായികലോകത്ത്ആക്രമി ക്കപ്പെടുന്ന സ്ത്രീസ്വത്വത്തെയാണ് ചിത്രീകരിച്ചിരിക്കുന്നത്. അംബി കാസുതൻ മങ്ങാടി'ന്റെ 'നിങ്ങൾക്കും എഡിറ്റു ചെയ്യാവുന്ന ചില ദൃശ്യങ്ങൾ', എന്ന കഥയിൽ പ്രിയംവദ എന്ന കോസ്മോവിഷന്റെ അവതാരികയിലുടെ പൊതു സമൂഹത്തിൽ പുതുസ്ത്രീസ്വത്വം നിർമ്മിക്കപ്പെടുന്നു. എന്തും 'Live'കാണിച്ച് കയ്യടിയും ചാനലിന്റെ തത്രപ്പെടുന്ന പുത്തൻതലമുറയുടെ വാഗ്ദാന റേറ്റിംഗും കൂട്ടാൻ

മാണ് 'പ്രിയംവദ'യെന്ന ചാനൽ പ്രവർത്തക. കഴിഞ്ഞ ദിവസം റോഡിനു വീതികൂട്ടാനായി വന്ന മണ്ണുമാന്തിയന്ത്രം ഗ്രാമീണരുടെ ചെറുഅതിരുകളുടെ ചുവടുമാന്തി പൊളിച്ചപ്പോൾ പൊന്തി വന്നത് നാട്ടിൻപുറത്തെ ദരിദ്രയായ വീട്ടമ്മയുടെ ഭർത്താവിന്റെ ശവശരീരമാ ണ്. അത് അവന്റെ ഭാര്യയിലും സ്കൂൾവിദ്യാർത്ഥിയായ മകനിലും ഉളവാക്കിയ നടുക്കം 'Live'ആയി ചിത്രീകരിച്ച് ജനശ്രദ്ധപിടിച്ചുപറ്റാ നാണ് പിറ്റേദിവസം പ്രിയംവദയടക്കമുള്ള ചാനൽ പ്രവർത്തകർ ഗ്രാമത്തിലെത്തുന്നത്. അതിന ചുക്കാൻ പിടിക്കുന്നതാകട്ടെ വിദ്യാല യമെന്ന മഹാസ്ഥാപനവും. എന്നാൽ 'തന്റെ അച്ഛനെ ജീവിപ്പിച്ചു തരാമോ' എന്ന ബാലന്റെ നിഷ്കളങ്കമായ ചോദ്യത്തിനു മുന്നിൽ കെട്ടിയുണ്ടാക്കപ്പെട്ട സ്ത്രീത്വം അഴിഞ്ഞു വീഴുന്നുണ്ട്.

ധന്യാരാജിന്റെ 'സെലിബ്രിറ്റിഷോ' – മെലിച്ചിൽ രോഗം ബാധിച്ച് മര മിലീൻ-ന്റെ ണമടഞ്ഞ എത്യോപ്യൻ മോഡൽ സഹോദരി എത്യോപ്യ ഡാനിയേല സ്റ്റീവൻസണിന്റെ പത്രസമ്മേളനത്തിലൂടെ യാണ് ആരംഭിക്കുന്നത്. മോഡൽ മിലീനെ 'ഒരു കറുത്ത അസ്ഥി കൂടം' എന്നാണ് മാധ്യമപ്രവർത്തകർ വിശേഷിപ്പിച്ചത്. തന്റെ വംശ ത്തെയും നിറത്തെയും ആക്ഷേപിച്ച വെള്ളക്കാർക്കു നേരെ അവൾ ആഞ്ഞടിക്കുന്നുണ്ട്. പലപ്പോഴും അവളുടെ പ്രതിഷേധം മുഖത്തു ഉരുണ്ടു കൂടുന്ന കാർമേഘമായും ഏങ്ങലടിച്ചു കൊണ്ടുള്ള കരച്ചി ലായും അമേരിക്കക്കാരി വില്ലത്തി അരാന്റാ റിച്ചാർസ്സണു നേരെ യുള്ള ദേഷ്യമായും ഇരമ്പിവരുന്നു. മിസ് എത്യോപ്യയായി സെല ക്ടായതിനാൽ 'സെലിബ്രിറ്റിഷോ' എന്ന റിയാലിറ്റിഷോയിൽ പങ്കെ ടുക്കാൻ ഒരു മാസം മുമ്പാണ് ഡാനിയേല അമേരിക്കയിൽ എത്തു ന്നത്. പരിപാടിയിലെ കറുത്തവർഗക്കാരായ മോഡലുകൾക്ക് വെള്ള ക്കാരിൽ നിന്ന് വളരെയധികം പരിഹാസങ്ങൾ കേൾക്കേണ്ടിവരുന്നു. വർണവിവേചനത്തിനെതിരെ അവർ വെള്ളക്കാരോട് ആഞ്ഞടി ക്കുമ്പോഴും രഹസ്യമായി ഓരോരുത്തരും വെള്ളക്കാരികളെപ്പോലെ യാകാൻ കഠിനശ്രമങ്ങൾ നടത്തുന്നവരാണ്. 'ഡാനിയേലയുടെ നിറം വെളുത്തതല്ലെങ്കിലും നീഗ്രോകളെപ്പോലെ അത്ര ഇരുണ്ടതല്ല. ഇരു നിറമുള്ള അവളുടെ മാർദ്ദവമുള്ളതാണ്. അവളുടെ ത്വക്ക് മുടി കറുത്ത മിനുസമാർന്നതാണ്. ഇപ്രകാരമുള്ള ആൽവിന്റെ വെളിപ്പെ

ടുത്തലുകൾ അവളുടെ കറുത്തമുഖത്ത് ഒരു പുതിയ വെളിച്ചമുണ്ടാ ക്കുന്നതിന്റെ കാരണവും മറ്റൊന്നല്ല. സെലിബ്രിറ്റിഷോയുടെ ലക്ഷ ക്കണക്കിന് വരുന്ന പ്രേക്ഷകർ ഡാനിയേലയെ വംശീയമായി അധി ക്ഷേപിച്ച അരാന്റയെ വോട്ടു ചെയ്തു പുറത്താക്കുമ്പോൾ ഡാനിയേ ലജേതാവാകുന്നു. അപ്പോൾ അവളുടെ വംശസ്നേഹവും വെള്ളക്കാ രോടുള്ള വെറുപ്പും അപ്രത്യക്ഷമാകുന്നു.

ടി.ഡി. രാമകൃഷ്ണന്റെ 'കെണി'യിൽ സ്ത്രീയും പുരുഷനും അടു ത്തിടപെട്ടകാലം മുതൽ പുരുഷൻ സ്ത്രീയ്ക്കുമേൽ എന്ത് കെണി യാണോ തീർത്തിരുന്നത് ആ വലയെ പൊട്ടിച്ചെറിയുകമാത്രമല്ല, അവനുമേൽ നൂതനമായൊരുകെണി ഒരുക്കി പുതുസ്ത്രീസ്വത്വം എന്തെന്ന് അടയാളപ്പെടുത്തുകയാണ് രേഖ എന്ന ന്യൂഎഞ്ചിനീയർ. കഴിഞ്ഞ ആറുവർഷമായി കമ്പനിക്കുവേണ്ടി ചെയ്ത കഠിനാധ്വാന ത്തിന് അർഹിക്കുന്ന അംഗീകാരമാണെങ്കിൽ പോലും അപ്രതീക്ഷി തമായിരുന്നു അവളുടെ സ്ഥാനക്കയറ്റം. പക്ഷേ അതിനുമുമ്പ് വിജ യ്മേനോൻ എന്ന ബോസിന് ഗുരുദക്ഷിണ നൽകണം. അതായി രുന്നു രണ്ടു ദിവസത്തെ മൈസൂർട്രിപ്പ്. 'വീവിൽസിംപ്ലി എൻജോയ് ടു ഡേയ്സ്' – അവളെ ഒരിക്കലും അയാൾ നിർബന്ധിച്ചില്ല പക്ഷെ 'റിമംബർ യുഹാവ് എഗ്രേറ്റ് ഫ്യൂച്ചർ ഇൻസ്റ്റേറ്റ്സ്' – അത് രേഖയെ സംബന്ധിച്ചിടത്തോളം വല്ലാത്ത ഷോക്കായിരുന്നു. '' ഒരു കോടിയി ജോലി, മറ്റ് സൗകര്യങ്ങൾ, എല്ലാരംഗത്തും ലറെ ശമ്പളമുള്ള ലോകത്തിന്റെ നെറുകയിലുള്ള ജീവിതം. രാജ്യത്തെ അതു നൽകുന്ന അനന്തസാധ്യതകൾ'' അത് അവൾക്ക് ഉപേക്ഷിക്കാൻ കഴിഞ്ഞില്ല. ശരീരത്തിന്റെ പവിത്രതയൊക്ക എന്നോ നഷ്ടപ്പെട്ടിരു ന്നതിനാൽ അതെക്കുറിച്ച് പ്രശ്നമില്ല. അവശേഷിക്കുന്നത്, സമൂഹ ത്തെക്കുറിച്ചുള്ള, സദാചാരത്തെക്കുറിച്ചുള്ള ഭയപ്പാടുകൾ എന്നാൽ യു.എസ്സിലേക്ക് പോയാൽ പിന്നെ സമൂഹവും സദാചാരവും പ്രശ്ന മാകില്ലല്ലോ. അങ്ങനെ അവൾ ഉറച്ചതീരുമാനത്തിൽ എത്തിച്ചേർന്നു. അയാൾ തന്നെ കുരുക്കാൻ ഒരുക്കിയ കെണിയെ, സ്വന്തം ശരീരവും സൗന്ദര്യവും കൊണ്ട് അയാളെ കുരുക്കാനുള്ള കെണിയാക്കി മാറ്റു ന്നുണ്ട്. ഇവിടെ സത്രീസ്വത്വം പുരുഷാധിപത്യത്തിന്റെ തന്ത്രങ്ങൾക്ക്

190

കീഴ്പ്പെടുകയല്ല മറിച്ച്, പുരുഷനെ സ്വന്തം ശരീരവും സൗന്ദര്യവും കൊണ്ട് കീഴ്പ്പെടുത്തുകയാണ് ചെയ്യുന്നത്.

ശ്രീകുമാരി രാമചന്ദ്രന്റെ 'ഓമനത്തിങ്കൾ'– എന്ന കഥയിൽ കഴിഞ്ഞ ഒമ്പതുമാസമായി സ്വന്തം ഉദരത്തിൽ കുടിപാർത്ത പിഞ്ചുജീവൻ തനിക്കാരുമല്ലെന്ന് വിശ്വസിക്കാൻ അവൾക്ക് പ്രയാസമായിരുന്നു. പക്ഷെ ഐ.വി.എഫിലൂടെ ഒരു കുഞ്ഞിനെ സ്വന്തമാക്കാൻ ആഗ്ര ഹിച്ച താരദമ്പതികൾക്കു വേണ്ടിയുള്ള വെറും വാടകഗർഭപാത്രമാ യിരുന്നു അവൾ. അതിലേക്ക് അവളെ നയിച്ചതാകട്ടെ 'ചന്തു' എന്ന അവളുടെ പ്രതിശ്രുതവരനും. വിവാഹത്തിന് 12 ദിവസം ബാക്കി നിൽക്കെ ആ കരാറിൽ അവർ ഒപ്പിടുകയായിരുന്നു. 'ബോളിവു ഡിലെ ഏറ്റവും വിലയേറിയ താരദമ്പതികൾ'. ലോകപ്രശസ്തർ, കോടികളുടെ വരുമാനമുള്ളവർ, സ്വന്തം കുഞ്ഞിന് വളരാൻ വാട കയ്ക്ക് ഒരു ഗർഭപാത്രം. ഇരുപതിനും ഇരുപത്തഞ്ചിനുമിടയ്ക്ക് പ്രായമുള്ള, കനൃകയായ ഒരു പെൺകുട്ടിയുടെ ഗർഭപാത്രം. സെലി ബ്രിറ്റികളുടെ ഭ്രാന്തിൽ അവൻ വീണു. 'രാത്രി പകലാക്കി പണിയെ ടുത്തിട്ടും നമുക്ക് കിട്ടുന്നതെന്താ. വെറും നക്കാപ്പിച്ച. പറമ്പിലെ ചില്ലിത്തെങ്ങുകളും അടുക്കളയിലെ ഓട്ടുപാത്രങ്ങളുമല്ലാതെ ഇല്ല ത്തെന്തുണ്ട്? ആർഭാടപൂർണമായ ഒരു ജീവിതമാ ഞാനാഗ്രഹിക്കു ന്നത്. അതിന് നീ എന്നോട് സഹകരിച്ചേ മതിയാവൂ'– എന്ന ചന്തു വിന്റെ അത്യാഗ്രഹത്തെ അവൾക്ക് നിരസിക്കാൻ കഴിഞ്ഞില്ല. തന്ത്ര ശാലിയായ ഒരു ബിസിനസ്സുകാരന്റെ വൈഭവത്തോടെ ചന്തു അവരു മായി സംസാരിക്കുന്നത് കേട്ടപ്പോൾ 'ഗായത്രിമന്ത്രവും വേദസൂക്ത ങ്ങളും' കേട്ടുവളർന്ന ഒരാൾക്ക് ഇത്രയ്ക്ക് തന്റേടമുണ്ടാകുമോ എന്ന് അവൾ സംശയിച്ചു. അവസാനം 'അജ്ഞാതമായ സങ്കേതത്തിൽ നിന്ന് പുറപ്പെട്ട് മറ്റൊരജ്ഞാതമായ സങ്കേതത്തിലേക്കു യാത്ര ചെയ്യുന്ന അജ്ഞയായ ഒരുവളെപ്പോലെ അവളും വിധിയെ അനുസ രിക്കുകയായിരുന്നു.'

ഉപസാഹാരാ

ആധുനികാനന്തര സ്ത്രീകഥകളിൽ വളരെ വ്യത്യസ്തതകളും വൈവിധ്യങ്ങളും പുതുമകളും ആഖ്യാനഭേദങ്ങളും കാണാ വുന്നതാണ്. മറ്റ് എല്ലാ മേഖലകളിലുമെന്നപോലെ നവമാധ്യമസാ ന്നിധ്യം ചെറുകഥാസാഹിത്യത്തിലും വളരെ സ്വാധീനം ചെലുത്തു ന്നുണ്ട്. ഇന്നലെ വരെ സ്ത്രീ എന്തായിരുന്നുവെന്നതിന് പ്രസക്തി നഷ്ടപ്പെടുകയും ഇന്ന് അവൾ ആരാണെന്നും നാളെ അവൾക്ക് എന്തെല്ലാമായിത്തീരാമെന്നുമുള്ള ചിന്തകളാണ് ദിനംപ്രതി വികസി ച്ചുവരുന്നത്. പുരുഷമേധാവിത്വത്തിന്റെയും അധികാരസ്ഥാപനങ്ങളു ടെയും അടിമത്തത്തിൽ നിന്ന് അവൾ സ്വതന്ത്രയാവുകയാണ്. സ്വന്തം സങ്കല്പങ്ങൾക്കും കാമനകൾക്കും അവൾ അമിത പ്രാധാന്യം നൽകുകയും അതിന്റെ പൂർത്തീകരണത്തിനായി കഠിന സ്ത്രീ പ്രയത്നം ചെയ്യുന്നുമുണ്ട്. എന്നത് വീട്ടുജോലിക്കും സെക്സിനുമുള്ള ഒരു ഉപകരണം മാത്രമല്ലെന്നും അവൾക്ക് വേറി ട്ടൊരു സ്വതന്ത്രവൃക്തിത്വമുണ്ടെന്നുമുള്ള തിരിച്ചറിവ് ഇന്നുണ്ടായിരി ക്കുന്നു. അതാകട്ടെ അവളെ സമൂഹത്തിൽ ശക്തയാക്കി കൊണ്ടിരി ക്കുന്നു. വിവാഹശേഷം സ്നേഹമെന്തെന്ന് അറിഞ്ഞിട്ടില്ലാത്ത സുന ന്ദയ്ക്ക് കമ്പ്യൂട്ടറിൽ ലഭിച്ച 'I love You' എന്ന സന്ദേശം വളരെ വിലപ്പെട്ടതായിത്തീരുന്നു. അതൊരു വൈറസാണെന്ന ഭർത്താവിന്റെ താക്കീതിനെ അവഗണിച്ചു കൊണ്ട് സ്വാതന്ത്ര്യപ്രഖ്യാപനം നട ത്താൻ സുനന്ദതയ്യാറാവുന്നുണ്ട്.

'ഒരുപലകമനുഷ്യന്റെ സങ്കടങ്ങളി'ലെ മുരളികസുനന്ദയിൽ നിന്ന് ഒരു പടി കൂടി കടന്ന് സോഷ്യൽ നെറ്റ്വർക്കുകളിലെ നിരന്തര ഇടപെടലുകളിലൂടെ സ്ത്രീസ്വത്വത്തിന്റെ പുതിയമാനങ്ങൾ കാഴ്ച വെയ്ക്കുന്നത് കാണാം. സാങ്കേതികതയുടെ സങ്കീർണ്ണതകൾ അപ്രാ പൃമായിരുന്ന സിൽവസ്റ്റർക്ക് മുരളികയുടെ നവമാധ്യമസമ്പർക്കം അരോചകമായിതീർന്നു. 'ചിലപ്പോഴൊക്കെ അവൾ വെബ്ക്യാമറ വെച്ചു സ്വന്തം രൂപം മറ്റുള്ളവർക്കു കാട്ടിക്കൊടുക്കുന്നതു കാണു അയാൾ വിരണ്ടു പോകുന്നുണ്ട്.' ഇവിടെ സ്ത്രീയുടെ മ്പോൾ അനിയന്ത്രിതമായ ആശയ/സ്വത്വപ്രകാശനത്തിന്റെ സാധ്യത കൾക്കുള്ള ഇടം എന്ന നിലയിൽ ബ്ലോഗുകളിലും മറ്റു സോഷ്യൽ മീഡിയകളിലും വർദ്ധിച്ചുവരുന്ന സ്ത്രീപങ്കാളിത്തം സ്ത്രീ എന്ന നിലയിലുള്ള പരിമിതബോധത്തെ ഇല്ലാതാക്കുന്നതായി കാണാം. ടി. ഡി.രാമകൃഷ്ണന്റെ 'കെണി'യിൽ രേഖയും വളരെ ശക്തമായി

ത്തന്നെ പുരുഷനു എതിരെ പ്രതികരിക്കുന്നുണ്ട്. വിജയ്മേനോൻ അവളെ കുരുക്കാൻ ഒരുക്കിയ കെണിയെ, സ്വന്തം ശരീരവും സൗന്ദ രൃവും കൊണ്ട് അയാളെ കുരുക്കാനുള്ള കെണിയാക്കി മാറ്റുകയായി രുന്നു. പ്ലഗിൽ കുത്തിവെച്ച ബ്ലാക്ക്ബെറിയുടെ ചാർജറിൽ ഒളിപ്പിച്ചു വെച്ച കെണിയിലൂടെ വേട്ടക്കാരൻ–ഇര എന്ന ദ്വന്ദ്വത്തെ തിരുത്തി ക്കുറിച്ചു.

ശരീരം വിൽക്കേണ്ടിവരുന്ന സ്ത്രീയെപ്പോലെ തന്നെയാണ് ടെലിവിഷൻ ചാനലുകളിലെ അവതാരകരുടെയും റിയാലിറ്റിഷോക ളിലെ മോഡലുകളുടെയും അവസ്ഥ. അവരുടെ ശരീരവടിവും വഴ കൊഞ്ചിക്കുഴഞ്ഞ് ഇക്കിളിപ്പെടുത്തുന്ന സംഭാഷണങ്ങളു ക്കവും മെല്ലാം പുരുഷകേന്ദ്രീകൃത സമൂഹം മതിവരുവോളം ആസ്വദിക്കു ന്നു. ഈ ആസ്വാദനത്തെ കൂടുതൽ സങ്കീർണ്ണമാക്കികൊണ്ട് അനു ദിനം സ്ത്രീശരീരങ്ങളെ കാമോദ്ദീപകമായ രീതിയിൽ നിർമ്മിച്ചെടു ക്കാൻ ഓരോരുത്തരും മത്സരിക്കുകയാണ്. ഈ ആസ്വാദനത്തിന്റെ പാരമൃതയാണ് ചാനൽകാരിയായ ഇന്ദുകുമാരിയെ പ്രോഗ്രാം ചിത്രീ കരണമെന്ന വ്യാജേന അപഹരിച്ചു കൊണ്ട് പോകുന്നതിൽ എത്തി നിൽക്കുന്നത്. അവിടെ സമൂഹം നിസ്സംഗതയോടെ നിൽക്കുന്നതാണ് വെള്ളക്കാരികളെപ്പോലെയാകാൻ പരിശ്രമിക്കുന്ന നാം കണ്ടത്. എത്യോപ്യഡാനിയേലയിലും എന്തും 'live' ആയി കാണിച്ച് ചാന ലിന്റെ റേറ്റിംഗ് കൂട്ടാൻ തത്രപ്പെടുന്ന പ്രിയംവദയിലും പുതു സ്ത്രീത്വം നിർമ്മിക്കപ്പെടുകയാണ്. ശരീരവില്പനയിൽ നിന്ന് ഒരു പടി കൂടി കടന്ന് സ്ത്രീയുടെ പവിത്രമായ സന്താനോല്പാദനത്തെ വിപണിവത്കരിക്കുകയും അവൾക്കുമാത്രം ഗർഭ സ്വന്തമായ പാത്രത്തെ ഫാക്ടറിയാക്കി മാറ്റുന്ന കാഴ്ചയാണ് 'ഓമനത്തിങ്കളി'ൽ ആവിഷ്കരിച്ചിരിക്കുന്നത്.

കമ്പ്യൂട്ടർ സംസ്കാരം പുരുഷ കേന്ദ്രീകൃതമാണെന്ന സമൂഹ ത്തിന്റെ കാഴ്ചപ്പാടിന ഏറെക്കുറെ മാറ്റം വന്നിട്ടുണ്ട്. സ്ത്രീ എന്നത് വിനോദോപാധി മാത്രമല്ലെന്നും പുരുഷനോടൊപ്പം എല്ലാ മേഖലക ളിലും ഇടപെടാനും കഴിവു തെളിയിക്കാനും അവൾക്ക് കഴിയു മെന്നും പുരുഷാധിപത്യത്തിന ബോധ്യം വന്നിട്ടുണ്ട്. വെറുതെ ബ്രൗസ്സ് ചെയ്യുകയോ നെറ്റ്ഷോപ്പിംഗ് നടത്തുകയോ ചെയ്യുന്നതിലു പരിയായി യാഥാർത്ഥ്യത്തെക്കുറിച്ചും ശരീരത്തെക്കുറിച്ചും സ്വത്വ ത്തെക്കുറിച്ചുമൊക്കെയുള്ള അവരുടെ തനതായ ഭാഷ്യങ്ങൾ മുന്നോ ട്ടുവയ്ക്കാനുള്ള ഒരിടമായി സൈബർ സ്പെയ്സ് മാറിയിരിക്കുന്നു.

സഹായകഗ്രന്ഥങ്ങൾ

ആദർശ് വി. കെ. :	വിവരസാങ്കേതികവിദ്യ ജീവിതത്തിൽ
	കേരളഭാഷ ഇൻസ്റ്റിറ്റ്യൂട്ട് തിരുവനന്തപുരം
	2018
രാജേന്ദ്രൻ എം. പി. :	മാറുന്ന ലോകം, മാറുന്ന മാധ്യമലോകം മാതൃഭൂമി ബുക്സ് 2009
സുനിത ടി പി (എസി) :	സൈബർ മലയാളം കറൻറ് ബുക്സ് തൃശ്ശൂർ 2010 വെബ്സൈറ്റുകൾ

Author Guidelines

Holistic *Thought* is a non-profitable peer reviewed multidisciplinary research journal published yearly by Sree Narayana College, Kollam and is devoted to all aspects of findings and research associated with multidisciplinary concept which covers areas of science, language, literature, art, history and culture. Original articles will be published either as papers or reviews after review process. Manuscripts must be formatted as follows: Title, Authors, Affiliations, Abstract, Text, References. The corresponding author should be indicated and his/her contact information including address, telephone and fax numbers as well as e-mail address should be provided. Please read these guidelines before preparing a manuscript and for further details, please contact through editorholisticthought@snckollam.ac.in

or visit https://snckollam.ac.in/holistic-thought/

Regular article: Original reports of high-quality research with conclusions representing a significant advance in the field. Because each journal page is roughly corresponding to 700 words, one article should be not more than 7000 words including figures/tables. The number of words taken by figures/tables must be deducted from the 7000-word limit. The number of words taken by each figure/table can be approximately estimated by the relative area of the figure/table to that of a journal page; the number of figures and tables should not exceed 12. Authors are expected to revise the manuscripts according to the suggestions, if any, of the editors/ peer-reviewers. Contributors should be very careful in sticking to the code of ethics related to the in-text citations (references) while they preparing the article. Plagiarism is a criminal offence and it will be reported, if found, to the authorities of law and order.

Holistic Thought

0975

9

-363X



Sree Narayana College, Kollam Affiliated to University of Kerala NAAC 'A' Grade, ARIIA All India Rank II Estd. 1948