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SRC-QUEST Volume 3 | October 2023

SRC-QUEST

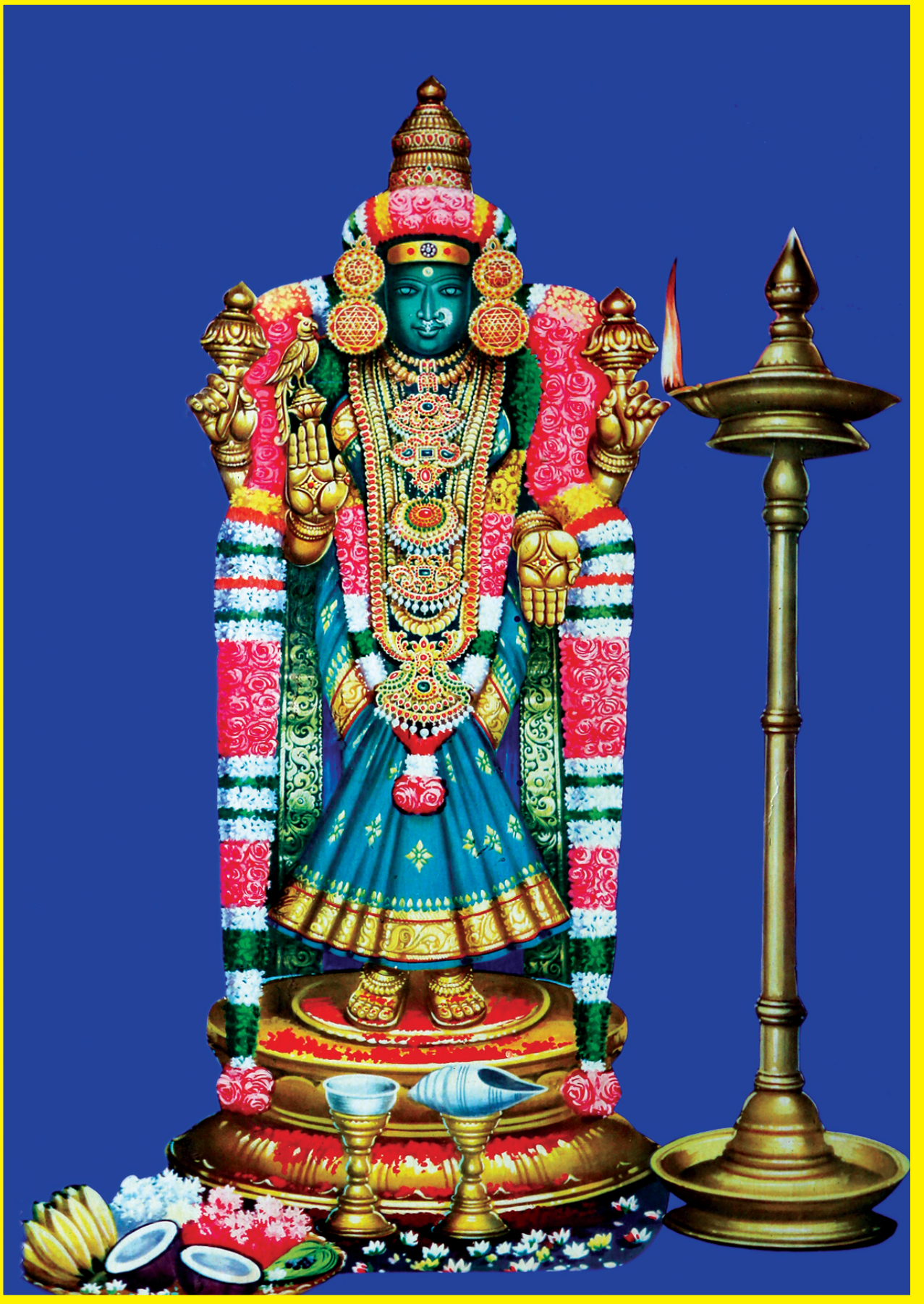
Volume 3 | October 2023

Showcasing the latest faculty research in arts, science and commerce.

Seethalakshmi Ramaswami College

Tiruchirappalli, Tamil Nadu, India

Accredited with A+(4th Cycle) by NAAC



The light that guides us all...
To them we owe all our achievements

Our Revered Founder

Padmabhushan Sri N.Ramaswami Ayyar
Srimathi Alamelu Seethalakshmi Ammal

Titles Conferred on our Founder

‘Rao Sahib’ by the British Government
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Smt. Vasantha Panchapakesan

Co-ordinator

Padmabhushan Sri. N. Ramaswami Ayyar Educational Complex

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An epitome of kindness and our source of inspiration.

May she continue to guide us from her heavenly abode

SEETHALAKSHMI RAMASWAMI COLLEGE

(Autonomous)

Affiliated To Bharathidasan University

Tiruchirappalli

Accredited with A+ (4th Cycle) by NAAC

SRC - QUEST

Volume 3 | October 2023

Editor - in - Chief

Dr. S. Santhi

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MESSAGE

SRC the name by itself holds testimony to the unique quintessential values the institution stands for. Being a well-known Higher Education Institution (HEI), SRC follows a myriad of academic practices which vouch for its excellence. The college has been exploring innovative avenues to hone the research acumen of its scholars. One such interesting venture is the publication of the annual in-house research journal SRC-QUEST.

The third Volume of the journal has given the right platform for current research and has made possible our foray into the developing areas of research and introduces those areas to our scholars and peers.

I congratulate the Journal team on this successful publication. I hope this volume will be useful to the researchers, students and faculty members of our institution and peer institutions. I appreciate all the faculty members who have meticulously contributed meritorious research articles to SRC-QUEST Volume 3.

I wish you all success in all your future endeavours!

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I wish you all success in all your future endeavours!

MESSAGE FROM DEAN OF QUALITY AND RESEARCH

Dr. S. Kala
Dean of Quality and Research
Seethalakshmi Ramaswami College
Tiruchirappalli-2

" Put your heart, mind, and soul into even your smallest acts.
This is the secret of success."
-Swami Sivananda

I am elated that SRC-QUEST forges ahead and provides a much needed platform showcasing research and strategy to develop innovative technologies and solutions integrating theory and concept from different disciplines. The journal furnishes a platform for sharing the views and opinion of the faculty and a forum for documenting and sharing their idea. It has played an important role in formalizing the professional development of the faculty. Warmest congratulations to the contributors. The Editor-in-Chief, Editorial and Technical team worked together toward a common vision and brought out this edition more efficiently and successfully. Congratulations on your incredible success! Wishing you even more success in the future.

Dr. S. Kala

MESSAGE FROM PRINCIPAL

Dr. M. Vasuki
Principal
Seethalakshmi Ramaswami College
Tiruchirappalli-2

I am filled with immense delight and pride at the release of SRC-Quest Volume 3. This volume of the in-house journal has many interesting research articles of our faculty members representing a wide range of disciplines. Each article aptly showcases the current developments in its particular field, enriching its relevance in the contemporary scenario.

I congratulate all the faculty members who have contributed scholarly articles to this volume. I wish that their contribution is used by future researchers and inspires their peers in our campus and in the academia.

I thank the members of the external and internal Review Committee who have contributed their suggestions and made possible the timely release of this volume.

My hearty appreciation goes to the Chair and to the members of the journal committee whose tireless efforts have made this possible.

I thank our Revered Founder, our Revered Madam Co-ordinator and Goddess Akilandeshwari for showering their blessings on us.

Dr. M. Vasuki

FOREWORD MESSAGE FROM THE BOARD OF EDITORS

Seethalakshmi Ramaswami College was established by our founder Padmabushan Shri. N. Ramaswami Ayyar with a vision of empowering women through holistic education that would enrich their personality and values of life and groom them academically proficient. The munificent and philanthropic founder envisioned the significance of women's education and made an ingenious initiative to provide education to women in the early 1950s. The illustrious son Shri. R. Panchapakesan further enhanced his father's vision by dedicated and untiring efforts to expand the growth of the noble institution, and has embarked on a journey in pursuit of excellence in education blended with traditional values with his noble wife Madam Co-ordinator Smt. Vasantha Panchapakesan. Their noble pursuit is continued with dedication and scholarly efforts by their illustrious sons Shri. Ramani Panchapakesan, the Executive Director, and Dr. Kannan Panchapakesan, Director-Academics.

The Journal SRC-QUEST got initiated in the year 2021 for academic excellence and dedicated approach towards dissemination of knowledge in the research areas with multifunctional methods and strives to report recent advances. The contribution of the authors demonstrates practical usefulness and multi-disciplinary approach to complex real world problems. The first volume of it was released in July 2021 as dedicated to our founder on his 125th birth anniversary, and second volume in October 2022. To maintain academic standards, ethics and integrity, the third volume has been released now with 32 research articles of our faculty from all the streams of Arts, Science, Commerce and Management.

The editorial and technical committees of this peer-reviewed journal, with the excellent support and remarkable guidance from the college authorities and enthusiastic and dynamic contributions from the faculty members, feel privileged to be a part of this dissemination of knowledge by quality based research articles.

Expressing our sincere gratitude to the college authorities and our earnest appreciation to the contributors, we feel delighted to bring out this third volume.

BOARD OF EDITORS

ACKNOWLEDGEMENT

First and foremost, I offer my copious pranams at the lotus feet of the omniscient and omnipotent Goddess Akilandeswari for blessing us with the prerequisite capacity and skill to tread the right path towards accomplishment of the goal without much ado.

I sincerely offer my prostrations to our Revered Founder for his perpetual blessings that constantly and rightly guide us all in our endeavours.

My profuse namaskarams are due to our Madam Coordinator for her sempiternal and invaluable blessings from her heavenly abode for our success in our sincere efforts.

I offer my namaskarams, wholehearted thanks and deep gratitude to our Managing Trustee for his unremitting, unstinted and unsagging succor that is the sine qua non for bringing out this volume spotlessly.

I place on record my profound and profuse thanks to our Executive Director for his rich and unequalled guidance and advice in the process of publication of this volume.

I express my bounteous thanks and gratitude to our Director-Academics for leaving no stone unturned to see that unscrimped buttress is provided, untinged care is taken and inimitable suggestions are offered for the unalloyed success of this work.

I also thank our Secretary, for his able guidance and unskimped encouragement for the successful publication of this volume.

With immense pleasure, I express my innumerable thanks to our Principal Madam, Dr. M. Vasuki for her competent and peerless guidance, unflagging efforts, Himalayan support, undrooping encouragement, unmatched motivation and towering advice throughout our journey in bringing out this publication.

I thank our Dean-Quality and Research Dr. S. Kala and the IQAC Team for their active and constructive participation in the smooth and unhindered process of publication.

My special thanks are due to all the reviewers and the authors for meticulously contributing their lion's share in making this publication a success.

I extend my deep sense of gratitude and thanks to the members of the Editorial Board and the Technical Committee who have by dint of their timely advice, valuable suggestions, fathomless support and unbesmeared cooperation made this publication a real success.

I am thankful to Mr. Gani Mohamed also for his timely help in this regard.

Last but not least, I extend my sincere and abundant thanks to all those who have by all possible means contributed their indispensable share in bringing out this volume successfully.

Dr. S. Santhi
Associate Professor of Chemistry
Editor-in-Chief-SRC-Quest

SRC – QUEST

SHOWCASING THE LATEST FACULTY RESEARCH IN ARTS, SCIENCE AND COMMERCE

Volume 3 October 2023

CONTENTS

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EVALUATION OF NUTRIENT CONTENT IN AQUEOUS EXTRACT OF *Ficus carica L* DRIED FRUIT

D. Nalini Devi
Department of Biochemistry, Seethalakshmi Ramaswami College, Tiruchirappalli.

Abstract

Ficus carica L constituted one of the largest genera of medicinal plants with about 750 species of woody plants, trees, and shrubs primarily occurring in subtropical and tropical regions throughout theworld. The fig is a very nourishing food and used industrial products. It is rich in vitamins, mineral elements, water, and fats. Figs are one of the highest plant sources of calcium and fiber. According to USDA data for the Mission variety, dried figs are richest in fiber, copper, manganese, magnesium, potassium, calcium, and vitamin K, relative to human needs. They provide many nutrients that are essential for the health and maintenance of our bodies. They are commonly consumed fresh, but can also be eaten in a dried state. Almost all dried fruits provide essential nutrients and also health protective bioactive ingredients that help to reduce its risk of illness by preventing chronic diseases. The Figs have the potential to be used as therapeutic drugs and it has been reported to include antioxidant, antiviral, antibacterial, hypoglycemic, cancer suppressive, hypotriglyceridaemic, and antihelminthic effects. This study was aimed to present an overview of traditional, nutritional values and pharmacological investigations of this plant.

Keywords: Antihelminthic, *Ficus carica,* hypoglycemic, pharmacological, subtropical

Introduction

Indian traditional medicine is based on various systems including Ayurveda, Siddha, Unani and Homoeopathy. The evaluation of all these drugs is based on phytochemical and pharmacological approaches which lead to drug discovery often is referred to as “natural product screening”. Any part of the plant may contain active components like bark, leaves, flowers, roots, fruits, seeds, etc. The beneficial medicinal effects of plant materials typically result from the combinations of secondary products present in the plant. Even the olympic athletes were given figs as a training food and figs were given as laurels to the winners of the first Olympics as a “medal ”. Ficus genus were also very likely one of the earliest and best sources of cultivated medicine as well as of food for people, and for their domesticated animals, **(Flaishman MA *et al*.,2008)**.

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Fruits are truly among nature's great gifts because they provide many nutrients that are essential for the health and maintenance of our bodies. They are commonly consumed fresh, but can also be eaten in a dried state. Almost all dried fruits provide essential nutrients and an array of health protective bioactive ingredients that help to reduce its risk of illness by preventing chronic diseases. Natural products have the potential to be used as therapeutic drugs for humans and live stock species. Such compounds, along with their analogues, can also act as intermediates to produce useful drugs, **(Makkar HPS *et al*.,2009)**.

Figure 1. ***Ficus Carica Linn.,***

In this regard, one such plant is Ficus Linn Carica., one of the oldest medicinal plant recorded in the Indian system of medicine (Family- Moraceae). Literature survey indicated that figs (Ficus Carica Linn.) are cultivated for over 11,000 years and figs, which almost certainly predate for human use, are the earliest cultivated plants. Fruits and vegetables are recommended as a source of dietary fibre, they are an important part of a healthy diet, and it was important as quantity and no single fruit or vegetable provides all of the nutrients needed to be healthy. A diet rich in vegetables and fruits can lower blood pressure, reduce risk of heart disease and stroke, prevent some types of cancer, lower risk of eye defects, digestive problems, oxidative stress and also help the body to develop the capacity to fight against these by boosting immunity **(Dani et al., 2007)**.

This is based on the fact that they are home for many antioxidants such as ascorbic acid (vitamin C), tocopherols (vitamin E), carotenoids (provitamin A) and several phenolic compounds (flavones, isoflavones, flavanones, anthocyanins and catechins) **(Shahidi and Naczk, 2004)**.

Ficus constituted one of the largest genera of medicinal plants with about 750 species of woody plants, trees, and shrubs primarily occurring in subtropical and tropical regions throughout the

world. The genus is remarkable for the large variation in the habits of its species. In India, the most important species of Ficus are F. *bengalensis, F. carica, Ficus racemosa and F. elastica.Ficus carica* is commonly referred as "Fig". Various parts of the plant like bark, leaves, tender shoots, fruits, seeds, and latex are medicinally important. The fig is a very nourishing food and used in industrial products. It is rich in vitamins, mineral elements, water, and fats. Figs are one of the highest plant sources of calcium and fiber. According to USDA data for the Mission variety, dried figs are richest in fiber, copper, manganese, magnesium, potassium, calcium, and vitamin K, relative to human needs. Figs have a laxative effect and contain many antioxidants. The dried figs produced a significant increase in plasma antioxidant capacity and also used in various disorders such as gastrointestinal respiratory, inflammatory, cardiovascular disorders, ulcerative diseases, and cancers. In traditional medicine the roots are used in treatment of leucoderma and ringworms and its fruits which are sweet, have antipyretic, purgative, aphrodisiac properties and have shown to be useful in inflammations and paralysis, **(Kirtikar KR and Nadkarni KM.,1996)**.

Materials and Methods

Preparation of *Ficus carica* extract

Ficus carica was procured at Gandhi market. Care was taken to select the fresh and juicy fruit. The fruit was washed thoroughly to remove all the foreign particles and peeled off the skin and the pulp was collected separately. The required quantity of 1gram fruit was weighed, ground well using mortar and pestle with distilled water. The prepared extract was subjected to the following analysis.

Qualitative Analysis of Nutrients

Test for Carbohydrate:

Molish's Test

1ml of aqueous extract of *Ficus carica* was separately mixed with 0.5 ml of water and was mixed with two drops of Molisch's reagent. To this, added 1 ml of concentrated sulphuric acid through the side of the tubes, formation of reddish brown ring at the junction of two liquids indicated the presence of sugars.

Test for Reducing Sugars:

Fehling's Test

1ml of each Fehling A and B mixed and boiled for 1 minute. Equal volume of test solution added and heated in water bath for 5-10 minutes the formation of brick red precipitate indicate the presence of reducing sugar.

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Test for Non-Reducing Sugar

Tannic Acid Test

5ml of aqueous extract of *Ficus carica,* were mixed with 3 ml of 20% tannic acid, the formation of white precipitate indicates the presence of non reducing sugar.

Test for Protein

Millon's Test

3ml of aqueous extract of *Ficus carica* were added with 5 ml of Millon's reagent (15% of mercuric sulphate in 15% of sulphuric acid). On heating the white precipitate which turns into brick red colour indicates the presence of protein.

Quantitative Analysis

Estimation of Total Carbohydrates

Total carbohydrate was estimated by the anthrone method of Hedge, *et al*., (1962)

Principle

Concentrated sulphuric acid hydrolyses the glycosidic bond of carbohydrate to give monosaccharides which are then dehydrated to furfural which reacts with anthrone to give green colour complex which can be measured colorimetrically at 640nm.

Reagents

30% potassium hydroxide: 30gm potassium hydroxide made up to 100ml distilled water.
0.2% o f sulphuric acid

Stock standard: 100mg of glucose was dissolved in 100ml of distilled water.

Working standard: 5 ml of stock was diluted to 100ml of distilled water.

Extraction

1g of fruit peel and pulp was ground thoroughly using 5ml of 30% potassium hydroxide. The plant homogenate was centrifuged at 3000 rpm and the clear supernatant was taken. To the pellet added 2 ml of 30% potassium hydroxide for complete extraction.

Procedure

Different concentration of standard were taken and made up to 1ml with distilled water. The tubes were kept in ice bath and added 4ml of 0.2% anthrone reagent with constant stirring. All test tubes were kept in a boiling water bath for 5 minutes. Blank was also processed similarly. For test 0.1ml of supernatant was taken, made upto 1ml with distilled water and treated similarly as standard. The blue green colour developed was read at 640nm.

Estimation of Fructose

Fructose was estimated by the Resorcinol method

Principle

Fructose in the presence of acidic medium is dehydrated and form hydroxyl methyl furfural. These formed compounds react with resorcinol to give a red colored complex, which is measured calorimetrically at 520 nm.

Reagents

Resorcinol reagent: Dissolved 1% of resorcinol with 125ml of glacial acetic acid.

HCL: 5 parts of concentrated acid was mixed with 1 parts distilled water.

Stock standard: 100mg of fructose was dissolved in 100ml of distilled water.

Working standard:10ml of stock solution was diluted to 50ml of distilled water.(1 in 5 dilution)

Procedure

Pipette out various concentration of working standard solution and made up to 2ml with distilled water. To this added 1ml of resorcinol reagent and 5ml of diluted HCL. The test was treated similarly as above with 0.5ml of test solution. All the tubes were kept in a water bath at 80^0C for 10mins, the tubes were allowed to cool under tap water and read the color developed was read at 520nm within 30minutes. A standard graph was drawn with concentration of X-axis and optical density on Y-axis.

Estimation of Total Protein

Total protein was estimated by the method adopted by Lowry *et al.,* (1951).

Principle

Protein present in the test sample reacts with Follin's ciocalteau reagent to give a colored complex. The color so formed is due to the reaction of alkaline copper with the protein and the reduction of phosphomolybdate with tyrosine and tryptophan present in the protein. The intensity of color developed depends on the amount of three aromatic amino acids present and the blue color developed is read at 620nm.

Reagents

Bovine Serum Albumin Standard: 20mg of bovine serum albumin was dissolved in 50ml of distilled water.

Working Standard: 10ml of stock was diluted to 50ml with distilled water.

Folin's reagent: Dissolved 100g of Sodium tungstate and 25g of Sodium molybdate in 50ml of distilled water in a round bottomed flask. Added 50ml of 50% Phosphoric acidand 100ml of

Concentrated Sulphuric acid. Reflexed for 10 hours. Added 150g of Lithium sulphate and 50ml of distilled water and a few drops of bromine. Boiled without a condenser for 50 minutes to remove excess of bromine. Cooled and made up to a litre. It was diluted 1:2 before its use.

Lowry's reagent

Solution A: 3g of Sodium carbonate in 150ml of 0.1N sodium hydroxide (600mg of sodium hydroxide in 150ml of water)

Solution B: Mixed 1% Sodium potassium tartarate and 0.5 % copper sulphate.

Mixed 150ml of Solution A and 3ml Solution B (50:1)

5% Trichloro acetic acid: 5g of Trichloro acetic acid was dissolved in 100ml of distilled water.

0.01N Sodium hydroxide: 40mg of Sodium hydroxide was dissolved in 100ml of distilled water.

Procedure Extraction

Weighed 1g of fruit peel and pulp and ground well using a mortar and pestle with tri chloroacetic acid and kept them half an hour for complete precipitation of protein. Centrifuged, discarded the supernatant and again washed with trichloro acetic acid. Then dissolved the precipitate in 3ml of 0.01N sodium hydroxide and made up to 100ml with distilled water. This served as the test solution. Pipette out 0.1ml of each test solution into a test tube and made up the volume to 1ml with distilled water. Various concentration of working standard also made up to 1ml with distilled water. To all the test tubes added 4.5ml of alkaline copper reagent and allowed to stand for 20minutes. A blank was also set up with water and Lowry's reagent. To all the test tubes added 0.5ml of Follin's reagent and allowed to stand for 10 minutes. The blue color developedwas read at 620nm.

Estimation of Free Amino Acid

The free amino acid present in the plant materials was estimated by Sadasivam *et al.,*1992

Reagents

1% Ninhydrin: 1gm of ninhydrin was dissolved in 100 ml of acetone.

0.1M Acetate buffer

Stock standard: 100 mg of glycine was dissolved in 100 ml of distilled water.

Working standard: 10 ml from the stock solution was made up to 100 ml with distilled water.

Extraction of Amino Acid

1gm of fruit peel and pulp was weighed and ground with mortar and pestle. To this homogenate, added 5 to 10 ml of 80% ethanol. Centrifuged and repeated the extraction twice with the residue and the supernatant was collected for the following estimation.

Procedure

To 0.1 ml of extract added 0.9 ml of buffer, 1 ml of ninhydrin solution and kept in a boiling water bath for 20 minutes and then added 5 ml of the buffer mixed well and cooled the contents for 15 minutes. Various concentration of working standard also processed similarly. Read the intensity of the purple color against a reagent blank in colorimeter at 570 nm.

Estimation of Calcium

Calcium was estimated by the method of Summerson (1941)

Principle

Calcium present in the sample is precipitated as calcium oxalate by the addition of ammonium oxalate solution and kept overnight for complete precipitation. The contents are centrifuged. The precipitate is neutralized and washed with diluted ammonia repeatedly for two times and then the precipitate is dissolve in concentrated sulphuric acid. The liberated oxalic acid is titrated against standard potassium permanganate.

Reagents

4% ammonium oxalate: 4gm of ammonium oxalate dissolved in 100ml distilled water.

1N sulphuric acid, Ammonia, 0.01N potassium permanganate, 0.01N oxalic acid

Precipitation of Calcium

2ml solution of fruit extract was taken in a centrifuge tube, to this added 1 ml of4% ammonium oxalate and mixed thoroughly and was kept overnight for complete precipitation. Next day the contents were centrifuged for 5 minutes and the supernatant was discarded. To the precipitate added 3 ml of diluted ammonia to ensure the complete removal of ammonium oxalate. Then the precipitate was dissolved in 5 ml of 1N sulphuric acid.

Procedure

5 ml of oxalic acid and 10 ml of 1N sulphuric acid was taken in a conical flask and warm gently. The burette was rinsed with potassium permanganate and was filled by the same. The content of conical flask was titrated against with burette solution for standardization of potassium permanganate. Appearance of permanent pink color was noted as an end point. The burette value was noted and repeated the titration for concordant value. The precipitate of each plant ash was dissolved in 5 ml of 1N sulphuric acid and then transferred into a clean conical flask separately. The content of conical flask was titrated against with standardized 0.01N

potassium permanganate. Appearance of permanent pink color was noted as an end point. The burette value was noted and repeated the titration for concordant value. A blank was also done by using 10 ml of 1N sulphuric acid it was titrated against 0.01N potassium permanganate. The end point was noted, and repeated the titration for concordant value.

Estimation of Iron

Iron was estimated by the method adopted by Jaffery *et al*., (1977).

Principle

Ferric ion present in the sample reacts with potassium thiocyanate to give a red colored complex,which is measured calorimetrically at 475nm.

Reagents

30% Sulphuric acid: 30ml Sulphuric acid made up to 70ml distilled water.

7% Potassium persulphate: 7gm of Potassium persulphate dissolved in 100ml distilled water.

40% potassium thiocyanate: 40g of potassium thiocyanate was dissolved in 100ml of distilled water.

Stock Standard: 70.2mg of Ferrous ammonium sulphate was dissolved in 100ml of distilled water. To dissolve the crystal 1ml of concentrated hydrochloric acid was used.

Working Standard: 5ml of stock standard was diluted in 100ml of distilled water.

Extraction

Weighed 1gm of fruit and grounded by using mortar and pestle, mixed with 100ml ofdistilled water. Centrifuged for 10minutes and the supernatant was used as the test solution.

Procedure

Various concentration of working standard were pipetted out into a series of test tubes and made upto 5ml with distilled water. 0.8ml of sample extract was taken and was made up to 5ml with distilled water. To all the tubes, added 1ml of 30% sulphuric acid and 1ml of potassium per sulphate were added, followed by the addition of 1.5ml of 40% potassium thiocyanate. A blank was setup and red coloured developed was read at 475nm within 5minutes. A standard graph was drawn taking concentration on X-axis and optical density on Y-axis. From the graph, the amount of iron present in the test solution was calculated.

Estimation of Ascorbic Acid (Vitamin-C)

The ascorbic acid was estimated by the method of Harries et al.,(1935)

Principle

Ascorbic acid is dehydrogenated in the presence of bromine water to form dehydroascorbic acid. The ketone group of dehydro ascorbic acid is then reacted with 2,4,dinitro phenyl

hydrazine (DNPH) to give an orange red colour osazone derivative ,which is dissolved in 80% sulphuric acid .Thio urea acted as preservative and the orange-red colour was spectrometrically measured at 540nm.

Reagents

4%oxalic acid: 100mg of oxalic acid was dissolved in 250ml of distilled water

2%Dinitro Phenyl Hydrazine (DNPH): 1g of dinitro phenyl hydrazine was dissolved in 50ml of 0.5N sulphuric acid.

0.5N Concentrated Sulphuric acid: 0.7ml of concentrated sulphuric acid was mixed with 49.3ml of distilled water.

10%Thio Urea: 2g of Thio Urea was dissolved in 20ml of distilled water.

Bromine water: Dissolved 1- 2 drops of liquid bromine in 100ml of distilled water.

80%Sulphuric acid: 80ml of concentrated sulphuric acid was mixed with 20ml of distilled water.

Stock Standard: 20mg of ascorbic acid was dissolved in 4% oxalic acid. To this added few drops of bromine water to convert ascorbic acid to dehydro ascorbic acid. After the solution had "Orange red" addition of bromine water stopped. Then the brominated stock was made up to 100ml with oxalic acid.

Working Standard:10ml of brominated stock was diluted to 100ml with 4% Oxalic acid.

Extraction

About 1g of fruit extract was weighed and ground in mortar and pestle with 6ml of4% Oxalic acid. The extract was centrifuged for 5 minutes. The supernatant was then brominated, and used as the test sample.

Procedure

2ml of test sample was taken and made upto 3ml with 4% Oxalic acid. Then pipette out various concentration of working standard solution into the series of test tube, and made upto 3ml of 4% oxalic acid . A blank was also set up by the taken 3ml of 4% oxalic acid. To all the test tubes, added 1ml of dinitro phenyl hydrazine reagent followed by 1-2 drops of thio urea and incubated at room temperature for 4 hours. The orange red osazone crystals were dissolved in 7ml of 80% sulphuric acid. The colour developed was read calorimetrically at 540nm. A standard graph was plotted against concentration of the standard ascorbic acid on X-axis and O.D on Y-axis. From the graph, the amount of ascorbic acid present in the given sample was calculated.

Estimation of Vitamin-E

Vitamin E was estimated by the method of Baker *et al*., (1980).

Principle

This method involves the reduction of ferric ion by Vitamin-E and the formation of a red colored complex with 2',2' – dipyridyl absorbance of the chromophore was measured at 520nm.

Reagents

0.5% Dipyridyl reagent: 0.5g of – dipyridyl in 100ml ethanol.

0.2% Ferric chloride: 0.2g of ferric chloride in 100ml ethanol.

Stock solution: 450mg of Vitamin E was dissolved in 100ml ethanol.

Working solution: 10ml of stock solution was diluted to 50ml with ethanol.

Procedure

Various concentration of working standard was taken and made up the final volume of each dilution is 2ml. Also set up tubes of undiluted as well as diluted samples of the given Vitamin-E test solution. Add 1.6ml of ethanol to all the tubes, including the blank. Add 0.2ml of dipyridyl solution followed by 0.2ml ferric chloride to all the tubes, mixed well and incubatedin the dark for 5minutes. Added 4ml of distilled water to all the tubes and shaken well, which results in the red color being diffused into the aqueous layer. Measure the absorbance of the aqueous phase at 520nm within 30 minutes. Plot the standard graph and using the absorbance values, calculated the concentration of Vitamin-E in the unknown sample.

Estimation Of Vitamin-A

Vitamin A was estimated by the method of Baker *et al*.,(1980).

Principle

This method involves the reduction of ferric ion by Vitamin-A and the formation of a red coloured complex with 2',2' – dipyridyl absorbance of the chromophore was measured at 450nm.

Reagents

0.5% Dipyridyl reagent: 0.5g of – dipyridyl in 100ml ethanol.

0.2% Ferric chloride: 0.2g of ferric chloride in 100ml ethanol.

Stock solution: 450mg of Vitamin A was dissolved in 100ml ethanol.

Working solution: 10ml of stock solution was diluted to 50ml with ethanol.

Procedure

Various concentration of working standard was taken and made up the final volume of each dilution is 2ml. Also set up tubes of undiluted as well as diluted samples of the given Vitamin-A test solution. Add 1.6ml of ethanol to all the tubes, including the blank. Add 0.2ml

– dipyridyl solution followed by 0.2ml ferric chloride to all the tubes, mixed well and incubated in the dark for 5minutes. Added 4ml of distilled water to all the tubes and shaken well, which results in the red colour being diffused into the aqueous layer. Measure the absorbance of the aqueous phase at 450nm within 30 minutes. Plot the standard graph and using the absorbance values, calculated the concentration of Vitamin-A in the unknown sample.

Results And Discussion

Table 1 represents the qualitative analysis of nutrient content in aqueous extract of *Ficus carica L*, showed that the presence of Carbohydrate, Reducing sugar, Non-reducing sugar and Protein in both peel and pulp **(Matheswaran Jagathambal *et al*.,2011).**

Table 1: Screening of Nutrients

S.NO	NUTRIENTS	AQUEOUS EXTRACT OF *FICUS CARICA* PEEL	AQUEOUS EXTRACT OF *FICUS CARICA* PULP
1	CARBOHYDRATE	+	+
2	REDUCING SUGAR	+	+
3	NON – REDUCING SUGAR	+	+
4	PROTEIN	+	+

Table 2: Nutrient Content of *Ficus carica L*

(Results are expressed in mg/100gm)

S.NO	NUTRIENT CONTENT	FRUIT PARTS	
		PEEL	PULP
1.	TOTAL CARBOHYDRATE	208	350
2.	FRUCTOSE	436	545
3.	TOTAL PROTEIN	186.6	800
4.	FREE AMINO CID	337	600
5.	CALCIUM	2400	850
6.	IRON	12	13.5
7.	ASCORBIC ACID	250	200
8.	VITAMIN-E	6750	
9.	VITAMIN-A	9000	

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Table 2 showed the content of Total Carbohydrate and Fructose in Ficus carica. The total Carbohydrate and Fructose in peel was found to be 208mg/100gm, 436mg/100gm and in pulp was found to be 350mg/100gm, 545mg/100gm, it was clearly shown that the Fructose content was more than total Carbohydrate. In contrast to peel, pulp have more Carbohydrate and Fructose content, this is because of juicy nature of pulp. Total protein and free aminoacid in peel was found to be 186.6mg/100gm, 337mg/100gm and in pulp was found to be 800mg/100gm, 600mg/100gm. From the table, it was found that the pulp contains more total protein content and free aminoacid than peel. Many fold increase of total protein content in pulp is due to flesh and seeds content.The nutritional profile of dried fig fruit has carbohydrates as a major component (73.50%) that corresponds to its high energy value (317.78 kcal). Moderate amount of protein (4.67%) was found in the dried fruit while dietary fiber content (3.68%) was good, **(Neha Soni *et al*.,2014).**

From this table represents the Calcium and Iron content in Ficus carica was shows that the calcium and iron content in ficus carica peel was found to be 2400mg/100gm, 12mg/100gm and in pulp were found to be 850mg/100gm, 13.5mg/100gm. It revealed that Ficus carica is rich in Calcium than Iron. There was marked increase in Calcium content in peel than that of pulp. Iron content in pulp is little bit high than peel. Dried fig was found to be a very good source of minerals like Ca, Mg, P and Fe. Calcium is crucial for bones; maintain overall health, important for strong bones and teeth. Iron is needed for the production of red blood cell and enzymes, **(Neha Soni *et al*.,2014).**Studies on the nutritional value of Ficus carica fruits showed that the fruits contain crude protein content of 1.48%, lipid of 7.58% and ascorbic acid of 5.3 mg/100g. The fruits also contain some important minerals elements such as calcium (7.62 mg), magnesium (25 mg), sodium (329 mg), potassium (49.30 mg) and manganese (2.4 mg) per 100 g on a dry weight basis, **(Oliveira et al., 2009).**

The content of Vitamin A and Vitamin E was found to be 9000mg/100gm and 6750mg/100gm. From the content of Vitamin A and Vitamin E in *Ficus carica L*(Table 2), it was well understood that Vitamin A was found to be higher than Vitamin E and it has been found to be very effective in the prevention and reversal of various disease complications due to its function as an antioxidant, its role in anti-inflammatory processes, its inhibition of platelet aggregation and its immune-enhancing activity, **(SalihaRizvi *et al*.,2014).**

Conclusion

Based on results obtained from the present study, it was concluded that the nutritional values were found in the aqueous extract of *Ficus carica L* fruit. This fruit is rich in nutrient content and remedies for various diseases. The bio reactive compounds are present in this fruit reduced the risk of various chronic diseases such as diabetes, cancer and cardiac diseases. The different kinds of nutrients were mainly involved in the prevention of human diseases such as anti-inflammatory, hypoglycemic, cancer suppressive, hypotriglyceridaemic and antihelminthic effects.

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HISTOCHEMICAL AND HISTOENZYMOLOGICAL STUDIES OF *ACANTHEPHIPPIUM BICOLOR,* LINDLEY

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Abstract

The histochemical studies of leaves of *Acanthephippum bicolor*, Lindley, a medicinal orchid is investigated in the present study. This orchid is used in urinary tract infection and its antimicrobial activity is also investigated. Histochemical analysis would help in localizing the metabolites. For histochemical studies, the free hand sections of leaves were taken and treated with the respective reagent in localize components.

Key words: Histochemistry, orchid, urinary tract infection, antimicrobial activity.

Introduction

Knowledge of the phytochemicals present and their localization with appropriate reagents within a plant cell may help to explain or to predict a variety of herbal preparations. The goal in surveying plants for biologically active compounds should be to isolate the constitutions responsible for a particular activity. Since the metabolomics of plants is rapidly developing, it will be a key technology in the system biology approach in studies of interaction of the plant and its environment and also for studies of activity of medicinal plants. In quality control of food and medicinal plants, the use of metabolic profiles should be an important tool[1].

There has been an interesting phenomenon in the last few decades, "Herbal Medicine has staged a comeback", because of the assurance of safety, quality and efficacy of medicinal plants and herbal products, which are the key issues in both developed and developing countries. Hence to rediscover the basis of the herbal medicine and to confirm scientific validation for folk medicine research is in progress in the contemporary world.

Folk medicine has reported *Acanthephippium bicolor* Lindley, a terrestrial orchid, to be antiseptic used to treat wounds. The terrestrial orchid, *Acanthephippium bicolor* Lindley, has been claimed as the most effective herbal medicine for the urinary tract infection by the traditional healers residing in the Kolli hills. When pathogenesis of UTI was tested, presence of *E. coli, Klebsiella pneumoniae, Proteus vulgaris, Staphylococcus aureus* and *Streptococcus faecalis* was identified. They are more prevalent in female than male. It is discovered that there is more instance of UTI in female particularly in women of age group between 20 and 50 and in male, men less than 20 years and above 50 years. The said women

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and men are more prone to UTI. The preliminary phytochemical analysis of the various parts of *Acanthephippium bicolor* Lindley (stem, bulb and leaf) showed most of the compounds responsible for antimicrobial activity are present only in leaf when compared to stem and bulb[2]. In the present study, the histochemical and histoenzymological analysis of *Acanthephippium bicolor* Lindley is analyzed.

Materials and Methods

Collection of Plant Materials

The healthy plant materials of *Acanthephippium bicolor* Lindley (Subfamily: Epidendroideae, Subtribe: Beltiinae) were collected from the Kolli Hills. It was authenticated in the Rapinat Herbarium, St. Joseph's college, Tiruchirappalli, Tamil Nadu, India with the help of herbarium record (Plate No. 703; RHT 25392;) [3].

Location

The Kolli Hills, one among the hills of the Eastern Ghats, has its geographical position between 11°10'00" to 11°30'00" N and 78°15'00" to 78°30'00" E. It belongs to Namakkal district and it is situated in two taluks namely Namakkal and Rasipuram, covering a total area of about 503 sq. km. The altitude is ranging from 200-1415 m about MSL from the foothills. The mean maximum and minimum temperature is 35° and 18° C respectively [4]. The location map of the Kolli Hills is appended (Plate I).

Morphology

Leaves about 3, oblong, lanceolate, acuminate with sheathing petiole about 45 cm long. Inflorescence lateral with 3-4 flowers, 3-4 cm long, sac-shaped, yellow spotted with red, lip hinged with 3 keels (3) (Plate I).

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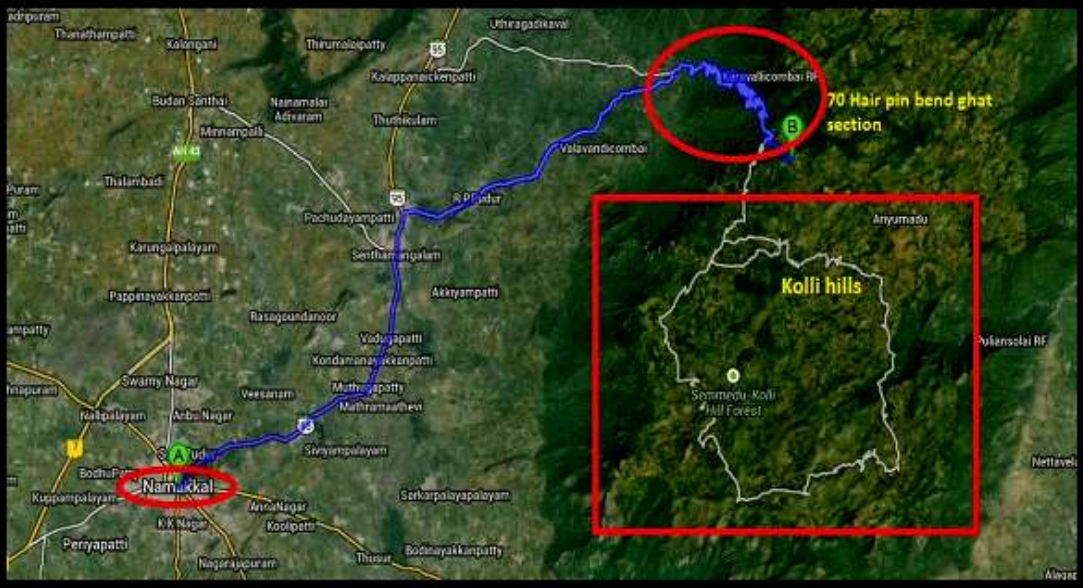
PLATE- I

THE KOLLI HILLS



ACANTHEPHIPPIUM BICOLOR, LINDLEY

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Histochemical analysis

Cytochemical staining procedure[5]

S.No.	Procedure employed and treatment time	Substances to be localized/ colour to be obtained	Control	Rationale
1.	Acid fuchsin method (1% in distilled water)	Protein - Reddish pink	2% acetic acid treatment after autoclaving	The aldehydes of proteins react with acid fuchsin and get stained.
2.	Alcian blue 8GX (3% solution in 0.1 N sodium acetate buffer, pH 5.6)	Carboxylated polysaccharides (including non-esterified pectin) – Blue	10% KOH, 5 hr treatment before staining.	The negatively charged carboxyl groups of uronic acids of pectins bind to the cationic alcian blue by salt linkage at the isoindole conferred cationic sites. Since this staining is done at pH 5.6, only the carboxylated pectins are stained.
3.	Amido black method (Amido black, 0.5 g in mercuric chloride 5 g, glacial acetic acid 5 ml and distilled water 100 ml)	Proteins – Blue	2% acetic acid treatment after autoclaving.	–
4.	Autofluorescence method (400-410 nm)	Lignin – Blue	–	Due to the presence of double bonds, lignin strongly absorbs UV light and so can be distinguished readily from the older cell wall components that do not absorb.
5.	Cellufluor MZR New (Sigma) (0.1% aqueous solution)	Cellulose - Blue fluorescence (400-410 nm)	Cuprammonium 5 hr treatment before staining.	It binds with 1, 3 and 1, 4 linked glucans.

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6.	Chlorazol black E (Sigma) (1% methyl cellosolve 5 min)	Cellulose - Black to bluish black.	Cuprammonium 5 hr treatment before staining.	–
7.	Nitrous test (10% $NaNO_2$, 10-20% urea and 10% acetic acid added in succession)	Phenols - Cherry red	Sodium hydroxide and ethanol (1:1) treatment	–
8.	Toluidine blue O (Merck) (0.05% in acetic buffer pH 4.4)	Carboxylated polysaccharides - Pink to reddish pink. Lignin-blue to blue green	10% KOH - 5 hr treatment before staining.	TBO - a metachromatic dye. Highly polymerized lignin shows orthochromatic blue colour. Less polymerized lignin bluish green.
9.	Vanillin method (HCl and mixture of vanillin 20% w/v and acetaldehyde 1% v/v in 95% ethanol)	Phenolics – Red	Potassium hydroxide ethanol extraction	–
10.	Gibbs reagent (0.5 ml of 2, 6-Dichloroquinone-4-chloroimine, 0.5% solution with 10 ml of borate buffer 0.2 m, at pH 9.5	Phenolics – Blue	–	Polyphenols interact with 2,6-dichloro-p-benzoquinone-4-chloro-imine to form the blue ammonium salt of indophenol.

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Histoenzymological Procedure-Krishnamurthy, 1999[5]

S. No.	Enzyme name and Code	Method followed for localization	Incubation time & pH	Control	Rationale
1.	Acid phosphatase E.C. 3.1.3.2	Lead phosphate method / Precipitation method. Colour: Browning black	30-40 min 5.0	Omit substrate (Sodium β-glycero phosphate)	When substrate glycerophosphate is given, acid phosphatase, if present, liberate phosphates as end product. They got trapped by lead phosphate. This by treatment with H_2S / ammonium sulphate it becomes lead sulphate (brownish black colour at the sites of acid phosphatase activity.
2.	Esterase E.C. 3.1.1.1	Simultaneous azo-coupling method. Colour: Reddish brown.	1-2 hr 7.0	Omit α-naphthyl acetate	–
3.	Peroxidase E.C. 1.11.1.7	Simultaneous azo-coupling method. Colour: Brown	15 min 7.0	Omit H_2O_2	Enzyme peroxidase catalyses the transfer of 2 electrons from substrate of H_2O_2 to form water and oxidized dyes. Benzidine/ DAB serve as an acceptor in the transfer of O_2 from H_2O_2. A blue product is formed, but soon fades into brown. Highly specific reaction.

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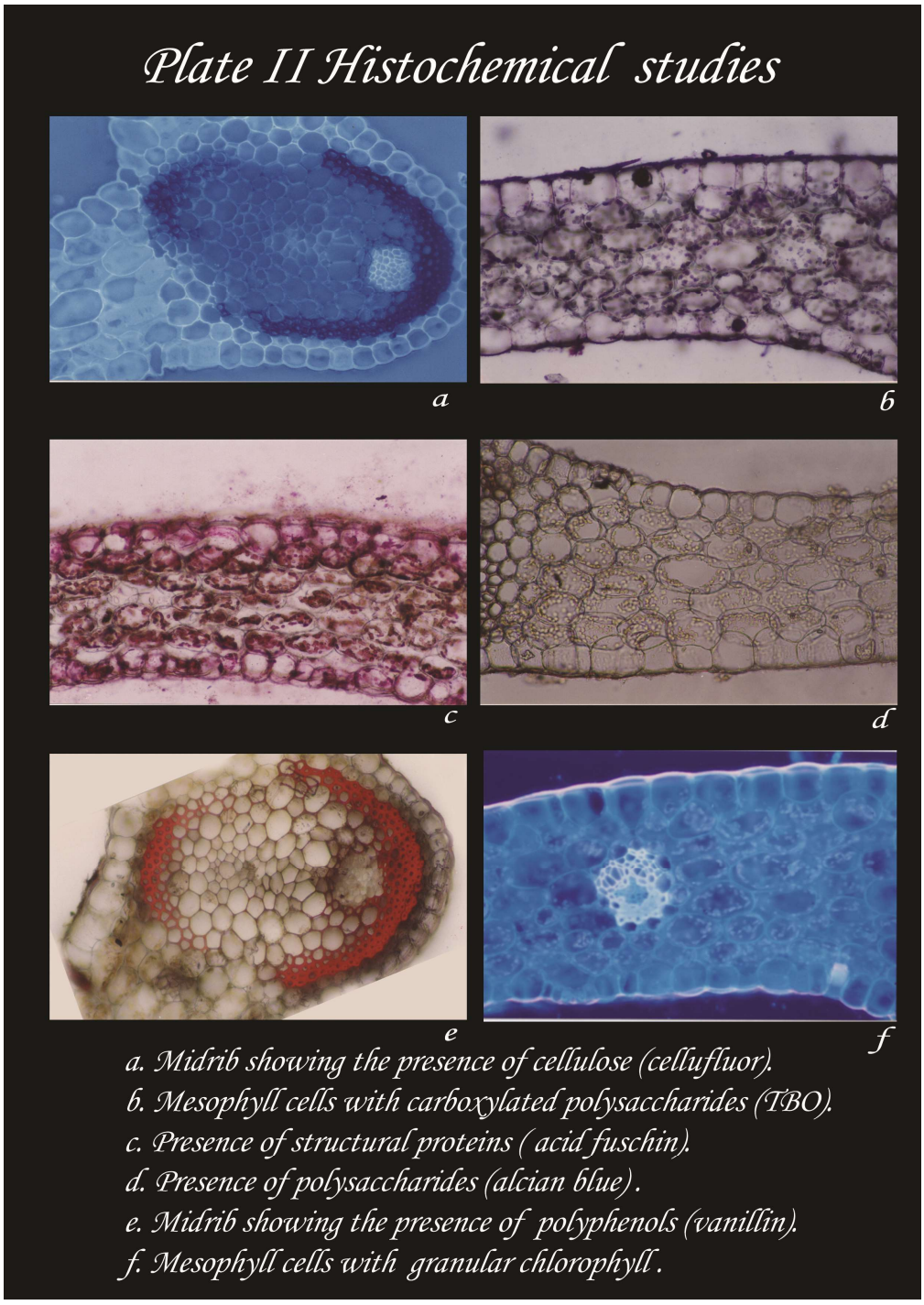
Histochemical Studies of Leaf

Histochemistry is a fascinating branch which permits the localization of the phytochemicals at the cellular level. In the present study, the leaf of *Acanthephippium bicolor* Lindley was treated with the important histochemical stains to localize respective substances at various sites of leaf through hand sections, and then the microphotographs were taken (Plates II & III).



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Anatomy of Leaf

The leaf consists of the following tissue zones epidermis, hypodermis and vascular region.

Epidermis is uniseriate and cuticularized. The cells are bigger and a number of them are radially elongated (Plate II. a). Their walls are composed of pectic polysaccharides, cellulose, yellow colour with acridine orange and light magenta colour with toludine blue (Plate II.b) and structural protein as deducted by the appearance of pink colour with acid fuschin (Plate II.c).

Hypodermis is present in the midrib region consisting of few layers of thick walled cells (Plate II-a). These cells are also positive to cellulose, pectic polysaccharides (Plate II.a, d) and structural proteins. In addition, these walls also have phenolic constituents as judged by vanillin (Plate II.e) and toludine blue (Plate II.b). The cytoplasm of these cells has polyphenols as judged by positive reaction to nitrous acid test (Plate III.a).

Mesophyll cells: The mesophyll cells consist of 6-7 layers of living cells with few vascular bundles distributed here and there (Plate II.f). The cells are circular to oval with intercellular spaces and consist of numerous small granular chlorophyll pigment. The walls of mesophyll cells have the following chemical constituents; cellulose (positivity to cellufluor, chlorazol black) (Plate II.f), pectic polysaccharides (non-esterified pectins) present abundantly in the cell wall (yellow colour with acridine orange, bluish green with alcian blue and magenta colour with toludine blue (Plate II.b) and basic structural proteins (positive to acid fuschin). Cells have chlorophyll pigment and prominent but small nucleus.

Vascular bundle: Xylem consists of few numbers of cells and their walls are highly lignified (Plate III.c) in addition to some phenolics positive to vanillin test, Gibbs (Plate III.b), Nitrous acid test (Plate III.a). The lignin present is predominantly of the syringyl guaiacyl type. Phloem cells have cytoplasm rich in total proteins and acidic polysaccharides. The cell walls of phloem do not have lignin and phenolics (Plate III.a) but rich in cellulose, pectic polysaccharides and some amount of proteins. Walls of cuticle and hypodermis are prominently stained with the activity of peroxidase, esterase and acid phosphatase (Plate III d, e & f).

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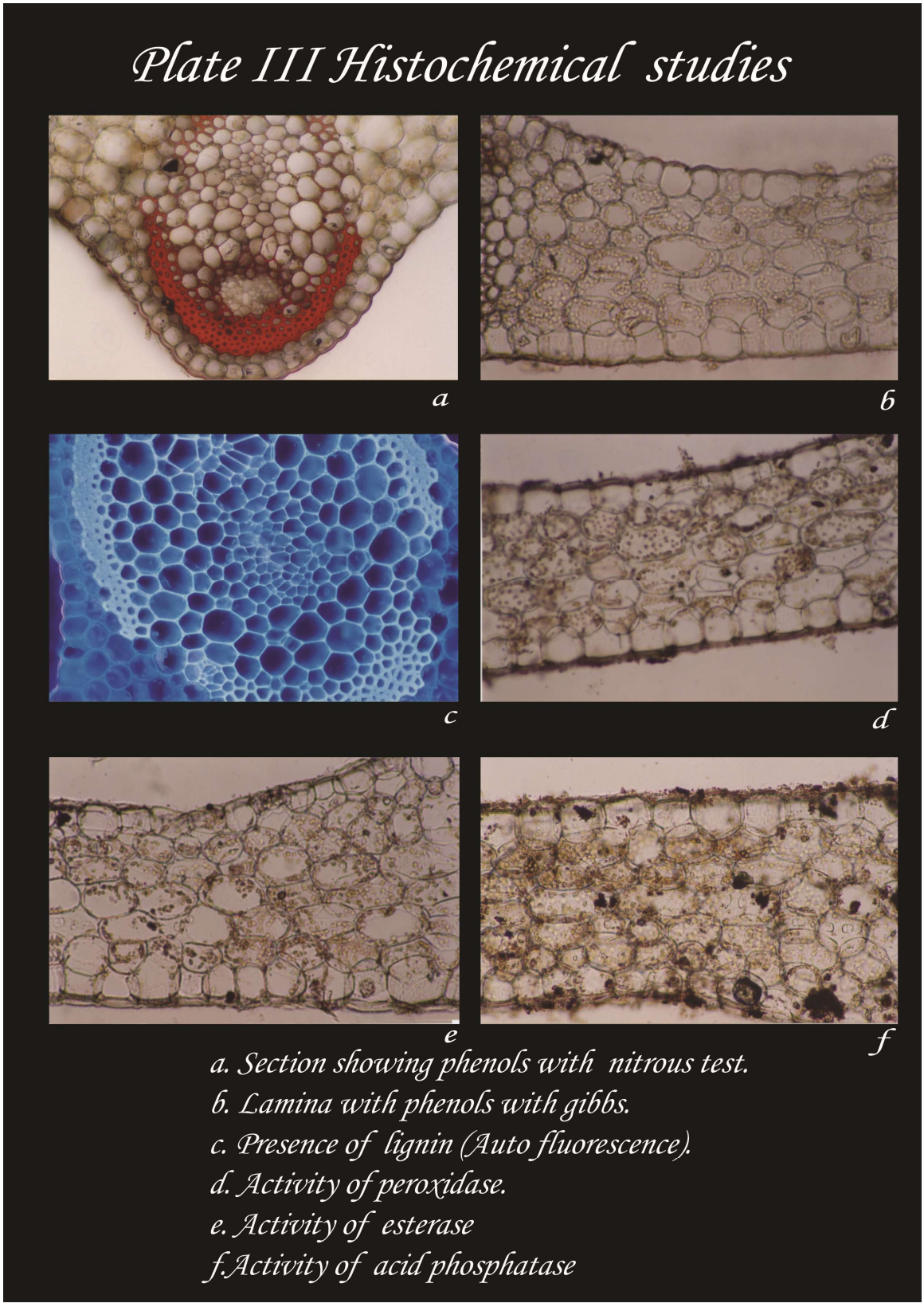

Earlier reports also clearly indicate that the antibacterial activity is due to different chemical constituents including thymol, flavonoids and phenolic compounds[6,7] and the

antimicrobial activity can be related to the presence of enzymes. The phenolic compounds isolated from the leaves of *Baseonema acuminatum* showed antifungal activity[8]. It is reported that the presence of biologically active compounds such as phenols, polyphenols which were known to possess antibacterial activity[9]. It is also proved that the presence of a number of phenolic compounds which would be responsible for antibacterial activity[10,11]

Results

Histochemical analysis showed the presence of pectic polysaccharides, cellulose and proteins in the epidermis. The cells of hypodermis are also rich in cellulose, pectic polysaccharides and proteins. In addition to these, the said cells have phenolic compounds. Mesophyll cells possess cellulose, non-esterified pectins and proteins. The presence of phenolics, lignin, acidic polysaccharides and some amount of proteins in vascular bundle is noticed. Walls of cuticle and hypodermis are predominantly stained with the activity of peroxidase, esterase and acid phosphatase.

The orchid possesses the bioactive compounds in its leaves, which are more sustainable resource. It could be used without any detrimental effect to the plant. Harvesting of leaves for medicinal purposes is more sustainable compared to harvesting of plant parts such as roots and stems which if over harvested could cause danger to the survival of the plant.

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MOSQUITO LARVICIDAL ACTIVITY, PHYTOCHEMICAL POTENTIAL OF *PLUMBAGO ZEYLANICA*, L. PLANT EXTRACTS AGAINST DENGUE MOSQUITO *AEDES ALBOPICTUS*

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Abstract

Mosquito is the arthropod vector of various diseases. Several types of mosquito are carriers of diseases, some of which are deadly. *Plumbago zeylanica* is the medicinal herb commonly called lead wort belongs to the family Plumbaginaceae shows phytochemical and larvicidal activity against dengue causing mosquito.They transmit pathogens which continue to make many deadly diseases. Interrupting mosquito larval stage is ideal to control spreading of various diseases. Aqueous, ethanol, ether and acetone extracts were subjected to qualitative test. Ethanol extract is identified as an ideal extract, based on the result wide range of phytochemicals have been isolated through ethanolic extract especially carbohydrates, hexose sugar, protein, steroids, glycosides, alkaloids tannins, terpenoids and saponins. Quantitative test was carried out with one gram ofthe plant residue dissolved in 100ml of solvent and considered as 1% stock solution (10000ppm). From this stock solution, different concentrations were prepared ranging from 50, 100, 150, 200 and 250 ppm, respectively. 250ppm of ethanolic extract shows 89% high mortality rate against *Aedes albopictus.*

Keywords: larvicidal, Plumbago zeylanica, Aedes albopictus, phytochemicals, instar larvae

Introduction

Mosquito is the most undeniable medicinal significant arthropod vector of diseases. Several types of mosquito are carriers of diseases, some of which are deadly. Many diseases caused by mosquito pose major health issues all over the world. It affects the socio economical status of the nations and it is an important pest against human causing allergy too, which includes a local skin reaction reported by Govindarajan *et al*.,[1] . Maheshwaran *et al*.,[2] also reported that they transmit parasites and pathogens which continue to have disadvantageous impact on human beings.

In India, only *Aedes aegypti* and *Aedes albopictus* transmit dengue chikungunya and Zika viruses. The diseases like filariasis, dengue, yellow fever, malaria, Japanese encephalitis and chikungunya are some of the deadly diseases spread by mosquitoes. Mosquitoes are also the main cause of nuisance due to their bites.

Mosquito is frequently found in poor sanitation and poor drainage system especially during rainy seasons, fish pond, and irrigation ditches and rice fields. This provides a better breeding place

for mosquitoes stated by Komalamisra *et al*.,[3]. Even though chemical vector program has been carried on for long time, these mosquito vectors remain because of repeated use of synthetic products, house hold spray, and insecticides for mosquito control. As a result, the mosquito develops their resistance and it may cause eye irritation, lung disease. Mosquito repellent cream may cause some skin irritation or allergic reaction. So there is provocative interest in research for larvicidal compound from natural sources.

Plumbago zeylanica is a perennial shrub which grows up to 2.0 m height, belongs to the family Plumbaginaceae. The family consists mostly of shrubs found in scarcely distributed grassland steppes of arid and coastal regions. The family consists of 10 genera and 280 species. They are slow growing, highly branched evergreen shrubs as reported by Kokwaro[4]. It is commonly called as lead wort and the vernacular name is Chitramoolam. It is a multipurpose medicinal herb. It can grow widely during rainy season and terminate its growth when it completes its post-flowering stage. *Plumbago zeylanica* grows in different parts of India as wild species but it is also cultivated due to its wide therapeutic applications.

Materials and Methods

Plumbago zeylanica (Figure 1) plant materials were collected from the campus and herbal garden of Seethalakshmi Ramaswami College, Tiruchirappalli. Collected material was compared with Rapinat herbarium, St . Joseph College, Tiruchirappalli.

Figure 1. ***Plumbago zeylanica***

Many of defensive components are biodegradable with no residual effect on the biological environment; hence, an attempt has been made in present investigation to identify the potential of the plant to control vector mosquitoes.

Preparation of Plant extracts

The dried leaves (100 g) were shade dried and powdered mechanically using commercial electrical stainless steel blender and extracted with distilled water (200 ml), ethanol (200 ml), ether (200 ml), and acetone (200 ml) in a Soxhlet apparatus separately until exhaustion.The extracts were filtered through a Buchner funnel with Whatmann No. 1 filter paper and they were concentrated in a

rotary vacuum evaporator and residues obtained were stored at 4ºC as stated by Vogel[5]. Aqueous, ethanol, ether and acetone extracts were subjected to qualitative and ideal extract was tested for the quantitative test. One gram ofthe plant residue was dissolved in 100ml of solvent and considered as 1% stock solution. From this stock solution, different concentrations were prepared ranging from 50, 100, 150, 200 and 250 ppm, respectively

Maintenance of pupae and adults

Collection of eggs and maintenance of larvae

The eggs of *Aedes albopictus* were collected from Entomology Department, Joint Director of Health Services, TVS Tollgate, Tiruchirappalli, Tamil Nadu,India, using an ‘‘0’’-type brush. These eggs were brought to the laboratory and transferred to 18 x 13 x 4-cm enamel trays containing 500ml of water for hatching. The mosquito larvae were fed with pedigree dog biscuits and yeast at 3:1 ratio reported by Subramanian *et al*.,[6]. The feeding was continued until the larvae transformed into the pupal stage.

Figure 2. ***Aedes albopictus***

Maintenance of pupae and adults

The pupae were collected from the culture trays and transferredto plastic containers (12 x 12 cm) containing 500-ml of water with the help of a dipper. The plastic jars were kept in a 90 x 90 x 90cm mosquito cage for adult emergence. Mosquito larvae were maintained at 27 ± 2°C, 75–85% relative humidity, under a photoperiod of 14:10 (light/dark). 10% sugar solution was provided for a period of 3 days before testing.

Qualitative Phytochemical Screening

Harborne[7] and Raaman[8] confirmed that the different qualitative chemical tests can be performed for established profile of given extract for its chemical composition. The following tests may be performed on extracts to detect various phytoconstituents present in them

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Reagents/Solutions		Composition
1.	Dragendroff's reagent	**Stock solution:** 5.2 gm Bismuth carbonate+4gm sodium iodide+50ml glacial acetic acid, boiled for few min, after12 hrs. precipitated sodium acetate crystals are filtered by sintered glass funnel; 40ml filtrate + 160 ml ethyl acetate +1ml distilled water, (stored in amber-coloured glass bottle). **Working solution:** 10 ml stock solution +20ml acetic acid +distilled water to make final volume100ml.
2.	Hager's reagent	Saturated aqueous solution of picric acid
3.	Mayer's reagent	**Solution A:** 1.358gm mercuric chloride+60ml distilled water **Solution B:** 5gm potassium iodide+10ml distilled water **Working solution:** solution A + solution B + distilled water to make final volume 100ml
4.	Wagner's reagent	1.27gm iodine + 2gm potassium iodide +distilled water to make final volume100 ml
5.	Barfoed's reagent	30.5gm copper acetate+1.8ml glacial acetic acid
6.	Seliwanoff's reagent	0.05 resorcinol+100ml dilute HCl
7.	Benedict's reagent	**Solution A :**173 gm sodium citrate + 100 gm sodium carbonate + 800 ml water, dissolve & boil to make solution clear **SolutionB:**17.3gm of copper sulphate dissolved in 100ml distilled water **Working solution:** Mix solution A and solution B
8.	Fehling's solutions	**Solution A:** 34.66gm copper sulphate + distilled water to make final volume 100mL. **Solution B:** 173 gm potassium sodium tartarate+ 50 gm NaOH+ distilled water to make 100mL.
9.	Baljet's reagent	95 ml 1% picric acid+5ml 10% NaOH
10.	Millon's reagent	1gm mercury + 9ml fuming nitric acid + equal amount of distilled water (after completion of reaction)

Qualitative Tests for Phytochemical Screening

Sl.No.	Name of the test	Experimental Procedure	Observation
1.	**Test for Carbohydrates:** Molisch's test	To 2-3ml of extract, add two drops of alpha naphthol solution in alcohol shake and add concentrated H2SO4 from sides of test tube.	Violet coloration occurs.
2.	**Test for Reducing Sugar:** Fehling's test	Mix 1ml of Fehling's A and 1ml Fehling's B solutions, boil for one minute. Add	Brick red colored precipitate is obtained.

		equal volume of test solution. Heat in boiling water bath for 5-10 min.	
3.	**Test for Monosaccharide:** Barfoed's test	To 1ml filtrate add 1ml of Barfoed's reagent. Heat for 2 min.	Red precipitate
4.	**Test for Hexose Sugars:** a)Selwinoff's test	Heat 3ml. of Selwinoff's reagent and add 1ml. of test solution in water bath for1-2 min.	Red color solution is obtained.
	b)Cobalt chloride test	Mix 3ml of test solution with 2ml of cobalt chloride. Boil and cool. Add few drops of NaOH solution.	Solution is greenish blue (glucose) in color.
5.	**Test for Non-Reducing Polysaccharides(Starch):** Iodine test	Mix 3ml of test solution and add few drops of dilute iodine solution.	Blue color solution is obtained. It disappears on boiling and reappears on cooling.
6.	**Test for Proteins:** a) Biruet test	To 3 ml of test solution add 4% NaOH and few drops of 1% $CuSO_4$ solution.	Pink color is obtained.
	b) Millon's test	Mix 3ml. of test solution with 5ml of Millon's reagent.	White precipitate, warm precipitate turns brick red or the precipitate dissolves and gives red colored solution.
7.	**Test for Amino Acids:** Test for tyrosine	Heat 3ml of test solution and add 3 drops of Millon's reagent.	Red color solution is obtained.
8.	**Test for Steroids:** a) Salkowski test	To 2 ml of extract add 2ml of chloroform and 2ml of concentrated H_2SO_4. Shake well.	Chloroform layer appears red and acid layer shows greenish yellow flourescence.
	Liebermann- Burchard test	Mix 2ml of extract with chloroform and add 1-2ml of acetic anhydride and 2 drops of concentrated H_2SO_4 along the sides of test tube.	First appears red then blue, finally green color appears due to steroids.
9.	**Test for Glycosides:** a) General test:	To 10ml of 50% HCl, 2ml of test solution and 1 ml nitroprusside is added	Pink to red precipitate is obtained

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	b) General test	To test solution add 1ml of water and NaOH.	Yellow coloration occurs.
10.	**Test for Cardiac Glycosides:** Legal's test (test for cardenolides)	To aqueous or alcoholic extract, add 1ml of pyridine and 1ml. of sodium nitroprusside.	Pink to red color change occurs.
	b) Keller killiani's test	To extract, add 1ml of glacial acetic acid containing one drop of ferric chloride solution. Add 1ml of concentrated H_2SO_4.	Formation of brown ring at the interface indicates the presence of cardiac glycosides.
11.	**Test for Anthraquinone Glycosides:** a) Borntrager's test	To 3 ml of extract add dilute H_2SO_4. Boil and filter. To cold filtrate add equal volume of benzene or chloroform. Shake well. Separate organic layer. Add equal volume of dilute ammonia.	Ammonia layer turns pink or red.
	b) Modified Borntrager's test	To 5 ml of 5% $FeCl_3$ add 5mlof dilute HCl. Heat for 1 min in boiling water bath. Cool and add benzene or any organic solvent. Shake well. Separate organic layer. Add dilute ammonia.	Ammonia layer shows pinkish red color.
12.	**Test for Alkaloids:** a) Dragendroff's test	To 2-3 ml of test solution add few drops of Dragendroff's reagent.	Orange brown precipitate.
	b)Wagner'stest	To 2-3 ml of test solution add few drops of Wagner's reagent.	Reddish brown precipitate.
	c)Mayer'stest	To 2-3 ml of test solution add few drops of Mayer's reagent.	White or pale precipitate.
13.	**Test for Tannins:** a)Lead acetate test	To 3-5 ml test solution add few drops of 1% lead acetate.	Red precipitate is obtained.
	b)Ferric chloride test	To 2-3 ml of test solution add 2ml of $FeCl_3$.	Blue precipitate is obtained.
14.	**Test for Phenolic Compounds:** Ferric chloride test	To 1-2 ml test solution add 2ml of water and10% of aqueous ferric chloride	Green color solution is obtained.

		solution.	
15.	**Test for Flavonoids:** a) Shinoda test	To test solution, add 5ml of alcohol. Few drops of concentrated HCl and magnesium turnings.	Pink coloration occurs.
	b)	To 1ml of extract, add 2.5ml of ammonia solution and then add Concentrated H_2SO_4	Appearance of yellow colour
16.	**Test for Terpenoids:** a)	To test solution add 2mlof chloroform and 1mlof concentrated H_2SO_4.	Reddish brown coloration occurs.
	b)	To test solution add 1ml of 2,4-Dinitrophenyl hydrazine in 2M HCl.	Yellow orange coloration occurs.
17.	**Test for Saponins:** Foam test	To test solution add drops of sodium bicarbonate. Shake well.	Honey comb like froth is obtained.

Quantitative analysis Determination of total phenols

The fat free sample was boiled with 50 ml of ether for the extraction of the phenolic component for 15 min. 5 ml of the extract was pipetted into a 50 ml flask, then 10 ml of distilled water was added. 2 ml of ammonium hydroxide solution and 5 ml of concentrated amyl alcohol were also added. The samples were transferred to the watch glass and left to react for 30 min. for colour development. Then the dried residue is weighed for quantitative determination of phenol.

Alkaloid determination: Harborne (1973) method[7]

0.5 g of the sample was weighed into a 100 ml beaker and 3 ml of 10% acetic acid in methanol was added and covered and allowed to stand for 4 hours. This was filtered and the extract was concentrated by keeping it in water bath to reduce it to one-quarter of the original volume. Concentrated ammonium hydroxide was added dropwise to the extract until the precipitation was complete. The whole solution was allowed to settle and the precipitated was collected and washed with dilute ammonium hydroxide and then filtered. The residue is the alkaloid, which was dried and weighed.

Tannin determination: Van-Burden and Robinson (1981) method[9]

0.5g of the sample was weighed into a 50 ml plastic bottle. 50 ml of distilled water was added and shaken for 1 hour in a mechanical shaker. This was filtered into a 50 ml volumetric flask and made up to the mark. Then 5 ml of the filtered was pipetted out into a test tube and mixed with 2 ml

of 0.1 M in 0.I N HCl and 0.008 M potassium ferrocyanide. The solution is transferred to the watch glass which was allowed to dry and then weighed.

Determination of Saponins

0.5g of the methanol extract of the plant sample is treated with 1ml of ethanol and 2ml of diethyl ether and then filtered. The filtrate is treated with n-butanol and sodium chloride and transferred the content to watch glass which was allowed to dry and the weighed for the determination of Saponin.

Determination of Flavonoid

0.5g of the methanol extract of the plant sample is treated with 3ml of methanol, filtered, then transferred the content to watch glass, dried and then weighed for the determination of flavonoid quantitatively.

Determination of Terpenoid

0.5g of the sample was soaked in 3ml of 70% methanol for 24 hrs. Then it was extracted repeatedly with few drops of petroleum ether at room temperature. The whole solution was filtered through Whatmann filter paper No 42 (125 mm). The filtrate was later transferred into a watch glass, dried, and weighed for the quantitative determination of terpenoids.

Larval toxicity test

A laboratory reared colony of *A. albopictus* larvae was used for the larvicidal activity. One gram of the plant residue was dissolved in 100ml of solvent and considered as 1% stock solution which is 10000 ppm. From this stock solution, different concentrations were prepared ranging from 50 (0.5ml), 100 (1.0ml), 150 (1.5ml), 200 (2.0 and 250 ppm, respectively. Twenty-five individuals of third instar larvae were kept in an enamel tray containing 249.5 ml of tap water and 0.5 mlof desired concentration of *P. zeylanica* leaf extracts were added. Larval food was given for the test larvae. Likewise, 1 ml, 1.5 ml, 2.0 ml and 2.5 ml concentration were made. Twenty-five larvae were used (25 insects per 250 ml) for each experiment in three replicates. At each tested concentration, two to five trials were made and each trial consists of 25 replicates. The control mortalities were corrected by using Abbott's formula[10]. The larvae were considered dead if they were immobile, unable to reach the water surface and lacked head to tail flexion in response to tapping the beaker with the end of a pencil as reported by Ali *et al*[11]. The larvae were scored for percent mortality after 24h.

$$\text{Corrected mortality} = \frac{\text{Observed mortality in control} - \text{Observed mortality in control}}{100 - \text{Control mortality}} \times 100$$

$$\text{Percentage mortality} = \frac{\text{Number of dead larvae}}{\text{Number of larvae introduced}} \times 100$$

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Results and discussion

Qualitative phytochemical screening of leaf extracts of *Plumbago zeylanica*

The phytochemical characteristic of leaf extracts were tested and summarized in the Table 1. The results revealed the presence of medically active compounds studied in the aqueous, ether, ethanol and acetone extracts respectively. From the table, it shows that, proteins, carbohydrates, steroids and tannins were present in aqueous extract.

Presence of hexose sugar, glycosides, alkaloids, tannin and saponins were identified in ether extract. Carbohydrates, hexose sugar, protein, steroids, glycosides, alkaloids, tannins, terpenoids and saponins were identified only from the ethanol extract of *Plumbago zeylanica*. Carbohydrates, protein, steroids, alkaloids, tannins and saponins steroids were identified in acetone extract.

Table 1: Qualitative phytochemical screening of leaf extract of *Plumbago zeylanica*

S.NO	EXPERIMENT	AQUEOUS	ETHER	ETHANOL	ACETONE
1.	Carbohydrate	+	-	+	+
2.	Reducing sugar	-	-	-	-
3.	Monosaccharide	-	-	-	-
4.	Hexose sugar	-	+	+	-
5.	Proteins	+	-	+	+
6.	Steroids	-	-	+	+
7.	Glycosides	-	+	+	-
8.	Saponin glycosides	-	-	-	-
9.	Alkaloids	-	+	+	+
10.	Tannins	+	+	+	+
11.	Phenolic compounds	-	-	-	-
12.	Terpenoids	-	-	+	-
13.	Saponins	-	+	+	-
14.	Steroids	+	-	-	-

Quantitative phytochemical screening of leaf ethanol extract of *Plumbago zeylanica*

Phytochemical screening of ethanol extract of *Plumbago zeylanica*was done through quantitative analysis (Table 2).

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Table 2: Quantitative Phytochemical Screening of leaf extract of *Plumbago zeylanica*

S. No	Name of the phytochemical constituent	Quantity of Phytochemicals in the leaves(mg/g)
1.	Flavonoids	0.154
2.	Tannin	0.015
3.	Saponin	0.019
4.	Alkaloid	0.121
5.	Phenol	0.159
6.	Terpenoids	0.010

Larvicidal activity

The younger larval stages were susceptible than the latter ones. Recent studies on the larval and pupal mortality of *Aedes albopictus* after the treatment of ethanol extract of *Plumbago zeylanica* leaf extract showed 89% mortality (22.33± 2.08) at third instar larvae as a result of treatment at 250 ppm (Table. 3). As control has no significant effect on mortality, it is negligible.

Table 3: Larvicidal activity of leaf extracts of *Plumbago zeylanica*

Larval toxicity test on aqueous extract							
concentration in ppm	**test 1**	**test 2**	**test 3**	**total**	**% of mortality**	**Mean**	**standard deviation**
50	10	15	17	42	56	14	3.61
100	15	16	20	51	68	17	2.65
150	15	18	20	53	81	17.67	2.52
200	18	21	23	62	82	20.67	2.52
250	17	23	24	64	85	21.33	3.79
Larval toxicity test on Ethanol extract							
50	15	17	18	50	66	16.66	1.53
100	16	19	21	56	74	18.66	2.52
150	17	19	22	58	77	19.33	2.52
200	18	22	24	64	85	21.33	3.06
250	20	23	24	67	**89**	**22.33**	2.08

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Larval toxicity test on Ether extract							
concentration in ppm	**test 1**	**test 2**	**test 3**	**total**	**% of mortality**	**Mean**	**standard deviation**
50	12	13	15	40	53	13.33	1.53
100	14	16	16	46	61	15.33	1.15
150	14	16	17	47	62	15.66	1.53
200	15	16	18	49	65	16.33	1.53
250	14	16	16	46	61	15.33	1.15
Larval toxicity test on acetone extract							
50	10	15	16	41	54	13.33	3.21
100	12	13	17	42	56	14	2.65
150	15	16	17	48	64	16	1
200	14	15	16	45	60	15	1
250	15	14	16	45	64	15	1

The different parts of the *P. zeylanica* plant have been studied for various medicinal properties as reported by Chopra *et al*[12].The napthoquinone, plumbagin was isolated from the plant reported having chitin synthetase inhibiting activity was said by Kubo *et al.*,[13] .

Zarrong *et al*.,[14] and Wiseman and Chapagain[15] suggested that the chemical constituents present in the leaf extract may arrest the metabolic activities of the larvae. The larvicidal activity against *P. zeylanica* leaf extract like *Balanites aegyptiaca* had been reported against mosquito larvae

Present study reflects the larvicidal potency of crude leaf extracts obtained from *P. zeylanica* against *Aedes albopictus*, third instar larvae which is the basic and most important step in the development of an insecticide of botanical source. There are probabilities that the active principle contained in these plant extracts, especially the ethanol extracted fractions will be further more potent as mosquito larvicidal activity as compared with their crude forms. The identification and isolation of these active components is a part of further research for an efficient, ecofriendy, biodegradable insecticide of plant origin and is under consideration in the laboratory

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ISOTHERM, KINETIC AND THERMODYNAMIC STUDIES ON ADSORPTION OF MALACHITE GREEN DYE FROM AQUEOUS SOLUTION ONTO ZnO NANOPARTICLES

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Abstract

Textile industries discharge a large quality of highly coloured waste water (effluents) which are released into nearby land or river without any treatment. These dyes in the flowing water retards photosynthesis, inhibits the growth of marine life by blocking out sunlight and dissolved oxygen. Some dyes may cause allergic dermatitis, skin irritation, cancer and mutation in human. The presence of dye materials greatly influence the quality of water and the removal of this kind of pollutant is of prime importance. Adsorption treatment is one of the efficient treatment methods due to its high efficiency, low cost, easy removal of dye from textile industry and recovery of adsorbent. The nanostructured adsorbents mainly due to the exceptionally higher surface area show much higher efficiencies and faster adsorption rates in water treatment than the conventional materials. In the present study zinc oxide nanoparticles is synthesized and used as an adsorbent for the removal of Malachite Green dye from aqueous solution. The adsorbent has been analyzed by FT-IR and SEM studies. The adsorption study has been carried out by varying contact time, initial dye concentration, dosage of adsorbent and temperature. The experimental data were subjected to Freundlich, Langmuir and Temkin isotherm models. The kinetic data were found to fit better with pseudo second order model. The thermodynamic parameters showed that the adsorption was feasible process. Thus zinc oxide nanoparticle is an effective adsorbent for removal of Malachite Green dye from aqueous solution.

Keywords: Adsorption, dye removal, adsorption kinetics, thermodynamics and zinc oxide.

1. Introduction

Dyes are widely used in number of industrial processes such as textile, leather, paper, plastic, printing etc., [1]. During dyeing process, a substantial amount of coloured wastewater is generated which leads to danger to human and aquatic life[2].Hence proper treatment of the effluents is necessary before it is being discharged into water bodies. Numerous remediation techniques such as flocculation, coagulation, reverse osmosis, ion-exchange, precipitation, membrane filtration, chlorination, neutralization, sedimentation have

been employed for the removal of contaminants from water[3].These traditional techniques are limited by their high operating costs, low effectiveness, and complicated design. Adsorption is found to be simplest, effective and economical method for removing dyes from waste water [4]. Many adsorbents used in adsorption treatments including bio-sorbents, zeolites, nanoperfluoro octyl alumina, multiwalled carbon nanotubes, and cellulose-based wastes have been reported to decolorize wastewater. Metal oxide nanoparticles have been receiving considerable attention because of their small size and large surface area.[5]. In the present study zinc oxide nanoparticles is used as an adsorbent for removal of Malachite Green dye from aqueous solution.

2. Experimental Methods

2.1. Materials

Malachite green used in the adsorption studies was obtained from LOBA CHEMIE PVT.LTD, .MUMBAI.Zinc nitrate hexahydrate, anhydrous Sodium hydroxide are obtained from MERCK LIFE SCIENCE PVT.LTD,.MUMBAI .

2.2. Preparation of Stock Dye Solution

Stock solution of Malachite Green was prepared by dissolving 0.05g of it in distilled water and making up to 100ml in a standard flask.

2.3. Standardisation of Dye Solution

Solution of Malachite Green was standardized by measuring the optical densities of various concentrations of the dye solution at 615nm using MAPADA spectrophotometer.

2.4. Preparation of Zinc Oxide Nanoparticles

50 ml of 1.0M NaOH was taken in a 250ml pyrex bottle and heated under constant magnetic stirring to the temperature of 70°C.After achieving this temperature, 0.5 M Zinc nitrate hexa hydrate solution was added slowly into the pyrex bottle containing aqueous NaOH solution under constant stirring. The suspension formed with the addition of zinc nitrate solution to the alkaline aqueous solution was stirred for 2 hours and the reaction temperature was maintained at 70°C.The material formed was filtered and washed several times with deionized water. The washed sample was dried at 65°C .The white solid obtained was ground using a mortar and the fine powder of ZnO was used as an adsorbent for adsorption experiments.

2.5. Adsorption Studies

The batch experiments were carried out in 250ml beaker with 100ml of the dye solution containing 0.05g of zinc oxide nanoparticles, shaken in an orbital shaker under UV light at

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250rpmto investigate the effects of contact time, initial dye concentration, dosage of adsorbent and temperature on the adsorption process. The percentage of adsorption of dye is calculated using Eq.1 respectively [6,7]

$$\% \text{ Decolourisation} = \left(\frac{C_0 - C_e}{C_0}\right) \times 100 \qquad \text{.....(1)}$$

C_0 and C_e are initial and equilibrium concentration of dyes (mg/L) respectively.

3. Results and Discussion

3.1. Characterisation

3.1.1. FT-IR Studies

FT-IR analysis [8] permits spectrophotometric observation of the adsorbent surface in the range 400-4000cm^{-1} and predicts as a direct means for the identification of the organic functional groups on the surface. The peaks that are observed at 1634cm^{-1} and 438 cm^{-1} correspond to ZnO stretching and deformation vibration respectively (Figure 1)

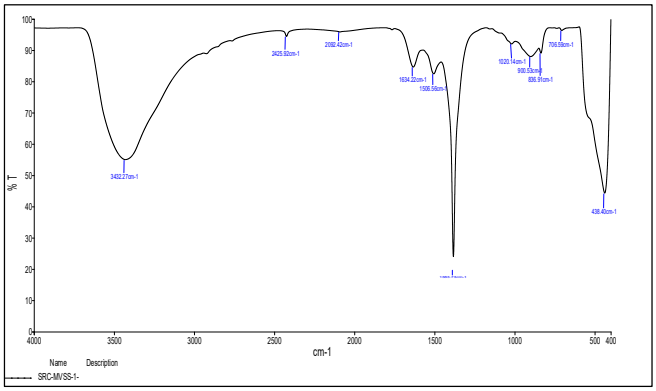

Figure 1. FT-IR spectrum of ZnO nanoparticles

3.1.2. Sem Analysis

A scanning electron microscope [9, 10] (SEM) images are widely used to study the morphological features and surface characteristics of the adsorbent material. It also reveals the surface texture and porosity of adsorbent. It also plays an important role in determining the surface availability for the adsorption of dye on adsorbents. Typical SEM study reveals a non-uniform surface morphology with approximate particle size of 48.24 nm (Figure 2)

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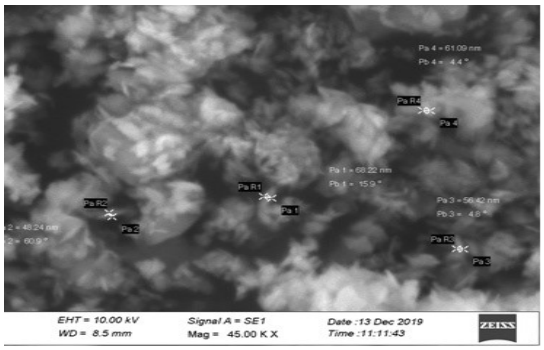

Figure 2. SEM image of ZnO nanoparticles

3.2. Variation of Contact time

The variation of contact time was performed with an initial dye concentration of 20mg/L using zinc oxide nanoparticle dose at 0.5g/L(Figure 3).The percentage sorption exhibits an increasing trend as the contact time increases and reaches equilibrium at about 80 minutes .As all the adsorption sites were occupied, further adsorption was not possible.

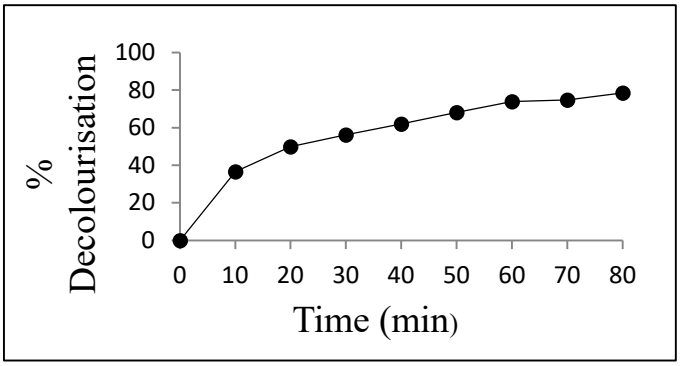

Figure 3.Variation of contact time

3.3. Variation of Initial Dye concentration

Zinc oxide nanoparticle was agitated in dye solutions of (100ml) each with initial concentrations of 15.0, 17.5, 20.0, 22.5, and 25.0 mg/L for 80 minutes at 33ºC. (Figure 4)

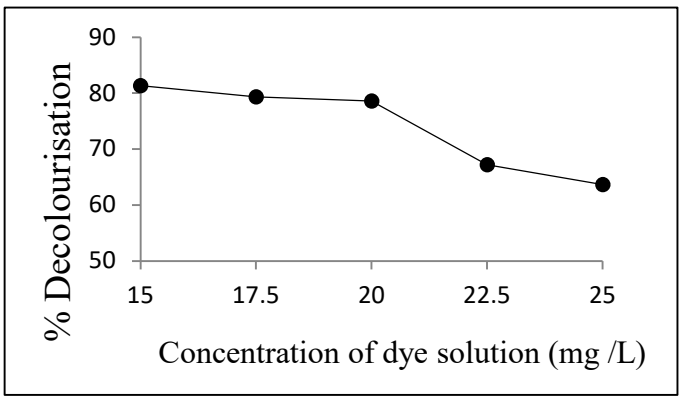

Figure 4. Variation of Initial Dye concentration

It is evident from the figure that the percentage decolourisation has been found to decrease with increasing initial dye concentration. It is attributed to the formation of mono layer of dyes on the surface of ZnO nanoparticles which hinders the formation of further layer of dyes.

3.4. Variation of dosage of adsorbent

Dye solution (100ml, 20 mg/L) were agitated with variable amounts of ZnO nanoparticles (0.3, 0.4, 0.5, 0.6, 0.7 g/L) for 80 minutes at temperature of 33^0C. (Figure 5)

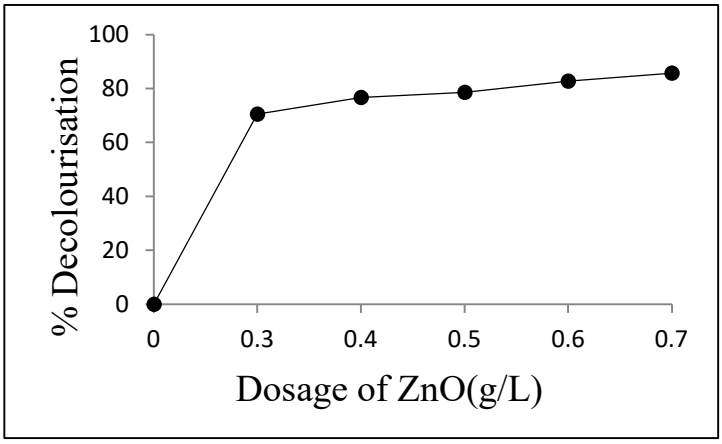

Figure 5. Variation of dosage of adsorbent

It is observed that the increase in dye adsorption increases with increase in zinc oxide nanoparticles dosage. It is due to the availability of more adsorption site as there is an increase in surface area of the adsorbent.

3.5. Variation of temperature

Dye solution (100ml, 20 mg/L) were agitated each with 0.05 g of ZnO nanoparticles at various temperatures (33, 37 & 40ºC). (Figure 6)

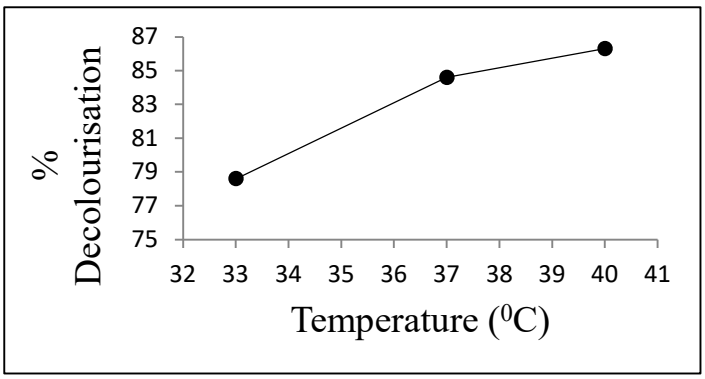

Figure 6. Variation of temperature

It is known that the percentage of decolourisation increases with increase in temperature. This observation is in accordance with Le-Chatlier's principle that adsorption process is endothermic one.

3.6. Adsorption Isotherm Studies

Adsorption isotherm is usually the ratio between the quantity adsorbed and remaining in solution at fixed temperature.

3.6.1. Freundlich Isotherm

The Freundlich equation is widely used in the environmental engineering practice to model adsorption of pollutants from an aqueous medium empirically[11]. The linear form of Freundlich equation is given by the following expression.

$$\ln q_e = \ln K_f + 1/n \ln C_e \quad \text{.....(2)}$$

q_e is the amount of the dye adsorbed per unit mass of adsorbent (mg/g) at equilibrium. K_f and n are Freundlich constants. Linear plot of $\ln q_e$ against $\ln C_e$ (Figure 7) shows that the adsorption follows Freundlich isotherm.

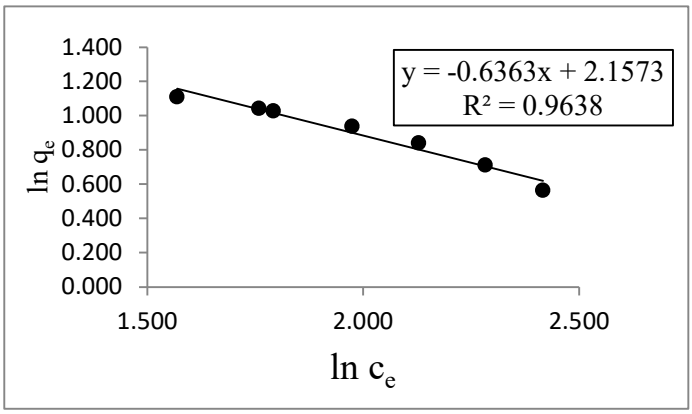

Figure 7. Freundlich Isotherm

3.6.2. Langmuir Isotherm

Langmuir isotherm[12,13,14] is used to estimate the maximum adsorption capacity corresponding to complete monolayer coverage on the adsorbent surface .This equation can be linearized as

$$C_e/q_e = (1+b\,C_e)/Q_0 b \quad \text{(or)}$$

$$C_e/q_e = (1/Q_0 b)+(C_e/Q_0) \quad \text{.....(3)}$$

Where Q_0 & b are Langmuir constants related to adsorption capacity and adsorption energy constant respectively.

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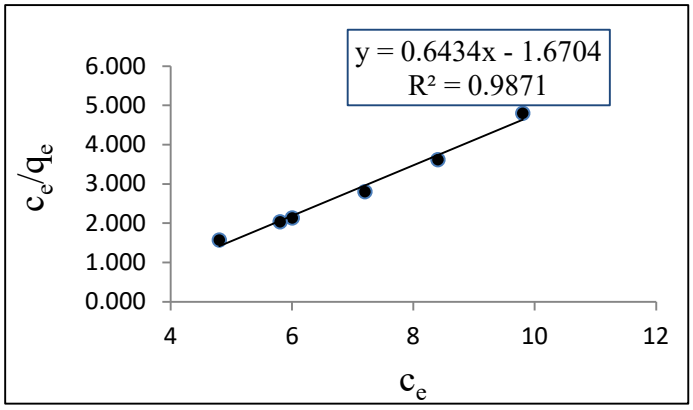

Figure 8. Langmuir Isotherm

The plot of C_e/q_e against C_e (Figure.8) was found to be linear. Langmuir isotherm can be expressed by a separation factor called equilibrium parameter, R_L which is expressed as

$$R_L=1/(1+bC_i)$$

Where b is Langmuir constant and C_i is the initial dye concentration.

In the present study, R_L value obtained is 0.1149 ($0<R_L<1$).This indicates that the adsorption of Malachite Green dye using ZnO nano particles is a favourable process.

3.6.3. Temkin Isotherm

The Temkin isotherm equation assumes that the heat of adsorption of all the molecules in layer decreases linearly with coverage due to adsorbent-adsorbate interactions and that the adsorption is characterized by a uniform distribution of the bonding energies up to some maximum binding energy. This equation can be expressed in its linear form as

$$qe=B_T\ln K_T+B_T\ln Ce \qquad \textbf{.....(4)}$$

Where K_T =Temkin isotherm equilibrium binding constant (L/g)

B_T = Temkin constant related to the heat adsorption (KJ/mol)

R = Universal gas constant (8.314 J/mol/k)

T = Temperature (307K)

The plot of q_e against $\ln C_e$ (Figure 9) was linear which shows the experimental data was fitted to Temkin isotherm.

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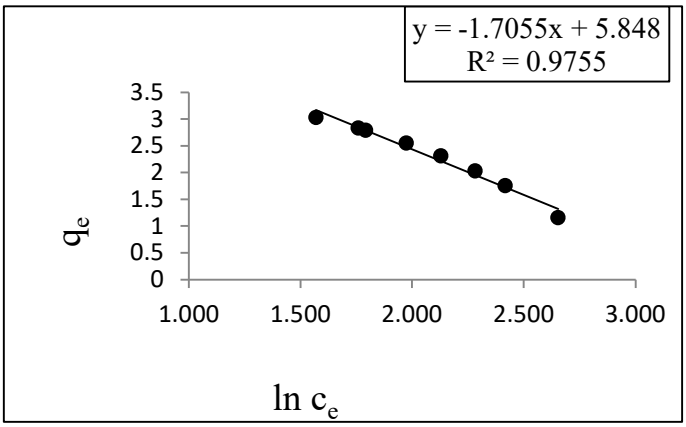

Figure 9.Temkin Isotherm

3.7. Adsorption Kinetics

The kinetics of decolourisation of Malachite Green dye solution over ZnO nanoparticles has been studied using mostly pseudo-first order and pseudo-second order models.

3.7.1. Pseudo -First Order Model

Pseudo-first order kinetic model [15] can be expressed as

$$\log(q_e - q_t) = \log qe - (K_L/2.303)t \quad \textbf{.....(5)}$$

It has been observed in many cases that the first order equation of Lagergren does not fit well for the whole range of contact time and is generally applicable over the initial stage of adsorption process.

3.7.2. Pseudo- Second Order Model

Pseudo- Second order reaction kinetics [16] is expressed as

$$t/q_t = 1/k_2 q_e^2 + t/q_e \quad \textbf{.....(6)}$$

Where k_2 is the rate constant of pseudo second order adsorption.

The plot of t/q_t against t (Figure 10) is linear and the correlation coefficient (R^2) also confirmed that the reaction kinetics follows pseudo second order rate equation.

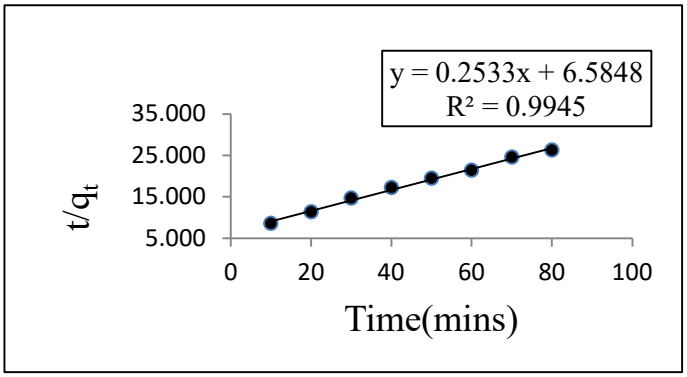

Figure 10. Pseudo second order kinetics

3.8. Adsorption Thermodynamics

The Gibbs free energy change of the adsorption process [17] is related to the

equilibrium constant by Van't Hoff equation,.

$$\Delta G° = -RT \ln K_C \quad \textbf{…..(7)}$$

Where T-Absolute temperature in K,R- Universal gas constant and K_C-Equilibrium constant

The entropy,$\Delta S°$ and enthalpy,$\Delta H°$ parameters were determined by the following equation.

$$\Delta G° = \Delta H° - T\Delta S° \quad \textbf{…..(8)}$$

The plot of $\Delta G°$ against T (K) (Figure 11) was linear from which the values of$\Delta S°$and $\Delta H°$ were calculated. The negative value of $\Delta G°$ indicates that the adsorption process is spontaneous and feasible in nature. The positive value of entropy change$\Delta S°$ reflects the affinity of ZnO nano particles for Malachite Green dye and the positive value of $\Delta H°$ shows that adsorption process is endothermic in nature.

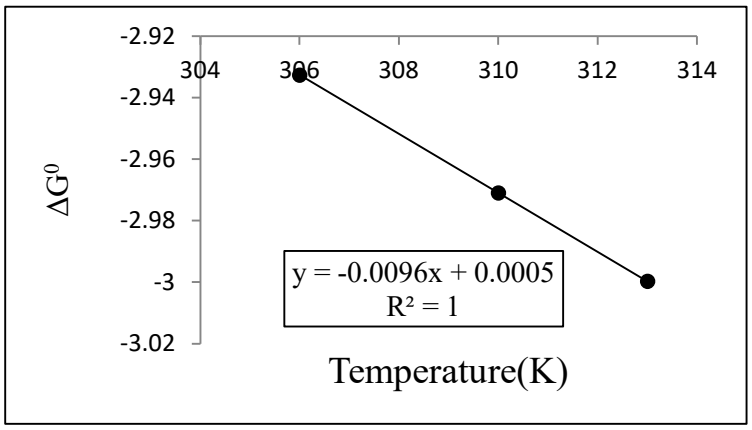

Figure 11. Variation of Temperature

4. Conclusion

In the present study, zinc oxide nanoparticles were synthesized and used for adsorption of Malachite Green dye from aqueous solution. The synthesized zinc oxide nanoparticles were characterized using FT-IR and SEM analysis. Adsorption efficiency was found to be 78.59% at equilibrium time of 80 minutes. The parameters affecting the adsorption such as contact time, initial dye concentration, dosage of adsorbent and temperature were optimized. The equilibrium data were better fitted with Freundlich, Langmuir and Temkin isotherm models. The adsorption process was found to follow pseudo second order kinetics. From thermodynamic study, the negative value of$\Delta G°$ and positive value of $\Delta S°$ and $\Delta H°$indicate that the adsorption process is spontaneous, feasible and endothermic in nature. Thus the zinc oxide nanoparticles could be used as an efficient adsorbent for the removal of Malachite Green dye from aqueous solution.

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COMPARISON OF EFFECTIVENESS OF ADSORPTION OF ANIONIC DYES BY PANI COMPOSITE

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Abstract

The textile industry is the largest consumer of dyestuff. A large amount of synthetic dyes does not bind well to the fabrics and due to this improper dyeing, it mixes with water resources. The discharge of highly toxic synthetic dyes to water causes water pollution. To protect the ecosystem industrial effluents should be removed from the wastewater by proper treatment before releasing into the environment.

Keywords: PANI -$CuCl_2$, PANI -$CoCl_2$ and anionic dyes.

1. Introduction

There has been plenty of fresh water on Earth, water has not forever been accessible when and where it is needed and nor is it available with required characteristics for different uses. The attainability and standard of water always have played an important part in determining not only where people can live. Adsorption is one of the most useful method to remove the harmful coloured materials from effluent of the textile industry.

2. Experimental methods

2.1. Instruments

2.1.1. Single-beam UV/Vis spectrophotometer

MAPADA-V-1100 D spectrophotometer in 1cm path length for dye solution using quartz cuvettes with a (volume of 4 ml) at room temperature was used to measure optical density (OD).

2.1.2. Orbital Shaking Incubator

RIS 24-BL orbital shaker (Remi Make) manufactured by Remi make was used for adsorption studies by batch process.

2.1.3. Magnetic Stirrer

REMI 1 MLH magnetic stirrer with hot plate and temperature adjuster was used for the preparation of polyaniline composite at room temperature.

2.1.4. Centrifugate Machine

R-8C laboratory centrifuge was used for centrifugation process.

2.2. Materials

2.2.1.Dyes

Reactive Blue 4, Reactive Blue 21, Reactive Black 8 and Reactive Yellow 84 dyes were

purchased from India mart. Pvt. Ltd.. Reactive Yellow 145, Reactive Yellow 186, Reactive Red 180, Reactive Blue 19 and Reactive Red 11 were bought from colourtex Ind Pvt. Ltd.. Naphthol Blue Black B was obtained from Glaxo India Ltd., Mumbai. Acid Blue 9, Eosin Yellowish, and Amaranth were obtained from Loba Chemie Pvt.Ltd., Mumbai. Reactive Blue 52 (RB 52) was received from Geigy Co. Ltd., and Reactive Orange 107 was procured from EMCO Dye Stuff Pvt. Ltd., Maharashtra. The above dyes were used without further purification.

2.2.2. Monomer

Aniline, (BDH, LR) was obtained from Merck Specialties (P) Ltd., Mumbai and purified by distillation (Boiling Point 184°C).

2.2.3. Oxidizing Agent

The oxidizing agent ammonium persulphate (AR, Loba Chemie) was used without further purification.

2.2.4. Dopant

Hydrochloric acid (BDH, AR) procured from Merck Specialties (P) Ltd., Mumbai, used as received.

2.2.5. Metal Salts

Cobalt (II) chloride hexahydrate ($CoCl_2.6H_2O$) was obtained from E. Merck (India) Ltd., Mumbai.

Copper (II) chloride dihydrate ($CuCl_2.2H_2O$) was obtained from E.Merck (India) Ltd., Mumbai, used as received.

2.2.6. Base

Sodium hydroxide (AR, Fischer) was used as such.

2.3. Methods

2.3.1. Cleaning of Glassware

The cleaning of the glassware was done by soaking the glassware in a detergent solution followed by keeping them in chromic acid for two days and then washed in water. This glassware was rinsed with double distilled water prior to use.

2.3.2. Distilled water

Distilled water used was obtained from an electrical all-glass still (tempaqua-15). This ultra-pure pyrogen-free distilled water was used to prepare reagents and dye solutions.

2.3.3. Preparation of PANI-ES

PANI–ES was prepared by chemical oxidation coupled with polymerization where ammonium persulphate was used as an oxidant. 10g of ammonium persulphate dissolved in 20ml distilled water was added into a solution of aniline (5ml) dissolved in 1.5M HCl (70ml).

The solution mixture was stirred at 400rpm for 5 hours at room temperature. A colour change from white through blue (after an induction period of approximately 90 min) to dark green was observed. After the polymerization leading to the green emeraldine salt form of PANI granules, the solution was filtered, washed, and dried[1].

2.3.4. Preparation of PANI-CoCl2 and PANI-CuCl2

The polymerization reaction was processed in a magnetic stirrer by stirring aniline and 1.5N HCl at 400RPM, and then the solution of Ammonium Persulphate was added dropwise followed by $CoCl_2$ solution at the required amount. The solution mixture was stirred for 6 hours. Precipitated $CoCl_2$ doped PANI composite was filtered washed, dried and stored[2,3]. The same procedure was adopted for the preparation of PANI-$CuCl_2$ composites by replacing $CoCl_2$ solution with required percentage of $CuCl_2$ solution[4-6] .

2.3.5. Preparation of Stock Dye Solution

A stock solution of each dye was prepared by dissolving 0.5g of it in distilled water and making it up to 500ml in a standard flask.

2.3.6. Calculation of λ_{max}

The cuvette is filled with dye solution up to the mark and placed in MAPADA V-1100D spectrophotometer. By changing the wavelength from 330nm – 1000nm, the Optical Density (OD) is measured for each wavelength for all the dyes. The wavelength of maximum OD is considered to be λmax for the dye solution.

2.3.7. Standardisation of Dye Solutions

All the dyes were standardized by measuring the optical densities of the various concentrations of the dye solution at respective λ_{max} by using MAPADA V-1100D spectrophotometer. Standardization plot was obtained for each dye by plotting concentration of solutions against corresponding optical density. It is found that all the following dyes obey the law.

2.3.8. Adsorption Studies

Measurement of Optical Density

The decolourisation of different adsorbates was followed by measuring optical density using MAPADA-V-1100 D spectrophotometer at appropriate nm. 100ml of dye solution of specified concentration was taken in a 250ml beaker which contains the required weight of adsorbent. The contents were shaken thoroughly using the orbital shaker rotating with a speed of 250 rpm under UV light exposure (6amps). At a pre-determined time interval, 10ml of aliquot was withdrawn and centrifuged at 250 rpm for two minutes. The filtrate was collected separately in a clear dry test tube and then placed inside a cell of UV-Visible

spectrophotometer to measure optical density. The procedure was repeated up to the attainment of equilibrium. Duplicate runs were carried out and the results found to be reproducible within ±3%.

The percentage of decolourisation of dye was calculated using the following equation,

$$\%\ Decolorisation = \frac{(Co - Ct)}{Co} X100 \ldots\ldots\ldots (1)$$

where C_o and C_t (mg/L) are the initial concentration of dye and concentration of the dye at a given time t(min.) respectively.

The adsorption capacity of the analysed adsorbents was evaluated using the following expression:

$$q_e = \frac{(Co - C\ )}{w} V \ldots\ldots\ldots (2)$$

where q_e (mg/g) is the adsorbed dye amount per unit mass of the adsorbent, C_o (mg/L) is the initial concentration of dye solution, C_e (mg/L) is the concentration of the dye in the aqueous phase at equilibrium, V(L) is the volume of the aqueous phase and W(g) is the amount of adsorbent used.

3. Results and Discussion

The time taken for the maximum adherence of adsorbate molecules from solution to the adsorbent site is known as contact time. In the adsorption process, dye molecules break the intermolecular force of attraction with water molecules and adhere to a site of the solid adsorbent. The identification of equilibrium time is important for the adsorption process and it was observed from the experiment that each dye attains equilibrium at a specific period[7-11]. The time curves for the adsorption of dyes onto both PANI-$CoCl_2$/PANI-$CuCl_2$ composites depict that the removal of dye is rapid at the initial stages due to a higher percentage of decolourisation (Table 1). On prolonging the time, a gradual occupancy of the adsorbent surface by the dye molecules leads to further adsorption becomes less effective[12]. Beyond a particular time, the progress in contact time does not give any significant effect on the rate of decolourisation of dye indicates the reach of equilibrium. After attaining the equilibrium, the percentage of adsorption of dye doesn't change with the change of time. A relatively large number of unoccupied surface sites are accessible for the uptake of dye molecules during the beginning of the adsorption process. Later the adsorbed dye molecule on the active site of the adsorbent may repel[13-16] the adsorbate from the bulk phase of the solution which slows down the rate of decolourisation[17-19]. The influence of contact time on the batch adsorption of dye was carried out at 30°C, 250rpm and at the specified pH. A short equilibrium time (60 to 150 minutes) integrated with high

adsorption capacity above and around 90% indicates a high degree of affinity between the anionic dyes and metal salt doped PANI-composites. The contact time has been picked out as a suitable adsorption time for further study. The percent decolourisation of dye was calculated by using following equation,

$$\% D = \frac{(Co - Ct)}{Co} \text{x} 100 \ldots\ldots\ldots (3)$$

3.1.Dosage of Adsorbent

A comparative study of dyes with the same initial concentration of all tested dyes using uniform dosage of adsorbent gives a reasonable result. This study reveals that the molecular weight of the dye molecule plays an important role in the percentage of decolourisation.

Table 1 : Time and percentage of removal for all analysed dyes

Name of the Dye	Adsorbent	Equilibrium Time (Minutes)	% of `decolourisation
RY 145	PANI-CoCl2	110	92.52
RR 180	PANI-CoCl2	150	93.51
RB 21	PANI-CoCl2	120	89.58
RO 107	PANI-CoCl2	90	94.19
RB 52	PANI-CoCl2	90	89.46
NBBB	PANI-CoCl2	80	94.71
AM	PANI-CoCl2	90	91.68
AB 9	PANI-CoCl2	70	90.31
EY	PANI-CoCl2	60	93.80
RY 145	PANI-CuCl2	80	96.75
RY 186	PANI-CuCl2	90	85.23
RR 11	PANI-CuCl2	120	89.77
RB 8	PANI-CuCl2	135	95.61
RR 180	PANI-CuCl2	150	89.77
RY 84	PANI-CuCl2	120	97.98
RB 19	PANI-CuCl2	100	94.91
RB 4	PANI-CuCl2	150	94.73
RB 21	PANI-CuCl2	120	93.16

Table 2 : Comparison of adsorption of dyes with same concentration by PANI-$CoCl_2$

[Dye] = 50mg/L – [PANI-CoCl2] =0.7 g/L; T= 30◦C; RPM = 250

Dyes	Number of anionic groups	Molecular Weight	Percentage of Decolourisation	Equilibrium Time (Minutes)
RO 107	2	566.49	100.00	40
AM	3	604.47	90.68	90
NBBB	2	616.49	95.61	90
EY	2	647.89	93.12	90
AB 9	3	792.85	91.32	100
RB 52	2	821.40	97.13	120
RR 180	4	933.76	82.12	150
RY 145	4	1026.25	81.73	150
RB 21	5	1079.60	96.16	150

Table 3: Comparison of adsorption of dyes with same concentration by PANI-$CuCl_2$

[Dye] = 50mg/L – [PANI-CuCl2] =0.8 g/L; T= 30◦C; RPM = 250

Dyes	Number of anionic groups	Molecular Weight	Percentage of Decolourisation	Equilibrium Time (Minutes)
RB 19	2	626.55	93.76	90
RR 8	2	656.90	91.93	100
RB 11	2	681.33	92.46	100
RB 4	2	681.39	90.55	105
RY 186	2	832.14	88.24	120
RR 180	4	933.76	85.52	120
RY 145	4	1026.25	83.54	180
RB 21	5	1079.60	85.28	180
RY 84	6	1628.22	89.40	180

The Table 2 and 3 shows that the percentage of decolourisation decreases on an increase in the molecular weight of the dye molecule and the time to reach equilibrium is also increases. This may be due to the reason that the lower molecular weight dyes can easily

accommodate at the reactive sites of adsorbent. Furthermore, the number of the anionic group attached to the dye molecule also plays a vital role in the amount of dye decolourised. Higher molecular weight dye molecule also has a greater percentage of decolourisation which is possibly because of the more number of the anionic group like SO_3^- and O^-.

4. Conclusions

The molecular weight of dye molecules and the number of anionic groups attached to the dye molecules play an important role in the percentage of decolorization and the time to reach equilibrium of adsorption.

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A STUDY ON CUSTOMER SATISFACTION TOWARDS AMAZON ONLINE SHOPPING SITE WITH SPECIAL REFERENCE TO CUSTOMERS IN TIRUCHIRAPPALLI CITY

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Abstract

Online shopping is a form of electronic commerce which allows consumers to directly buy goods or services from a seller over the Internet using a web browser or a mobile app. Consumers find a product of interest by visiting the website of the retailer directly or by searching among alternative vendors using a shopping search engine, which displays the same product's availability and pricing at different e-retailers. Customers can shop online using a range of different computers and devices, including desktop computers, laptops, tablet computers and smart phones. Online shopping has become a popular way of shopping for consumers. This new innovation for shopping not only brings a great number and variety of merchandise to potential consumers, but also offers a numerous business activities and huge market.Amazon.com is leading the global e-commerce market with the revenue of US $131,019 million in 2021 worldwide. Amazon's e-commerce strategy largely derives from its innovative technologies and practices. Amazon's innovation strategy is customer-oriented. The benefits of innovation can be reaped by any company only when the customers are satisfied. Amazon is also not an exception to this dogma. Hence the present study entitled, "A Study on Customer Satisfaction towards AMAZON Online Shopping Site with special reference to customers in Tiruchirappalli City" is undertaken to identify mainly the reasons for choosing Amazon online shopping site, to find out the extent to which the customers are satisfied and the problems encountered by the respondents while using this site.

Keywords: Online shopping, Amazon, customers, satisfaction and problems.

Introduction

Online shopping is a form of electronic commerce which allows consumers to directly buy goods or services from a seller over the Internet using a web browser or a mobile app. Consumers find a product of interest by visiting the website of the retailer directly or by searching among alternative vendors using a shopping search engine, which displays the same product's availability and pricing at different e-retailers. Customers can shop online using a range of different computers and devices, including desktop computers, laptops, tablet

computers and smart phones. Online shopping has become a popular way of shopping for consumers. This new innovation for shopping not only brings a great number and variety of merchandise to potential consumers, but also offers a numerous business activities and huge market.Amazon.com is leading the global e-commerce market with the revenue of US $131,019 million in 2021 worldwide. Amazon's e-commerce strategy largely derives from its innovative technologies and practices. Amazon's innovation strategy is customer-oriented. The benefits of innovation can be reaped by any company only when the customers are satisfied. Amazon is also not an exception to this dogma.

Objectives of the Study

- To identify the factors that influence the consumers towards Amazon.
- To portray the preferred product, mode of payments and satisfaction level of customers
- To exhibit the problems encountered in Amazon online shopping site.
- To present the findings and suggestions of the present study.

Scope of Study

The study is confined to satisfaction of the customers towards Amazon site only. The study covers the customers residing in Tiruchirappalli City.

Importance of the Study

As the study highlights the problems faced by the customers in dealing with the Amazon site it helps Amazon to identify and overcome the problem while dealing with customer. It also intends to facilitate the efforts of Amazon to come out with good quality service customer satisfaction strategies.

Methodology

The study is based both on Primary and Secondary Data. Primary Data have been collected from one hundred respondents residing in Tiruchirappalli City by circulating questionnaire. These one hundred respondents are selected based on convenience. Secondary data have been analysed with suitable tables along with percentage.

Limitations of the Study

- The sample size is limited to 100.

- ❖ The result of the study relating to the Amazon online shopping site cannot be treated as universal problems in online shopping.

Review of Literature

The following reviews highlight the factors that identify the problem in the online shopping, customers who are attached to the online shopping by age, the factors that prevent the consumers from online shopping, web site design, website reliability and the factors which influence consumer perception of online purchasing.

Muruganantham, et al. (2017) examined the satisfaction towards online shopping. Online shopping is the process whereby consumers directly buy goods, services etc., from a seller interactively in real time without an intermediary service over the internet. The main objective of the study is to identify the problem in the online shopping. The customers face major problems on theft of credit card information and lack of security on online payments. Implementing precautionary step to solve these problems shall create consumers' confidence in online shopping. They concluded that the consumers are looking for trust, security and wider choice throughout online shopping[1].

Shanthi and Destikannaiah (2015) this study establishes the internet marketing concept is different from other marketing channels. Today internet marketing is the fastest growing segment of online commerce. The objectives of the study are to identify the leading online shopping site in India, to identify the segment of customers who are deeply attached to online shopping and to know the type of product purchased by consumers through online shopping. The study reveals that mostly the youngsters are attached to the online shopping and hence the elder people don't use online shopping much as compared to the younger ones. The study also reveals that majority of the respondent buys clothes from Flipkart.com which is thus one of the leading online shopping websites in India[2].

SajjadNazir et al (2012) Internet has developed in new delivery channels and as a result electronic transactions are increasing rapidly. Most of the people who use the internet to purchase goods online still face some reasons for which they are reluctant to buy online. The attitudes of people towards the online purchase are different in Pakistan. This study revealed the factors that cause reservation on the part of consumers in online shopping[3].

Aminul Islam (2011) Consumer satisfaction on online shopping in Malaysia highlighted the factors that are affecting consumers' intention and satisfaction to shop online. To shop on internet becomes an alternative for consumers since it is more comfortable than

conventional shopping which usually attributed with anxious, crowded, traffic jam, limited time and parking space problems etc[4].

John D. Wells, Veena Parboteeah and Joseph S. Valacich, (2011) This paper reports on two empirical studies that examine the interplay between a consumer's inherent impulsiveness to buy and website quality. Specifically, consistent with past online impulse buying research, website quality manifests as an environmental cue that directly influences the likelihood that a consumer will experience an urge to buy impulsively. Further, highly impulsive consumers can be both positively and negatively influenced by varying degrees of website quality[5].

Oracle ATC Web Commerce, (2010) In July 2009, ATG (acquired by Oracle in 2010) commissioned a consumer survey to examine the differences in attitudes toward online shopping across the U.K., Spain, Germany, France, and Benelux (Belgium, the Netherlands, and Luxembourg). The study asked more than 6,500 consumers about their satisfaction, likes and dislikes, common frustrations, and spending habits related to online shopping. The research shows marked differences in buying behaviors among the countries surveyed and highlights clear areas where retailers can improve the online shopping experience they offer to customers[6].

The review of above studies clearly brings to light that customers differ in their attitudes and preferences in different regions and about different shopping sites. This has necessitated the present study on Amazon website and the satisfaction of the customers in Trichirappalli City of Tamilnadu State of India.

Analysis and Discussions

- It is inferred that 9% of the respondents are visiting Amazon daily, 35% of the respondents are visiting Amazon weekly, and the majority 52% of the respondents are visiting Amazon monthly. Customers who visit this online shopping site rarely are very less with 4%.
- Majority 35% of the respondents are influenced for Amazon online shopping by Family & Friends. 30% of the respondents got influence through online advertisements, 20% promotional e-mails and print and broadcast media influences 15% of the respondents.
- Electronic items, fashion materials, kitchen and home items, books are purchased more. 39% respondents prefer to buy Electronics, 30% of the respondents prefer to buy fashion materials, 20% respondents prefer to buy kitchen and home appliances, 11% of the respondents prefer to buy books which is very less in number.

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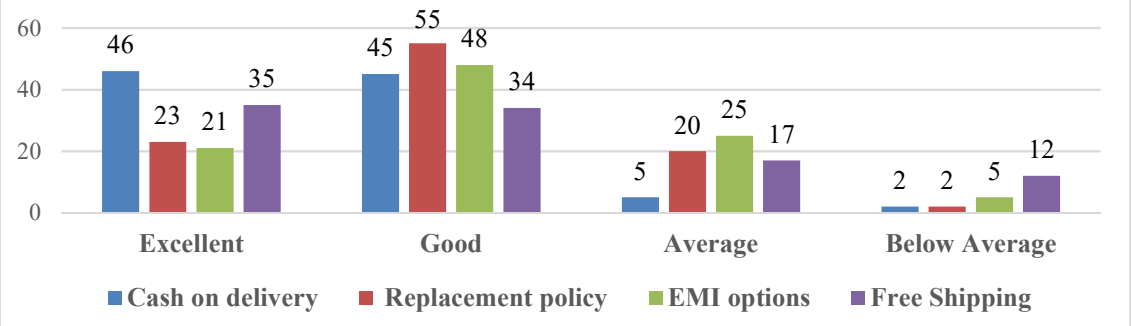
- Majority 50% of the respondents prefer cash on delivery for payment, 10% of the respondents prefer Amazon pay and 10% prefer Net banking for payment.
- It is inferred that the majority 40% of the respondents spent for purchase below Rs.1000,15% of the respondents spent for purchase above Rs.10000, 29% of the respondents spend between Rs 1000 and Rs 5,000, 16% of the respondents spent for purchase of items in the range of Rs.5000 – Rs.10000 respectively.
- One of the most efficient features in Amazon is fast delivery when compared to other online shopping websites. So, most of the customers prefer this website for shopping with the perception of fast delivery 20%, more payment option 22%, 35% of the respondents are of the opinion that they are choosing the site for the promotional offers by Amazon. 10% choose for transaction security and 13% of the respondents favour Amazon for less delivery charges.
- It is inferred that 70% of the respondents agree that Amazon online shopping site provides comparison shopping by offering various products in their sites and 9% of the respondents are not satisfied with the range of products they offer for comparison, whereas 21% of them are neutral.
- 90% of the respondents state that information for products such as descriptions and specifications are easy to read and are satisfied and 10% of the respondents do not feel so.
- 54% of the respondents agree that Amazon online shopping gives satisfaction by delivering the products on the basis of their requirements. 46% of the respondents are not satisfied with the supplies which do not conform to their requirements. 70% of the respondents are satisfied with shopping through Amazon, 14% of the respondents are very much satisfied and 9% of the respondents are not satisfied.
- It is inferred that 46% of respondents rated excellent for cash on delivery services, while for replacement policy 55% rated good and 23% rated excellent. For EMI options 48% rated good and 21% rated excellent, and for free shipping 35% rated excellent.

Chart 1: Rating of Amazon Services



- 22% of the respondents have stated that they faced problems during shopping and rest of 78% of the respondents have stated that they did not face any problems.
- It is inferred that 15% of the respondents feels that delay in delivery is the main problem while shopping at Amazon followed by that 35% of the respondents who feels that product damage is the main problem. 25% of the respondents feel that Non-availability of the product in the site is also the one of the main problems and 25% of the respondents feel that non-delivery is the main problem faced by them while shopping at Amazon.
- 78% of the total respondents consider them as loyal customer of Amazon as they have been purchasing via Amazon only and if the products they want to buy are not available at the time they want to buy then they do not buy from other sites and they never mind waiting till such time the products are available in Amazon. Remaining 22% of the respondents do not consider them as loyal customers of Amazon.
- In this survey most of them 85% are happy to recommend Amazon to others like friends and family. This shows word of mouth publicity is successfully running and this is one of the great advantages for Amazon.

Suggestions

Based on the findings the following suggestions are offered:

- Sometimes consumers are facing delivery issues due to logistic complaints; hence the portal should take appropriate measures to overcome the logistics problem.
- One of the major drawbacks that the respondents have felt is no proper returning policy to the product. After getting opinion from the respondent if the above said problem occurs, then they should be guided in a proper way to return the product. This will create a good website reputation and repurchasing power of the respondents.
- The features and information provided about the product on the website is different from actual product received. This will create lack of consumer satisfaction. So, the vendor must take necessary steps before delivering it to the customer. Then only it creates good reputation for the shopping site among the consumers.
- The reliability and responsiveness of the delivery system is the key success factor for any online business and this will attract the customers' repurchasing intention.
- Amazon must improve customer care services to avoid the problem faced by the respondents.

Conclusion

In today's completely digitalized environment, cost- effective transaction from the point of view of both buyers and sellers is possible only through online. In traditional channel of buying the channel should be narrow one in order to be cost- effective. Today it is possible through online shopping facilitated with the help of Smartphone applications and internet facilities available even in villages. With an exponential rise in the Smartphone penetration and internet penetration in India no doubt online shopping will have growth prospects in future. Moreover demonetisation and covid pandemic have fuelled the engine of online transactions in India. The study about the various aspects of customer satisfaction on Amazon online shopping has revealed that 90% of the customers are satisfied with the information provided by Amazon and 78% of the respondents are loyal customers. In order to tap the remaining segment of the customers the suggestions given above are to be followed by Amazon .The result indicates that the consumers are fully satisfied in buying products through Amazon online shopping site.

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EFFECTIVENESS OF YOUTUBE ADVERTISING ON COSMETIC PRODUCTS WITH SPECIAL REFERENCE TO TIRUCHIRAPALLI

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Abstract

Advertising is one of the most important instruments of modern marketing system, especially YouTube advertising plays a pivot role, YouTube itself has over two billion monthly logged in users, with 500 hoursof video content uploaded every minute to the platform, each visitor, on average, spends 11 minutes and 24 seconds on YouTube every day, and every visit to YouTube an average lead to 6.5page views. An advertising YouTube therefore produces many opportunities for companies to expand their online marketing strategy. Hence, this study focused on the effectiveness of YouTube advertising on Cosmetic Products in Tiruchirappalli.

Keywords: YouTube Advertising, Marketing, Cosmetic Products

Introduction

YouTube advertising means advertising on YouTube, the online video-sharing platform, promoting video content, or in relevant search terms in YouTube Search. In YouTubeadvertising, companies can utilize its many video ad formats or use it in part with display campaigns. YouTube advertising, done through Google Ads, is a way of advertising your videocontent on YouTube or in search results so you can maximize your user reach. Basically, there are two types of advertisement on YouTube video. In stream video advertising and in-video advertising are two different types of advertisements through YouTube. In stream ads let viewers choose to watch brand' ads, or skip it after playing for at least 5 seconds. Standard In-Stream Ads can be a maximum of 15 seconds. In -video ads are the ads that usually appear on the lower portion of company's video. These ads typically appear for the 15 s mark that the viewer if desired can close or minimize them [1]. The purpose of advertising is to inform the consumers about their product and convince customers that a company's services or products are the best, enhance the image of the company, point out and create a need for products or services, demonstrate new uses for established products, announce new products and programs. This article helps to make consumers aware of a cosmetic product and aims to build preferences for that product over its competitor. This paper was mainly undertaken to create promises to consumers that certain product can make consumers look younger or that products can take years off your

appearance. The success of effectiveness of advertisement has become an important area of the study for marketers. You Tube advertising almost a necessity for modern businesses, especially those that do business outside their local community.

Objectives of the study

- To identify the role of YouTube advertising in forming purchase intention of consumers
- To findout the factors that influence YouTube advertising value in advertisements
- To understand the effectiveness of YouTube advertising on cosmetic products.

You Tube Advertising

Advertising evolves with technological advancements from television ads to internet banners to social media promotions [2]. There was an exponential growth in product marketing via social media channels nowadays. Due to its large user base, YouTube unquestionably became the most significant target among companies when delivering their advertising effort to the customer [3]. According to a global survey of marketers conducted in December 2017, marketers believe YouTube is the most effective video channel for marketing [4]. Because compared with traditional methods, YouTube advertisements for products and services with universal appeal enjoy high viewsand low cost per view. Also, audience interests and user devices influence advertisements' views on YouTube [5]. Traditional advertising methods such as television and radio remind the consumers about the brand available in the market [6]. However, they do not influence brand recognition as YouTube [7]. Therefore, business organizations tend to utilize YouTube as a medium for product awareness and increase customer engagement [8].

Review of Literature

Martins et al., (2019), Zheng & Chen (2020) The purchase intention of the customer is described as the decision-making process of a customer whether or not to purchase a product, making an intention on the purchase [9].

Silaban (2019) Delivered by Setyo Riyanto, the evolution of knowledge and communication technologythat occurred within the era of the economic process affects the manner humans creates their shows. The presence of the net and social media during this Era makes communication easier totry to. Therefore, social media is thought-about because the right media in doing personal stigmatization for somebody[10].

Brands taken for the Study

A "cosmetic product" shall mean any substance or mixture intended to be placed in

contact with the various external parts of the human body epidermis, hair system, nails, lips and external genital organs or with the teeth. This article focuses top five brands of cosmetic. They are Sugar, Color bar, Mama Earth, Pond's, Jovees.

Significance of the Study

Social media have become an important platform for companies to connect with their target audience and make an impression. With the rise of digital platform, effectiveness of advertisements has become an important area of study for marketers to determine the most efficient and appropriate medium of communication to place their advertisements. This study investigates effectiveness of YouTube advertising on cosmetic products with special reference to Tiruchirappalli

Social Relevance

In an environment where competition is increasing day by day, businesses are looking for different ways to influence the consumers. Social media is also one of the ways to influence consumers. In recent years, increased usage of social media has created new business opportunities. As a social media channel, YouTube has attracted the attention of many consumers. Therefore, this study is socially related.

Research Methodology

Research methodology is the process used to collect information through various publication research, interviews, surveys etc. for solving the research problems systematically. This is the descriptive study. The sample size is 100 respondents. The method of sampling is convenient sampling. The area of the study is Tiruchirappalli. Primary data were collected through questionnaire. Secondary data were collected from books, journals, magazines and internet.

Research Layout

Social Media Marketing is one of the best marketing strategies, which not only gives advantage to the organization, but also to the customers. Empirically, Dehghani, et al. found that entertainment, informativeness, and customization had a positive effect on advertising value; meanwhile, irritation had a negative effect on advertising value [11]. Hence, this study has developed a research model and was presented in Figure 1

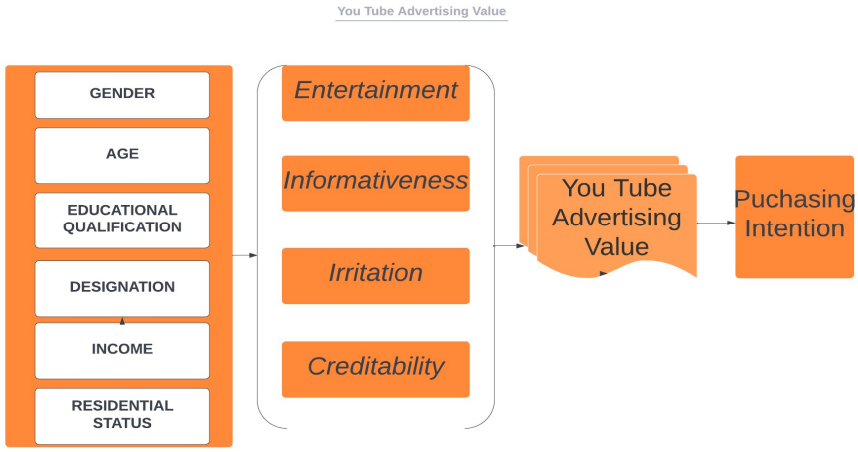

Figure 1: You Tube Advertising Value

Analysis and Interpretation

Table 1: Demographic Profile of the Respondents

Gender	**Percentage of Respondents**
Female	81
Male	19
Total	**100**
Age	**Percentage of Respondents**
Below 15	-
15-30	47
30-40	32
Above 40	21
Total	**100**
Educational Qualification	**Percentage of Respondents**
SSLC/HSC	25
UG	43
PG	20
Research Students	12
Total	**100**
Designation	**Percentage of Respondents**
Students	32
Homemakers	31
Professionals	21
Others	16
Total	**100**
Income	**Percentage of Respondents**
Below Rs.25,000	29
Rs.25,000-Rs.50,000	48
Rs.50,000-Rs.75,000	11
Above Rs. 75,000	12
Total	**100**

Residential Status	Percentage of Respondents
Urban	68
Rural	32
Total	**100**

Source: Primary Data

Table No 1 explains that 81% of the respondents are female, 47% of them are on the age group between 15-30, 63% of the respondents are Graduates, 32% of the respondents are students, 48% of the respondents family monthly income is Rs. 25000-50000, 68% of the respondents are resided in urban.

Table 2: Entertainment and Trendiness

Factors	SA	A	N	D	SD	Total
With YouTube ads, I learn what products / services / brands to buy to impress people	23	57	5	9	6	100
I am learning about trends with YouTube ads	24	66	4	4	2	100
YouTube ads are entertainment	10	60	5	9	16	100
With YouTube ads, I am learning about brands that suit my personality	28	62	8	-	2	100
Watching / reading YouTube ads is fun	9	61	7	8	15	100
YouTube ads show people with similar tastes to buy/use	9	60	8	9	16	100

Source: Primary Data

**** SA – Strongly Agree A - Agree N – Neutral D – Disagree SD – Strongly Disagree***

The above table depicts that 80% of the respondents opined that they have learnt about the products or services through You Tube advertising after that they buy the products for impress the people. 90% of the respondents felt that they learnt about recent trends through You Tube Advertising. 70% of the respondents stated that You Tube ads are entertainment and fun. 69% of the respondents felt that you tube ads show that people with similar tastes to buy or use.

Table 3: Informative and Impressive

Factors	SA	A	N	D	SD	Total
YouTube ads are a good source of product/service/brand information	28	61	2	4	5	100
I get extensive information with YouTube ads	28	61	4	2	5	100

YouTube ads are one of the best sources of product/service/brand information	25	61	4	5	5	100
I have enough information about the product/ service/brand with YouTube ads	27	62	3	3	5	100

Source: Primary Data

**** SA – Strongly Agree A - Agree N – Neutral D – Disagree SD – Strongly Disagree***

The Table No. 3 shows that 89% of the respondents felt that you tube ads are a good source of information and it has provide enough information about products or services or brand. 86% of the respondents opined that You Tube ads are one of the best sources of products or services information.

Table 4: Irritability

Factors	SA	A	N	D	SD	Total
YouTube ads are confusing	15	58	12	5	10	100
YouTube ads are frustrating	10	49	11	11	19	100
I see YouTube ads as an unwanted interruption	14	64	4	5	13	100
YouTube ads are deceptive	15	58	5	12	10	100

Source: Primary Data

**** SA – Strongly Agree A - Agree N – Neutral D – Disagree SD – Strongly Disagree***

The above table explains that 78% of the respondents felt that You Tube ads are unwanted interruption, 73 % of the respondents agree that You Tube ads are confusing and deceptive. 59% of the respondents opined that You Tube ads are frustrating.

Table 5: Creditability and Trust Worthy

Factors	SA	A	N	D	SD	Total
You Tube ads are Trust worthy	12	28	21	39	20	100
You Tube ads are Creditability	11	25	21	42	21	100

Source: Primary Data

**** SA – Strongly Agree A - Agree N – Neutral D – Disagree SD – Strongly Disagree***

The above table depicts that 59% of the respondents disagree with ‘you tube advertisements are trust worthy’; 63% of the respondents disagree with ‘You Tube advertisements are Creditability’.

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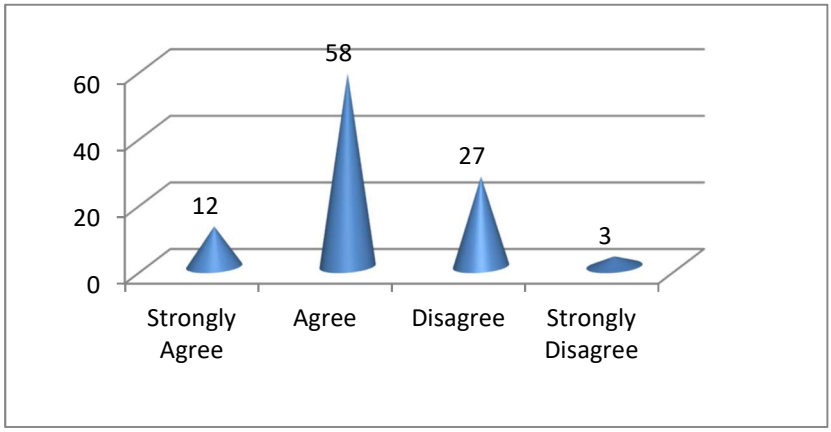
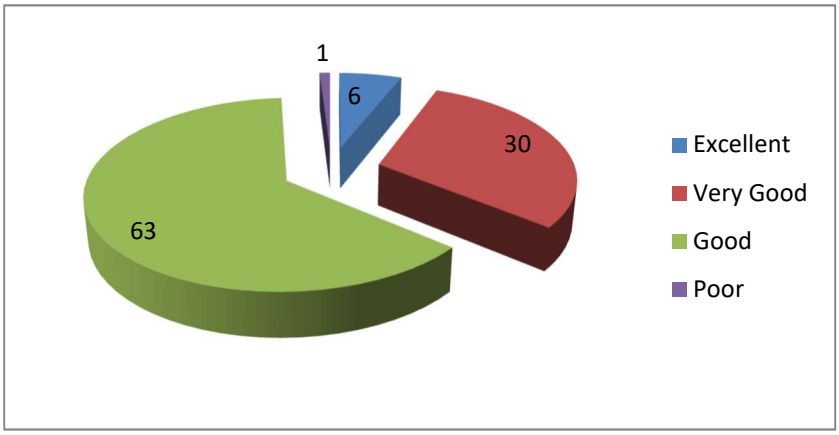
Chart 1: Effectiveness of You Tube Advertising



Source: Primary Data

The above Chart shows that 70% of the respondents agreed that You tube advertising is very much effective for buying decisions.

Chart 2: Overall Satisfaction of You Tube Advertising



Source: Primary Data

The above Chart explains that 93% of the respondents' satisfaction level is good.

Suggestions

- It is preferable to restrict the duration of advertisements.
- The customer has to give feedback about advertisement in social media sites.
- The consumer has to choose the video and to appear before or around videos across the Google display network.
- The majority of the respondents preferred to buy cosmetic products from permanent store, private bazaars and medical shop. Thus, the company has to maintain the availability of goods round the clock.
- To avoid interference in work, advertising should be designed to meet the

preference of target consumers or target audience.

Conclusion

This study shows that effectiveness of ads, measured by the number of page views from YouTube pages has a significant effect on purchase intentions. In recent years social media has created new business opportunities. YouTube has attracted the attention of businesses; therefore, this study examined the effectiveness of YouTube advertising.

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AN EXPLORATORY STUDY ON LIVING CONDITIONS OF WOMEN DOMESTIC WORKERS IN TIRUCHIRAPPALLI TOWN OF TAMIL NADU

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Abstract

In India, more than 90% of the workforce is engaged in the informal sector for their livelihoods. Informal sectors involve street vending, construction works, domestic works, etc. Domestic workers share an important link in the economic development through their labour contributions. Domestic work, a predominantly female occupation, has been increasing in India significantly. Growing urbanization, the increased labour force participation rate of women, and the decline of extended families are the primary reasons for the growth of this sector. Despite this growth, there are few laws and policies to regulate domestic work and protect domestic workers, most domestic workers are from the socio-economically marginalized sections of society and a large number of them are migrant workers. Workers range from full-time to part-time workers, skilled and unskilled workers. Largely women, who already know how to clean and cook, domestic workers are seen as requiring very little skill training. Besides, the work is seen as allowing women, who also shoulder the responsibility of their own households, some degree of flexibility. This paper tries to traces the living conditions of domestic workers who are working in the households of Tiruchirappalli Town which is rapidly developing as smart city in Tamil Nadu next to state capital, with an objective to explore the socio – economic conditions of women domestic workers.

***Keywords*:** Labour, Economic development, Domestic workers

Introduction

Labour plays a vital role in the economic development of the country. In India, more than 90% of the workforce is engaged in the informal sector for their livelihoods. Informal sectors involve street vending, construction works, domestic works, etc. Domestic workers share an important link in the economic development through their labour contributions. Domestic workers care the children and contribute to their upbringing, take care of elderly people, scrub the floors, cook, clean the windows, do the dusting, wash and iron the clothes, put out the rubbish and so on. In doing so, they facilitate their employers to work away from home while still having enough time for leisure and family. Domestic work constitutes one of the largest, yet least visible service industries in the world. According to the International

Labour Organization (ILO), there are 53-100 million domestic workers worldwide, 83 per cent of whom are women (ILO, 2011)[1]. They represent 4 to 10 per cent of the labour force in developing countries and about 2 per cent in developed countries (UN Women, 2013)[2].

In India too, while systems of servitude have historically existed because of feudal social structures, newer trends of migration of young women from rural areas to cities to do (live-in) domestic work have become a dominant feature in the urban labour landscape. Apparently, domestic labour is one of our largest job categories – next to farming and construction. There are over 100 million domestic workers in India, more than 50 times the number of people working in the software industry (Bhala Sasi, 2010)[3]. Domestic work, a mainly female work, has been growing in India significantly. Rising urbanization, the increased labour force participation rate of women, and the increase of nuclear families are the major factors for the growth of domestic work. Even though this development, there are limited legal provisions and policies to standardize domestic work and safeguard domestic workers, most domestic workers are from the socio-economically deprived sections of society and a majority of them are migrant workers. Workers are range from full-time to part-time workers, skilled and unskilled workers. Generally, women who already familiar with household cleaning work, domestic workers are seen as requiring very minimum skills.

This is an important view of the fact that domestic workers constitute a large section of women workers in India today. Most domestic workers are poor, illiterate, and unskilled and come from vulnerable communities and backward areas. They are underpaid and ill-treated as domestic work and undervalued and poorly regulated. The clean, fetch, tend, serve and make it possible for many upwardly mobile women to pursue their careers without worrying about domestic chores. Yet this work is referred to as the 'informal sector' as if it were scarcely works at all. Out of the total 397 million workers in India, 123.9 million are women. Of these, roughly 106 million women work in rural areas and the remaining 18 million work in urban areas. Overall, the female domestic workers participation rate has increased from 19.7 per cent in 1981to 25.7 per cent in 2001. While comparing rural areas, in the urban areas the need of domestic workers is increasing from 8.3 per cent to 11.6 per cent. This is because of the family and the increasing cost of living as a result of the neo liberal economic policies**.** As per the National Sample Survey 68th round, 39 lakhs people are employed as domestic workers by private households, of which 26 lakhs are female domestic workers (NSSO Statsitics-2011-2012)[4]. This paper tries to traces the living conditions of domestic workers who are working in the households of Tiruchirappalli Town which is rapidly developing as smart city in Tamil

Nadu next to state capital, with an objective to explore the socio – economic conditions of women domestic workers.

METHODOLOGY

The present study is based both primary and secondary data . Primary data have been collected from 50 respondents by using purposive sampling technique from domestic workers in Tiruchirappalli town through the interview schedule. The secondary data have been collected from various sources such as books, journals, reports and websites. The data have been processed and analyzed with the help of statistical tools like simple percentage analysis.

Table 1: Social Conditions of Domestic Workers

Particulars	Number of Respondents	Percentage of Respondents
Native place		
Tiruchirappalli	37	74
Lalgudi	5	10
Samayapuram	6	12
Mannachanallur	2	4
Total	50	100
Age		
Below 30	3	6
30 – 40	9	18
40 – 50	17	34
50 – 60	6	12
Above 60	15	30
Total	50	100
Age at Employment		
Below 30	5	10
30-40	14	28
40-50	13	26
50-60	7	14
Above 60	11	22
Total	50	100
Religion		
Hindu	40	80
Muslim	1	2
Christian	9	18
Total	50	100
Caste		
SC	28	56
BC	22	44
Total	50	100
Educational Qualification		
Primary school	15	30

High	21	42
Higher secondary	2	4
Illiterate	12	24
Total	50	100
Marital status		
Married	33	66
Widow	12	24
Separate	1	2
Single	4	8
Total	50	100
Age at Marriage		
Below 18	7	14
18- 28	43	86
Total	50	100

Source: Primary data

Background of Domestic Workers

As seeing the background characteristics of the domestic workers, majority (74%) of them are lived in urban areas of Tiruchirappalli town, remaining (36%) are resided in Samayapuram (12%), Lalgudi (10%) and Manachanallur (4%) nearby villages of Tiruchirappalli. Tiruchirappalli town has supplied the domestic workers a lot than rural parts of the district; it reflects the urbanised nature and demands of domestic work in growing urbanisation contexts as well as the rising trend of lack employment opportunities in rural areas. Among the educated domestic workers, seventy percent are hailed under the productive age group and 30 per cent of them are above 60 years. Irrespective of the age group young, adult and elderly, all aged women are participated in this work due to their poor economic conditions of family circumstances, unskilled nature and decreasing employment in farm and allied activities. Apart from all reasons, family poverty as a push factor to them to choose domestic work as occupation for their livelihood. Analysing the social category of domestic workers, they are represented mainly by three religions i.e., Hindu, Christian and Muslims. Among them more than half (56%)of the domestic workers are belonged to Scheduled Caste category and remaining are Other Backward Castes category. The larger participation of SCs workers in domestic sector reveals their socio-economic marginalisation in general and economic vulnerability in particular both in rural and urban setting of society.

Education is an important in transforming the social and cultural status and outlook of an individual. As analysing their educational status, nearly one-fourth (24%) of the domestic workers are stated that they never attended school due to poverty of their family and child marriage. The remaining domestic workers are completed their school level education. This

shows that the society's priority and perception on women's education. The societal attitude towards providing education to women and poverty are the major factors to alienating women from imparting skill education. Moreover, the less skilled and unskilled education is an important push factor for women entering more into domestic works than other works.

Considering marital status and age at marriage of respondents more than half (66%) of the respondents are married, 24 percent of them are widow, 8 percent of the respondents are single and 2 per cent are separated. As seeing the age at marriage, the respondents stated that majority (86%) of the domestic workers are married at the age of 18 – 28 years and 14% of the respondents are married at the age of below 18 years i.e., child marriage. This shows that irrespective of their marital status women are shouldering the economic responsibility of their households due to their low family income in one way, the other way more than one third of the women i.e., widow, separated and single who are relied on domestic work as primary source for their families.

Table 2: Working Conditions of Domestic Workers

Particulars	**Number of Respondents**	**Percentage**
Nature of Work		
Cooking	12	24
Cleaning Works	22	44
Gardening	8	16
Care Works	8	16
Total	50	100
Working hours		
Below 3 hours	6	12
3-5	16	32
Above 5 hours	28	56
Total	50	100
Years of Experience		
Below 5 years	31	62
Above 5 years	19	38
Total	50	100
Mode of Payment		
Daily	15	30
Weekly	12	24
Monthly	23	46
Total	50	100
Income (Monthly)		
Below 1000	27	54
1000-2000	3	6
2000-3000	12	24

Above 3000	8	16
Total	50	100

Source: Primary data

This table reveals the working conditions of domestic workers such as nature of work, working hours, experience, mode of payment and income. 44% of the respondents are engaged in cleaning works like washing clothes, dishes, sweeping and mopping floor. Nearly one fourth (24%) of the workers are engaged in cooking alone. 16% of the respondents are engaged in gardening and care works particularly child and elderly care. While observing the nature of work pattern domestic workers are more engaged in cleaning works than other household works.

Majority of the respondents are engaged in the worked throughout the day time. This reveals that these respondents help the owner in peak hours of the work .The above table reveals that the 12% of the respondents are worked below 3 hours, 32% of the respondents are worked in 3 – 5 hours and remaining 56% of the respondents are worked above 5 hours.

Wage is an important factor to recognise the workers productive contribution and improve the economic status. The above table shows that the mode of payment received by the respondents from their employers. 30% of the respondents are received as daily wage, 24% of the respondents are got as weekly wage and 46% of the respondents are received monthly wage. When compare to other mode of payment daily wage payment is predominated. In daily wage mode of payment, 28 % received their wage below Rs. 150 per day. Regarding weekly payment 16% of the respondents are received Rs. 300-350 as weekly wage. Four percent of the respondents received Rs. 350 and above per week.

While discuss about the monthly income of domestic workers, majority (54%) of the respondents are earned monthly income of below Rs. 1000. 24% of the workers earning income ranging from Rs.2000-3000 per month. 16% of workers earned monthly above Rs.3000. Only 6% of the workers earned Rs.1000-2000. Their monthly earning capacity is depends upon the number of households they are working per day and nature of work they have done.

Family Income

Family member's income is very useful to their family expenditure, majority of domestic workers family members were worked as unorganized daily wage earners and temporary workers. While explain about the monthly family income of domestic workers, 36% each of workers monthly family income ranges from Rs.3000-6000 and Rs. 6000-9000

respectively. 18% of workers earned monthly income of less than Rs.3000 and only ten percent of workers earned more than Rs.9000.

Experience

The respondents are classified on the basis of experience. More than half (62%) of the respondents have had below 5 years of experience in domestic work. Thirty eight percent of the respondents have above 5 years of experience. Majority (92%) of the respondents are chosen this work due to their family situation and only 8% of the respondents reported that they have chosen this work due to the need of independent living.

Conclusion

Under the unorganized sector, domestic work is one of the most important growing sectors which is consisting of large number of female workers as well as contributing more to the growth of informal sector. Due to rapid development of urbanization and industrialization need of domestic help is change as inevitable both urban and semi-urban areas. Simultaneously participation of female in this sector is increasing in trend due to poverty and women's unskilled condition. Also, there is big challenge associated with this sector to accept as equal to other sectors like construction and textile because it confines within the domestic sphere. The present study is concluded that the socio-economic conditions of the domestic workers in this study area is very poor, because most of the respondents belong to the socially backward community. Majority of the respondents are working more than 5 hours per day and mostly indulge in cooking and cleaning work. 60% of the respondents' earning is less than Rs.2000 per month which is not sufficient to meet out their needs in the present scenario.

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CONCOCTION OF AB-REAL, REAL AND SUPER-REAL IN BEN OKRI'S *THE FAMISHED ROAD*

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Abstract

Literature is metaphorical and referential. It represents the contemporary society both directly and indirectly. Though reality is the central idea in all the works it is clothed with unreality. The unreality and the reality form the arena of fantasy literature. The unreality emphasises on life and the intricacies through the untamed imagination. Mimetic novels too do not state the life elements without sprinkling imaginative elements. In the same way fantasy mixes up literary elements and tends to make factual a reality. This paper shows how crude realities are presented in a novel of fantasy with ethereal elements in *The Famished Road.* With these elements, Ben Okri enables Azaro, the protagonist to move between real and unreal worlds and beyond to have a sense of relief from the earthly world of pain and suffering as he is unable to bear with the disgusting facts. Azaro is portrayed as an abiku, a born-to-die spirit who is actually from the spirit entity of virtues, beauty, truths and attraction. Okri takes pleasure in mingling and intermingling the absolute realities of the day: the poverty of the family, the egoistic father, the struggling mother; the cunning society, the incorrigible landlord etc' the realities: the corrupted leaders, the self-centred politicians, the uncaring society, etc. the super realities; the spirits, the ghosts, the abiku, etc

Keywords: Fantasy, Reality, Imagination, Spirits, World, Culture

If God can create a world of reality
Man can create a world of imagination
God is a creator and Man is a sub-creator

Literature is defined as the mirror of life. It is imaginative and the imagination is aroused by reality. The reality is the food for the creativity that results in an endearing output combining the prosaic and interesting to produce an entertaining arena. Literature is the best tool for entertainment. It takes the forms of poems, prose, drama and fiction to provide amusement to the readers. The art forms like poetry, prose and drama had been coexisting with the first man and woman in the universe. Novel had its birth in the 19th century which has been growing and gaining importance ever since its birth.

In the recent times, fiction, the pocket theatre is considered to be the best tool to picturise the current society, politics and environment. Prasad in his *A Background to the Study of English Literature* defines novel as 'a long narrative in prose detailing with the actions of fictitious people'. A novel like a play has a plot, characters and theme. It has no rigid framework, it can begin anywhere in the middle or in the end and go backwards to the beginning. According to Hudson, a novel presents the life of people "directly or indirectly, whether the writer himself is conscious of it or not, every novel must necessarily present a certain view of life and of some problems of the life, that is, it must so exhibit incidents, characters, passions, motives as to reveal more or less distinctly the way in which the author looks out upon the world and his general attitude towards it"(237). The place of poetry and drama was taken up by novel.

Countries like Australia, Africa, Canada, Sri Lanka, Malaysia, India produced literature in English in addition to their regional literatures. There were a few countries like Africa where literature was passed on from one generation to the other through the word of mouth. These countries, the colonies of England were influenced by the English Literature introduced to them as a means of relaxation. The literature produced in colonized nations were different from the native literatures.

Unlike in England, in the commonwealth countries ,literature served various purposes. Literature is a weapon of instruction and tool for education and communication. Colonialism, cultural disintegration and slavery were some of the themes and it spread awareness to commoners. Spirit for independence gathered momentum and writers aroused the public against colonial masters. The common goal of independence unified the writers all over the world to portray the sufferings of the natives of the land. So Indian, African, Canadian, and Australian writing in English portrayed the social, cultural and political milieu.

Like the other commonwealth countries, Nigeria produced English literary works from the 19th century. Chinua Achebe published the first regular English novel, *Things Fall Apart*, which sold many copies in London. Nigerians never copied the British style of writing but used it as a tool of instruction. Following Achebe, many novelists grew giving expression to their anger and suffering through writings. Ben Okri is a Nigerian poet, novelist, short story writer born in the euphoria of independence which has turned into despondency. His hyphenated identity Nigerian-Londoner determines the socio-political atmosphere of his novels.

Ben Okri's novels are *Flowers and Shadows, The Landscapes within, The Famished Road, Songs of Enchantment, Infinite Riches, The Age of Magic, Star Book, In Arcadia. The*

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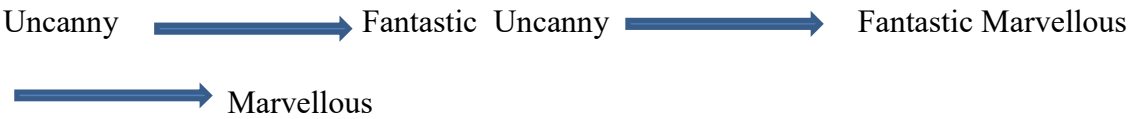
Famished Road has received the Booker Prize and other prizes too. Okri has created Azaro, a spirit-child, an abiku in Yoruba myth and portrays the sufferings of this poor young boy in the corrupt political climate living amidst the ghettos dwellers of Lagos. The inconsolable sufferings that one may undergo after being born in this world is pointed out by the spirit companions before his birth and Azaro had a secret pact with his companions assuring to make use of the situation and die and join them in the spirit world. But Azaro's mom, her love and the sufferings compel him to break the pact inspite of the continual pressures from the companions.

The spirit world, supernatural beings, eerie atmosphere, one-eyed spirit, herbalist, Madam Koto and her colossal shape, the forest and the bar their descriptions make this a novel of fantasy. The narrative glides from the absolute reality, reality and super reality. The structure is not linear instead it is hazy and it does not begin in the beginning, there is a continuous shift throughout. The beginning is " In the beginning there was a river. The river became a road and the road branched out to the whole world. And because the road was once a river it was always hungry. (3 *The Famished Road*)" As the road branched out, the novel is branched out into various books and parts leading to utter confusion. An attempt to understand clearly the entire happenings in the novel will be an utter failure because reading and re-reading tend to evolve patterns of a maze.

Fantasy according to Pringle is the fulfilment of heart's desire. It is a combination of reality and imagination. Todorov, Rosemary Jackson and Eric Rabkin are some of the important critics of fantasy. It is a seductive subject difficult to be explained and its attraction lies in its indefinite quality. Tzevan Todorov in his Fantastic: A *Structural Approach to Literary Genre* sets three requirements of fantasy. The uncanny phenomenon can be explained in two fashions, by means of natural causes and supernatural causes. The possibility of a hesitation between the two creates the fantastic effect. Todorov calls this hesitation the heart of the fantasy and says that the fantastic occupies the duration of the hesitation. The moment the readers choose between then alternatives they leave the realm of pure fantasy and enter some other genre, or a subgenre of the fantastic. When the uncanny is given natural explanation then the fantasy ceases and becomes 'uncanny' and when the uncanny is given supernatural explanation it becomes marvellous. Todorov makes the following division:



Todorov sets three requirements including the hesitation. The first one is the hesitation between the natural and supernatural explanation of the elements of fantasy. Secondly the same hesitation must be experienced by the character and thereby the reader must identify himself with the character. Here hesitation becomes the theme of the fantasy. Third factor is the reader's attitude towards the work on hand, the reader must understand literally without giving an allegorical or poetical interpretations for the story. According to Todorov, there are three important characteristics of fantasy. Exaggeration is an important element which creates a supernatural atmosphere. The reader must understand the literal meaning of the fantasy without giving a figurative meaning. The use of represented narrator 'I' making a double game and creating the situation where the readers believe without believing.

The themes of the fantastic are similar to the themes of other genre. The fantastic has social and literal functions. The function gives the writer to describe things that could not be mentioned in realistic terms. Todorov explains the three literary functions, pragmatic, semantic and syntactic with reference to the function of the supernatural. When the supernatural disturbs or keeps the reader in suspense it is pragmatic, the supernatural constitutes its own manifestation in semantic and the supernatural enters into the development of the narrative in syntactic.

In *The Famished Road,* the uncanny, the elements of spirit cannot be given any supernatural explanation or natural explanation, and the hesitation between the two makes it an enigmatic novel. The reader hesitates between the natural and supernatural elements as the protagonist is neither accepted to be an earthly being nor a spirit being, he remains between the two and the hesitation is gradually shifted from the reader to the character creating a theme of fantasy. The spirit world is not known both for the writer and reader, and to construct the impossible the writer depends on the world of words. The writer exploits the Yoruba culture and his words create the world, the writer extensively exaggerates for the mind map in the reader. The forest, travel to reach the spirit world by Azaro, Madam Koto's bar and its backyard are some descriptive examples of the writer which Todorov terms exaggeration. The reader identifies himself with the narrator, Azaro and the ambiguity in the reader is gradually shifted to the characters .*The Famished Road* can be called a political satire and the theme, plot revolves around politics. The distrust in the writer is expressed by comparing the world of imagination with reality. Throughout the novel, the writer attempts to keep the reader happy by the imaginative world. The novelist in the first book(classification of a collection of chapters into book) brings to light all the sufferings caused to a human being inspite of its negative

aspect it takes an optimistic turn and concludes saying that it is a sort of experience. The spirit companions turn into enemies plotting against Azaro's desire of staying in the world and bring death and destruction to him. Koto's bar is a dreadful place where Azaro is lost, taken away by spirits to the under world below the sea. With these actualities of the day, the realities of the house and the super realities Okri has rendered the textual space of *The Famished Road* voluminous and incredible.

According to Rosemary Jackson fantasy is an account of writer's displeasure. "From W.H.Auden, C.S.Lewis and J.R.R.tolkien, this notion of fantasy literature as fulfilling a desire for a 'better', more complete, unified reality has come to dominate the readings of the fantastic, defining it as an art form providing vicarious gratification." Fantasy can take any form based on the demand of the situation in which the novel is written. A novel of fantasy allows the writer to express desire and expel desire when it is a disturbing element. It does not create a new world but works with the world on hand and supplies the necessities and takes away weeds. Jackson says, "Fantasy is not to do with inventing another non-human world: it is not transcendental. It has to do with inverting elements of this world, re-combining its constitutive features in relations to produce something strange, unfamiliar and apparently 'new', about absolutely new and 'other' and different.

Jackson's focus is primarily on the function and it is well defined in Okri's novels. In the post-independent period Nigeria is not a place of virtues, bringing back the pre-independent arena but white rulers were replaced with blacks but the attitude and despondency of the whites prevailed. The political leaders were self- centred having the regional and tribal fervour. So autocracy continued, the poor and needy were suppressed, rich amassed wealth. Money and power were not distributed and it was accumulated by corrupt leaders. Okri picturises through the landowner, a man involved in politics harassing the ghetto dwellers. The photographer's plight shows the atrocities of the land owner . The disgusting nature of reality forces the writers to attempt a flight into the world of imagination, spirit world, forgetting the crude reality.

Okri painfully presents the real world and its coarseness and happily goes on a trip to the world of imagination where animals speak, trees move from one place to another rejuvenating the readers. Azaro is a character of the real world, spirit world, supernatural world and the underworld. Forging all these *The Famished Road* provides scintillating experience to the readers in the realm of fantasy.

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JAWAHARLAL NEHRU ON THE RIGHTS OF WOMEN: SOME OBSERVATIONS

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Abstract

The principal aim of this paper is to focus on 'Women's Rights' a major contemporary human rights issue in India. The topic is relevant as the concept of rights of women is gaining momentum across the country with the legal protection of women is being debated in the sessions of Parliament. The paper discusses Nehru's vision and concern for the upliftment of women in the pre-post Independent India, Constitutional promises and the reform initiatives taken by Nehru with regard to Hindu code bill.

Keywords; Human rights, Rights of Women, Struggle for freedom, Gender Justice, upliftment of women, Legislative enactments.

An Outstanding personality of the 20th century Indian History, Jawaharlal Nehru was a pivotal figure in Indian Independence movement. One of the striking features of Jawaharlal Nehru was that he maintained balance between reflection and action. He can be rightly called as the architect of Modern India. As a Prime Minister he addressed pertinent women's rights issues such as dignity, equality, education and economic independence.

Jawaharlal Nehru was an uncompromising champion of women's rights. To Jawaharlal Nehru, women's participation in large numbers in the national struggle in response to Gandhi's call was a social revolution. It broke barriers of social restraint and gave women a new cause and sense of commitment.

As he wrote in his *Discovery of India*,

> '…. A remarkable thing happened our women came to the front and took charge of the struggle, here were these women, women of the upper or middle classes, leading sheltered lives in their homes- peasant women, working class women, rich women-pouring out in their tens of thousands in defiance of government order and police lathi'

In his own family Nehru realized the impact of Gandhi's call. Kamala Nehru was a total convert to the Gandhian philosophy of non-violent and non-cooperation. Her total commitment that made Jawaharlal Nehru to involve himself as a full time worker in the nationalist politics. Explaining Kamala's involvement Nehru simply explained that she wanted to play her own part in the national struggle and not be merely a shadow of her husband.

To Jawaharlal Nehru the participation of women in the National Movement was only the beginning of a larger process whereby women would struggle to find their proper identity in the Indian social milieu and enjoy equal rights with women. He firmly believed that the women of India will not attain their full rights by the mere generosity of the men of India. He had a due respect on women. In 1938, two years later after his wife's death Nehru says 'My wife influenced me considerably in many ways'. Probably his political work made him to forget his immediate environment. In later years he regretted his unkindness attitude towards his wife. His *Autobiography* which was written in 1936 was dedicated to his wife. In that book he wrote 'Kamala gave me strength'.

Though she was the wife of Nehru she was not free from oppressive nature of society. Sarvapalli Gopal while writing the *Biography of Nehru* documented the sufferings underwent by Kamala Nehru in her husband's family. They treated her as an intruder from the outside world into their exclusive relations with Jawaharlal. Nehru himself realized this only in his later part of his life.

In the Karachi session of the Indian National Congress in 1931 a resolution was adopted on fundamental rights which incorporated the concept of equality of sexes. Article 4 of the Fundamental Rights and Economic Policy says Protection of women workers, adequate provision for leave during the maternity period. When it came up for discussion at A.I.C.C meeting in Bombay on 8 August 1931 Kamaladevi Chattopadhyaya said that, 'Women want attention and not Protection'.

The word protection in her opinion denoted an inferior position and they were not going to tolerate protection from anybody not even from the state. Therefore her amendment was the state shall pay attention to the needs of women workers including children when their mothers are at work and adequate provisions during maternity period. Replying the amendment Nehru said,

> 'I am personally unconcerned even if the House accepts the amendment in preference to the original clause. But he went on to add there can be no better instance of inferiority complex than Mrs. Kamaladevi's objection to the word protection. I do not understand what is humiliating in protection.'

Kamaladevi's objection itself clearly shows what they exactly want from the state.

The National Planning Committee was constituted in 1938 under the chairmanship of Nehru prepared a report on the women's question highlighting many of the modern day concepts equality of sexes and Gender Justice. Twenty-nine sub-committees were appointed

to investigated and report on specific problems. The women's sub-committee was formed with Rani Laxmibai Rajwade as Chairman and Mridula Sarabai as Secretary to examine the place of women in a planned economy and evaluate their social, economic and legal status. Many of the basic themes pertaining to the rights of women like dignity, equality, freedom, protection from discrimination, social justice, education had been articulated in a proper form by Nehru even before the adoption of conventions such as International Convention on Economic, Social and Cultural Rights (ICESCR) , Convention on the elimination of All forms of Discrimination against Women in the international sphere.

By following this December 13, 1946 Nehru moved the objectives Resolution. It provided the blue print for the future constitution. Thus the liberal perspective had gained prominence by the 1940's. Nehru contributed a lot to women's status as the first Prime Minister of India. Apart from the Preamble, a section on Fundamental Rights guarantees to men and women equally various freedoms such as equality before law, opportunity for employment under the state and forbids discrimination on the grounds of religion, caste, sex, place of birth or residence. Article 15 (3) empowers the state to make special provisions for women and children even in violation of fundamental rights. The Directive Principles of State Policy contain general clauses and women specific clauses. The women specific clauses are right to an adequate means of livelihood, Equal pay for equal work, just and humane conditions of work, Maternity benefits etc.

Nehru firmly believed that social change could only come by positive legislation. One such experiment was that Hindu Code Bill. In 1941 Hindu Code Committee was set up under the chairmanship of Sir B.N. Rao, a former Judge of Calcutta High Court. The major areas of concerns of the Hindu Code Bill were rights relating to marriage, property, inheritance, adoption, maintenance and guardianship. After Independence the bill was reintroduced in the Parliament. Nehru decided to break up the code into four separate parts such as Hindu Marriage Act 1955, Hindu Succession Act 1956, Hindu Adoption and Maintenance Act 1956, Dowry Prohibition Act 1961to facilitate their early passage. These acts were all embedded with the elements of progression not only in achieving justice for women but also an enabler in transforming the Indian patriarchal mindset.

The voluminous debates on the Hindu Code brought into public focus on a broad spectrum of ideas on social issues. The major groups opposing the legislation were Vallabhai Patel, Rajendra Prasad, J.B.Kripalani etc. The participation of women legislators in the crucial discourse over the Hindu code bill is significant to understand the political participation of women. The major contributors in the debates were Hansa Mehta, Renuka Roy, G. Durgabai

and Sucheta Kirpalani. The principal objections advanced by the opposition to the Hindu Code bill were as follows:

- It interfered with Hindu religious law
- It broke with custom and tradition
- It would lead to endless litigation over inheritance rights
- It would break up the joint family

Though the bill was criticized, it laid the foundation for establishing a benchmark for a modern construction of the family in the Indian society.

For Nehru the Hindu code was a necessary reform measure. As he put it,

> 'We talk about Five Year plans, economic progress, industrialization, political freedom and all that. They are all highly important. The real progress of the country means progress not only on the political plane, not only on the economic plane but also on the social plane. They have to be integrated when the great nation goes forward.'

Beyond doubt all the acts considerably improved Hindu women's legal status. Nehru did everything when the country was full of problems and challenges. It was a good attempt to shake off the rigidity of Indian patriarchal structure. But the progressive elements of the legal reforms largely remained only in the statute book.

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IMPACT OF LIVING VALUES EDUCATION AMONG COLLEGE STUDENTS

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Abstract

Education is fundamental for achieving full human potential, developing an equitable and just society, and promoting national development. India will have the highest population of young people in the world over the next decade, and our ability to provide high-quality educational opportunities to them will determine the future of our country (National Education Policy (NEP), 2020). Values are always a part of a nations' philosophy and its educational system. Values reflect an individual's judgment and help us determine what is important in life (Purc and Laguna, 2019). There is a serious need to give the living value education to individuals mainly in the place of learning environment, as they spend most of their time and learn many things. In this study by adopting descriptive design 137 college students pursuing their first year degree were selected to respond to this study. An attitude scale was constructed to measure their attitude towards ten different values they are experiencing in their life. Training programme was provided on living value education for the college students and hence in this study an attempt was made to examine the impact of training programme on living value education among the college students.

Keywords: Living Values, Value education and College students

I. INTRODUCTION

Education is very important for an individual's success in life. It can give a big impact on human opportunity in continuing their life quality. Education is generally seen as the foundation of society which brings economic wealth, social prosperity and political stability. Education through industry is the basic principal of basic education, Basic education, because it help developing values like respect for manual labour, sense of co-operation, feeling of being mutually helpful through manual work, development of friendship feeling, economical self-reliance, team spirit and sincerity. Role of education is means of socializing individuals and to keep society smoothing and remain stable (Carnoy, 2017). Education in society prepares youngsters for adulthood so that they may form the next generation of leaders. The reflection on the values of a student is of extreme importance to the educational system, due to the relationship between education and living values. Education tries to develop three

aspects: physique, mentality and character. Even though physique and mentality are important, they are menaces without the third because character is the greatest of these. Value-based education is a tool which not only provides us a profession which we can pursue but also a purpose in life. The purpose of our life is undoubtedly to know oneself and be ourselves (Sabri, 2017).

Values are guiding principles, or standards of behaviour which are regarded desirable, important and held in high esteem by a particular society in which a person lives. The importance of Values and Morals are the code we live by in a civil and just society. They are what we use to guide our interactions with others, with our friends and family, in our businesses and professional behaviour. Our values and morals are a reflection of our spirituality; our character. They are what we hope to model for our children and the children around us, because children do watch us as they develop their own sense of right and wrong. Value education means inculcating in the children sense humanism, a deep concern for the well- being of others and the nation.

Living values are various universal habits that serve as a basis of good relationship and harmony between us and others around us (Arniati, et, al, 2020). Conceptually, the living values education is an integral part of the educational process as a whole (Komalasari, et. al., 2014). Value is neither thought nor caught, it is learned (Hermann, 1972). It means that the substance of value is not merely captured or taught but, further, it is digested in the sense of captured, internalized, and standardized as the inherent part of one's personal qualities through a learning process. Therefore, the educational process is a process of acculturation, which produces civilized man, including cultured human. One of the models of values education is the integration of the living values education in the learning process. The concepts that are providing the importance of values are used in this present study for analyzing the living values among the college students.

Living Values Education is a global endeavor which provides an approach, and tools, to help people connect with their own values and live them. Living values is a comprehensive value education programme scheduled to offer trainings through practical methodology to explore and develop universal values (Al- Braizat, 2016).

Living values are various universal habits that serve as a basis of good relationship and harmony between individuals and others around us. Living values education is one of the learning model developments of character education that emphasize in fun learning (Komalasari, et. al., 2014). The various values activities of living values education includes reflection point; imagining; relaxation/ concentration practice; artistic expression; self-

development activity; social skill; values awareness of social justice; developing skill for social unity; and integrating the values into the existing curriculum. The living values developed for measuring among the college students before and after providing training programme in this study includes tolerance, honesty, humility, cooperation, happiness, responsibility, simplicity, peace, love and unity.

II. RESEARCH METHODOLOGY

The research was conducted based on the descriptive research design. The knowledge of college students towards the living values was examined and training programme was given for the students and after the training programme their knowledge on living values was again examined in the present study in a detailed manner hence the design is descriptive in nature.

Objectives of the study:

- To study the personal profile of the college students
- To analyse the students knowledge on living value indicators before and after the training programme
- To identify the difference between the knowledge of college students before and after the training programme on living values.

Hypothesis:

- The year of pursuing education do not have a significant difference with the students' knowledge towards living values before and after the training programme.

Sampling

The study was conducted among 137 respondents pursuing their first and second year undergraduate degree was selected from a private arts and science college in Trichy. The total population of the first and second year students was found to be 687 and 683 respectively. From the total population 10 per cent was selected as the samples which comprises of 69 students from first year and 68 from second year which accounts for a total of 137 students. The researcher adopted Simple Random Sampling method for the study.

Tools for data collection

Questionnaire was used by the researcher to collect the necessary and relevant data for this study. Self- structured Questionnaire was developed to analyse the personal profile of the respondents and it comprises of two parts:

- The first part of the Questionnaire deals with personal profile of the respondents comprising of Name, Age, Department, membership in NSS / NCC / Sports, type of family and parents educational status.
- The second part of Questionnaire comprises of the Living Values inventory. This part measures the respondents' knowledge towards 10 different living values that are practiced in daily life. This is measures by adopting Likert's Summated Rating Scale technique. Each item in the scale was provided with five responses categories. These were strongly agreed, agree, neutral, disagree and strongly disagree with scores 5,4,3,2 and 1respectively. Ranges from strongly agree to strongly disagree.

III. RESULTS AND DISCUSSION

A. Demographic Profile

The Descriptive results of the personal profile of the respondents are provided. The general profile such as age, year, stream of education, and membership distribution of the selected college students is given in Table 1.

Table 1: Personal Profile

Personal Profile		**Frequency (N = 137)**	**Percentage**
Age	Upto 18 years	53	39
	19 years	71	52
	20 years & Above	13	9.0
Year	I year	69	50
	II year	68	50
Stream of Education	Arts	78	57
	Science	59	43
Membership Distribution	NSS	72	53
	NCC	24	17
	Sports	41	30

The above given table no. 1 shows that a little more than half of the students (52%) belong to 19 years of age. Exactly half of the respondents of the study are taken from I year and II year. More than half of the respondents comprising 57% are studying in arts stream

and the remaining 43% are science students. In analyzing the membership status of the respondents 53% reported that they are the members of NSS, 30% students are in sports and the remaining 17% are in NCC.

B. Knowledge Level before and after the training programme on Living value Education

The finding in the table 2 reported the knowledge possessed by the selected college students towards living values before and after providing the training programme. The level of knowledge are measured and categorized among the college students with respect to their year of education.

Table 2: Knowledge possessed by the selected college students towards living values before and after the training programme

Living Value Indicators	Knowledge among the College Students					
	I Year (In Percentage)			II Year (In Percentage)		
	Before	After	Mean Difference	Before	After	Mean Difference
Tolerance	46	74	28	60	80	20
Honesty	56	66	10	64	92	28
Humility	45	79	34	60	85	25
Cooperation	65	87	22	47	86	39
Happiness	77	80	3	74	90	16
Responsibility	50	80	30	58	94	36
Simplicity	63	86	23	81	90	9
Peace	69	89	20	71	89	18
Love	72	90	18	64	88	24
Unity	75	95	20	73	90	17

The above table reveals that before the training program the aspects of living values imbibed by the selected college students of I and II year ranged between (45 - 75) among the I year students and (57 - 74) among the II year students.

After providing training programme for the college students, it was found that the highest mean difference was seen among the I year students was for Humility (34%). This could happen among the students by getting an understanding of the training programme that the living values are important in pursuing a peaceful and happy life. The other factors that have a considerable increase in the mean difference level among I year students include responsibility and tolerance with 30 and 28 per cent respectively. Among II year students it was found that the living value 'Cooperation' highest mean difference (39%) when compared to other values. This is followed by the value 'Responsibility (36%). Whereas, the value 'Happiness' has very low mean difference (3%) among I year students and 'Simplicity' has very low mean difference (9%) among II year students

C. Comparative analysis of Living value education programme among I and II year students

Paired-samples t-test was used to determine whether two means are significantly different from each other or not when the two values for each sample are collected from the same individuals. The statistical analysis of the living values among college students studying in I and II year with respect to age after the educational program is presented in the Table 3.

Table 3 explains the results of the statistical analysis performed for the college students before and after the training programme. The highest mean value found among I year students in the pre- test was found to be 38.71 for the value 'responsibility' and the standard deviation was 2.178. The highest mean of the post-test was found for the living value 'unity' with a mean as 38.32 and the standard deviation was 4.057. The highest mean value found among I year students in the pre-test was found to be 38.72 for the value 'love' and the standard deviation was 2.184. The highest mean of the post-test was found for the living value 'love' with a mean as 41.35 and the standard deviation was 1.907. The t-value found from the analysis of the mean scores of the before and after training program for the ten living values among the I and II year students shows that there exist a significant difference after providing the training programme for most of the living value indicators. The value 'Honesty' ($t = 1.518$, $p > 0.05$) alone does not have a significant difference with respect to I year college students.

Table 3: Descriptive Statistics of Living Values among I and II-year college students before and after training programme

Living Value Indicators	I-year students						t value	Sig.	II-year students						t value	Sig.
	Before			After					Before			After				
	Mean	N	SD	Mean	N	SD			Mean	N	SD	Mean	N	SD		
Tolerance	20.46	69	2.330	36.41	69	2.659	34.780	.000	20.71	68	2.350	36.44	68	2.470	39.011	.000
Honesty	15.94	69	3.807	16.83	69	2.64	1.518	.134	15.74	68	3.326	17.60	68	2.876	3.557	.001
Humility	36.49	69	4.082	19.67	69	4.667	52.944	.000	35.65	68	3.446	18.04	68	4.205	50.468	.000
Cooperation	18.01	69	4.533	35.70	69	2.178	30.773	.000	17.54	68	4.101	35.66	68	2.176	32.215	.000
Happiness	17.68	69	4.773	20.52	69	2.084	4.600	.000	18.12	68	4.638	21.35	68	2.698	5.133	.000
Responsibility	38.71	69	2.178	18.17	69	3.208	81.813	.000	38.66	68	2.176	17.31	68	3.279	65.275	.000
Simplicity	20.96	69	2.681	33.70	69	2.178	27.771	.000	21.74	68	2.250	33.66	68	2.176	31.132	.000
Peace	12.74	69	3.810	21.52	69	2.435	16.598	.000	11.93	68	3.159	20.65	68	2.795	17.560	.000
Love	38.68	69	2.170	41.71	69	2.170	8.280	.000	38.72	68	2.184	41.35	68	1.907	7.705	.000
Unity	12.52	69	2.004	38.32	69	4.057	45.100	.000	18.19	68	4.254	35.21	68	3.299	20.344	.000

The hypothetical results between the year of education towards the living value indicators shows that there exists a significant difference between the means of different living values and year of education. The value of $p < 0.05$ depicts a significant difference for students studying in I and II year in their level of acquiring knowledge on living values by rejecting the null hypothesis and accepting the alternate hypothesis proves that the year of pursuing education have a significant difference with the students' knowledge towards living values before and after the training programme.

IV. CONCLUSION

The present study results show that students have shown an improvement in their level of knowledge on living values after providing essential training programmes on different aspects of living values. Hence it is suggested to incorporate the living values into the teaching materials so that the students identify, explore, clarify, analyze, internalize, and apply the living values in their daily activities in the classroom, campus, home, and community. Thus it is essential to develop the living values among the future generations by integrating the living value concepts with the regular academic learning of the students to enhance themselves and the society.

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ROOT SQUARE MEAN LABELLING OF SOME GRAPHS

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Abstract

A graph labeling is an assignment of integers to the vertices or edges or both subject to certain conditions. S.S.Sandhya, S.Somasundaram and S.Anusa introduced the concept of Root square mean labeling of graphs. In this paper we investigate Root square mean labeling of some more graphs.

Keywords: Root square mean labeling, Root square mean graph

1. Introduction

By a graph G = (V(G), E(G)) with p vertices and q edges we mean a simple, connected and undirected graph. In this paper a brief summary of definitions and other information is given in order to maintain compactness. The term not defined here are used in the sense of Harary [1].

A graph labeling is an assignment of integers to the vertices or edges or both subject to certain conditions. A useful survey on graph labeling by Gallian (2019) can be found in [2]. .S.S.Sandiya, S.Somasundaram and S.Anusa introduced the concept of Root Square Mean labeling of graphs in [3] and studied their behavior in [4] and [5]. In this paper we investigated Root square mean labeling of some more graphs.

2. Main results

Definition 2.1

A graph G=(V,E) with p vertices and q edges is called a root square mean graph if it is possible to label the vertices $x \in V$ with distinct labels $f(x)$ from 1,2,….,q+1 in such a way that when each edge e = uv is labeled with

$$f(e = uv) = \left\lfloor \sqrt{\frac{f(u)^2 + f(v)^2}{2}} \right\rfloor \; or \left\lfloor \sqrt{\frac{\sqrt{f(u)^2 + f(v)^2}}{2}} \right\rfloor$$

then the edge labels and distinct. In this case f is called a Root square mean labeling of G.

Definition 2.2

The union of two graphs $G_1 = (V_1, E_1)$ and $G_2 = (V_2, E_2)$ is a graph $G = G_1 \cup G_2$ with vertex set $V = V_1 \cup V_2$ and the edge set $E = E_1 \cup E_2$.

Definition 2.3

Let G be a graph . Let G' be a copy of G. The mirror graph M(G) of G is defined as the disjoint union of G and G' with additional edges joining each vertex of G to its corresponding vertex in G'.

Definition 2.4

If G is a graph, then S(G) is a graph obtained by subdividing each edge of G by a vertex.

Definition 2.5

A triangular snake T_n is obtained from a path $u_1, u_2, \dots, u_n$ by joining u_i and u_{i+1} to a new vertex v_i for $1 \leq i \leq n-1$

Definition 2.6

A double triangular snake DT_n is a graph obtained from a path $u_1, u_2, \dots, u_n$ by joining u_i and $u_{i+1}$to two new vertices v_i and v_i' ,$1 \leq i \leq n-1$.

Theorem 2.1

The graph $T(P_n)$ is Root square mean labeling for all $n \geq 2$.

Proof:

Let $v_1, v_2, v_3, \dots, v_n$ be the vertices and $e_1, e_2, \dots, e_{n-1}$ be the edges of path P_n.

$T(P_n)$be the total graph of path P_n with $V\big(T(P_n)\big) = V(P_n) \cup E(P_n)$. Then

$V\big(T(P_n)\big) = \{v_i; 1 \leq i \leq n,\ e_i; 1 \leq i \leq n-1\}$ be the vertices and

$$E\big(T(P_n)\big) = \{p_i = (v_i v_{i+1}) / \ 1 \leq i \leq n-1\} \cup \{q_i = (v_i e_i) / \ 1 \leq i \leq n-1\}$$
$$\cup \{r_i = (e_i v_{i+1}) / \ 1 \leq i \leq n-1\} \cup \{s_i = (e_i e_{i+1}) / \ 1 \leq i \leq n-1\}$$

be the edges.

The ordinary labeling $T(P_n)$ is given Figure 1

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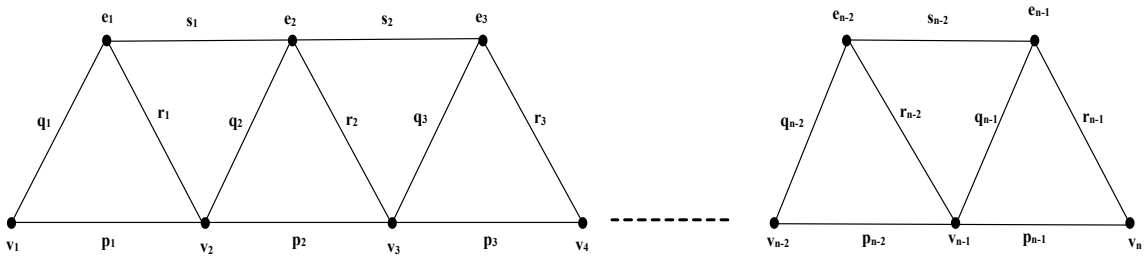

Figure 1

First we label the vertices $T(P_n)$ as follows

$$f(v_1) = 1$$

$$f(v_i) = 4i - 4,\ 2 \le i \le n$$

$$f(e_i) = 4i - 2,\ 1 \le i \le n - 1$$

Now the induced edge labels as follows

$$f^*(v_i v_{i+1}) = 4i - 2,\ 1 \le i \le n - 1$$

$$f^*(v_i e_i) = 4i - 3,\ 1 \le i \le n - 1$$

$$f^*(e_i v_{i+1}) = 4i - 1,\ 1 \le i \le n - 1$$

$$f^*(e_i e_{i+1}) = 4i,\ 1 \le i \le n - 2$$

Then f induces an edge labeling $f^*(E) = E\big(T(P_n)\big) \to \{1,2, \dots, q\}$ is a distinct.

Consequently the graph $T(P_n)$ is a Root square mean labeling and Hence $T(P_n)$ is a Root square mean graph for all $n \ge 2$.

Example 2.1: Root square mean labeling of $T(P_4)$

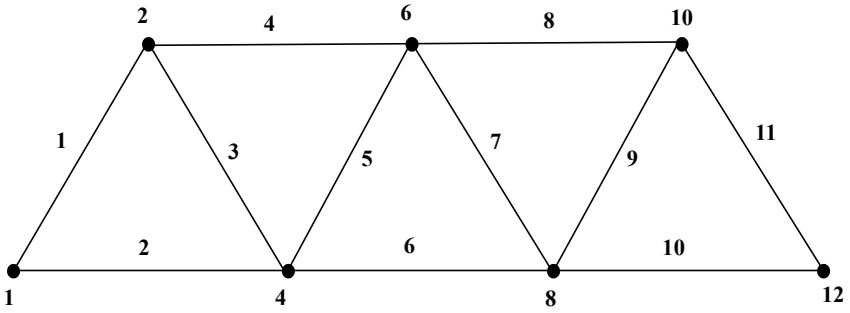

Figure 2

Theorem 2.2

The graph P_n^2 is a Root square mean labeling for all $n \ge 1$.

Proof:

Here $p = n; q = 2n - 3$

Let $V(P_n^2) = \{u_1 = 1, u_i / 2 \le i \le n\}$ and

$$E(P_n^2) = \{e_i = (u_i u_{i+1}) / 1 \le i \le n-1\} \cup \{e_i' = (u_i u_{i+1}) / 1 \le i \le n-2\}$$

be the vertices and edges of P_n^2 respectively.

The ordinary labeling P_n^2 is given in Figure 3

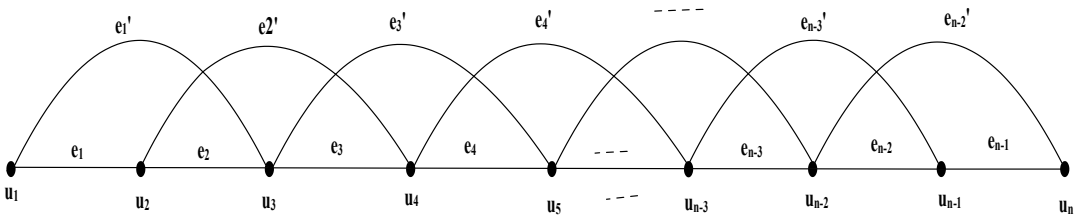

Figure 3

First we label the vertices P_n^2 as follows

$$f(u_1) = 1$$

$$f(u_i) = 2i - 2,\ 2 \le i \le n$$

Now the induced edge labels as follows

$$f^*(e_i) = 2i - 1,\ 1 \le i \le n-1$$

$$f^*(e_i') = 2i,\ 1 \le i \le n-1$$

Then f induces an edge labeling $f^*(E) = E(P_n^2) \to \{1,2,\dots,q\}$ is distinct.

Consequently the graph P_n^2 is a Root square mean labeling and Hence P_n^2 is a root square mean labeling graph for all $n \ge 1$.

Example 2.2:

The root square mean labeling of P_6^2

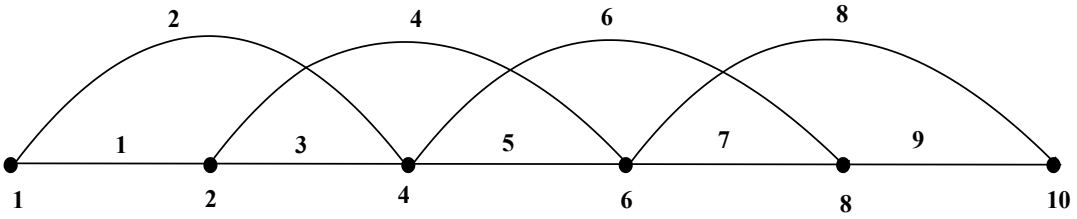

Figure 4

Theorem 2.3

$[P_n; C_3^2]$ is a root square mean labeling for all $n \ge 1$.

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Proof:

Here $p = 5n$, $q = 7n-1$;

Let $V[P_n;C_3^2] = \left\{u_i^{'} / 1 \le i \le n\right\} \cup \left\{u_i^{''} / 1 \le i \le n\right\} \cup \left\{u_i^{'''} / 1 \le i \le n\right\} \cup$

$\left\{u_i^{'v} / 1 \le i \le n\right\} \cup \left\{u_i^{v} / 1 \le i \le n\right\}$ and

$E[P_n;C_3^2] = \left\{e_i^{'} = \left(u_i^{'}, u_i^{''}\right) / 1 \le i \le n\right\} \cup \left\{e_i^{''} = \left(u_i^{'}, u_i^{'''}\right) / 1 \le i \le n-1\right\} \cup \left\{e_i^{'''} = \left(u_i^{''}, u_i^{'''}\right) / 1 \le i \le n\right\} \cup$

$\left\{e_i^{'v} = \left(u_i^{'''}, u_i^{'v}\right) / 1 \le i \le n\right\} \cup \left\{e_i^{v} = \left(u_i^{'''}, u_i^{v}\right) / 1 \le i \le n\right\} \cup$

$\left\{e_i^{v'} = \left(u_i^{'v}, u_i^{v}\right) / 1 \le i \le n\right\} \cup \left\{e_i^{v''} = \left(u_i^{'''}, u_{i+1}^{'''}\right) / 1 \le i \le n\right\}$

be the vertices and edges of $[P_n;C_3^2]$ respectively.

The ordinary labeling $[P_n;C_3^2]$ is given in Figure 5.

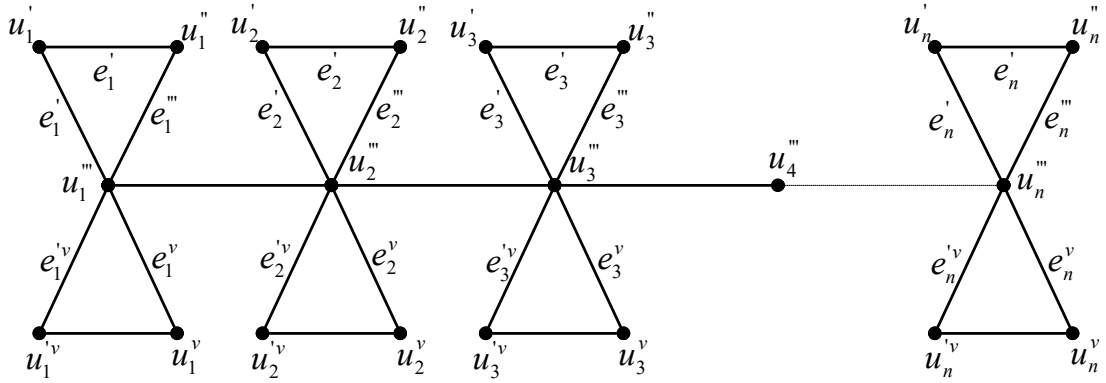

Figure 5

First we label the vertices $[P_n;C_3^2]$ as follows:

$f\left(u_i^{'}\right) = 7i-6, \qquad 1 \le i \le n$

$f\left(u_i^{''}\right) = 7i-5, \qquad 1 \le i \le n$

$$f\left(u_i'''\right) = 7i-4, \qquad 1 \le i \le n$$

$$f\left(u_i'^{v}\right) = 7i-2, \qquad 1 \le i \le n$$

$$f\left(u_i^{v}\right) = 7i, \qquad 1 \le i \le n$$

Now the induced edge labels as follows:

$$f^*\left(e_i'\right) = 7i-6, \qquad 1 \le i \le n-1$$

$$f^*\left(e_i''\right) = 7i-5, \qquad 1 \le i \le n-1$$

$$f^*\left(e_i'''\right) = 7i-4, \qquad 1 \le i \le n-1$$

$$f^*\left(e_i'^{v}\right) = 7i-3, \qquad 1 \le i \le n-1$$

$$f^*\left(e_i^{v}\right) = 7i-2, \qquad 1 \le i \le n-1$$

$$f^*\left(e_i^{v'}\right) = 7i-1, \qquad 1 \le i \le n-1$$

Then f induces an edge labeling $f^*(E) = E([P_n; C_3^2]) \to \{1, 2, ..., q\}$ is a distinct.

Consequently, the graph $[P_n; C_3^2]$ is a root square mean labeling.

Hence $[P_n; C_3^2]$ is a root square mean graph for all $n \ge 1$.

Example 2.3

Root square mean labeling of $[P_2; C_3^2]$.

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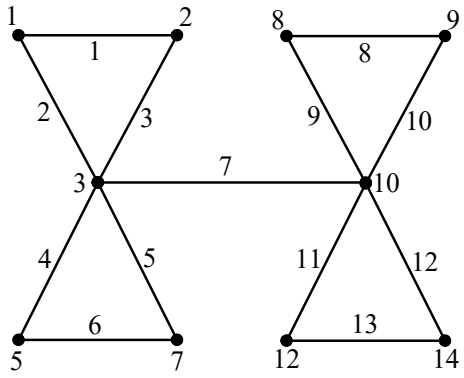

Figure 6

Theorem 2.4

C_{2n} e K_1 is a root square mean labeling for $n \geq 1$.

Proof:

Let $V(C_{2n} \text{ e } K_1) = \left\{u_1; 1 \leq i \leq \frac{n}{2}\right\} \text{U} \left\{u_i = 4n - 4i + 1; \frac{n}{2} + 1 \leq i \leq n\right\} \text{U}$

$$\left\{v_i = 4i - 1; 1 \leq i \leq \frac{n}{2}\right\} \text{U} \left\{v_i = 4n - 4i + 2; \frac{n}{2} + 1 \leq i \leq n\right\}$$

$$E(C_{2n} \text{ e } K_1) = \left\{e_i; 1 \leq i \leq \frac{n}{2} - 1\right\} \text{U} \left\{e_i; i = \frac{n}{2}\right\} \text{U} \left\{e_i; \frac{n}{2} + 1 \leq i \leq n - 1\right\} \text{U} \left\{e_i; i = n\right\} \text{U}$$

$$\left\{e_i^{'} = 4i + 1\right\} \text{U} \left\{e_i^{'}; i = \frac{n}{2}\right\} \text{U} \left\{e_i^{'}; \frac{n}{2} + 1 \leq i \leq n - 1\right\} \text{U} \left\{e_i^{'}; i = n\right\}$$

be the vertices and edges C_{2n} e K_1 respectively.

The ordinary labeling of C_{2n} e K_1 is given in figure 7.

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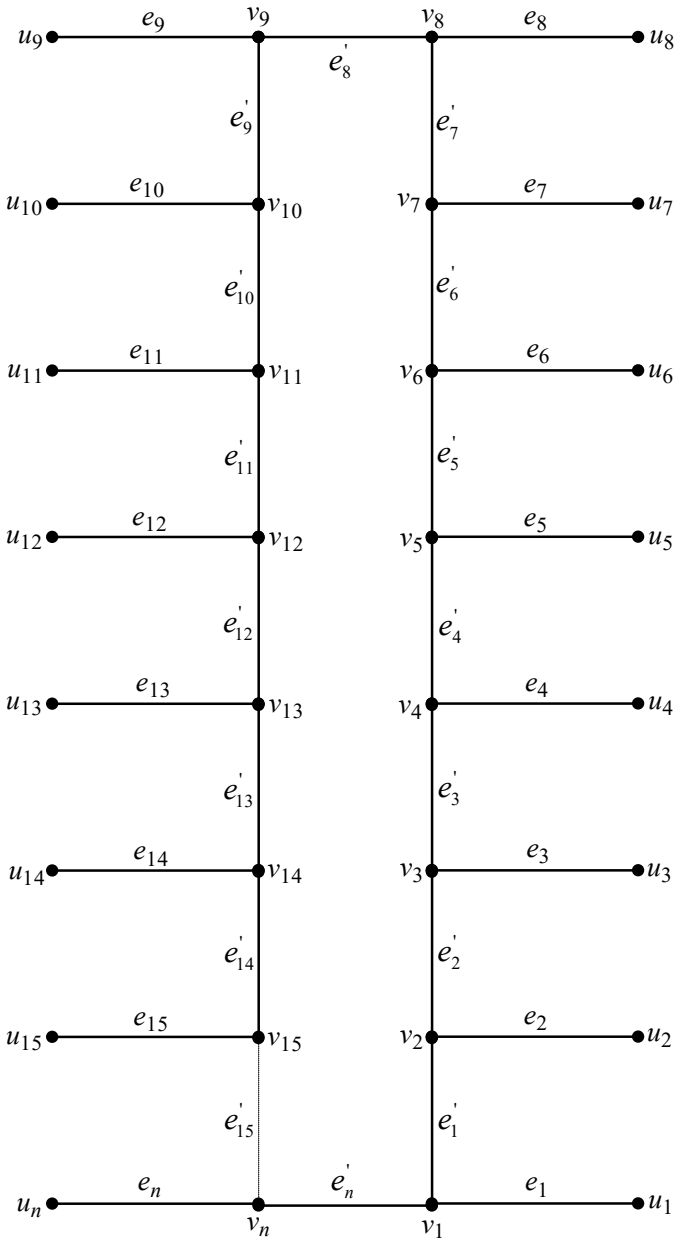

Figure 7

First we label the vertices of C_{2n} e K_1 as follows:

$$f(u_i) = 4i, \qquad 1 \le i \le \frac{n}{2}$$

$$f(u_i) = 4n + 4i + 1, \quad \frac{n}{2} + 1 \le i \le n$$

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$$f(v_i) = 4i-1, \qquad 1 \le i \le \frac{n}{2}$$

$$f(v_i) = 4n-4i+2, \quad \frac{n}{2}+1 \le i \le n$$

Now the induced edge labels are follows:

$$f(e_i) = 4i-1, \qquad 1 \le i \le \frac{n}{2}-1$$

$$f(e_i) = 2n, \qquad i = \frac{n}{2}$$

$$f(e_i) = 4n-4i+2, \quad \frac{n}{2}+1 \le i \le n-1$$

$$f(e_i) = 1, \qquad i = n$$

$$f\left(e_i'\right) = 4i+1, \qquad 1 \le i \le \frac{n}{2}-1$$

$$f\left(e_i'\right) = 2n-1, \qquad i = \frac{n}{2}$$

$$f\left(e_i'\right) = 4n-4i, \qquad \frac{n}{2}+1 \le i \le n-1$$

$$f\left(e_i'\right) = 2, \qquad i = n$$

Here $p = 2n$ and $q = 2n$.

Then f induces an edge labeling $f^*(E) = E[C_{2n} \text{ e } K_1] \to \{1,2,...,q\}$ is a distinct.

Consequently $(C_{2n} \text{ e } K_1)$ is a root square mean labeling and hence $[C_{2n} \text{ e } K_1]$ is a root square mean graph for all $n \ge 2$.

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Example 2.4

Root square mean labeling of C_8 e K_1.

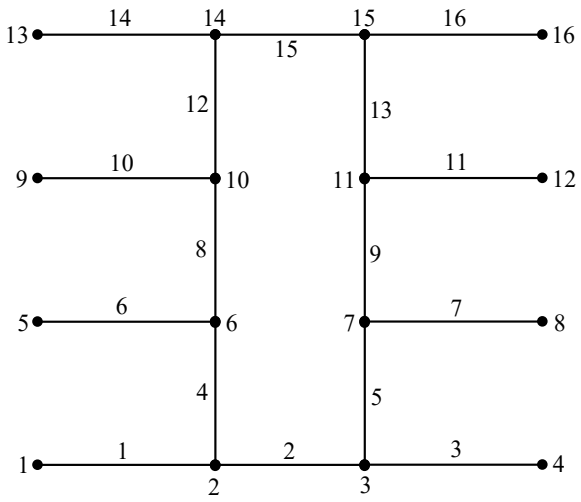

Figure 8

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ON $sg^*\alpha\omega -$ CLOSED SETS IN TOPOLOGICAL SPACES

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Abstract

The aim of this paper is to introduce the concept of $sg^*\alpha\omega -$ closed set and its properties.

Key words: $sg^*\alpha\omega -$closed set, a $sg^*\alpha\omega -$open set

1. Introduction

The notion of semi open set was introduced by Levine[1] in 1963 and he also introduced the concept of generalized closed sets in topological spaces in 1970. In 1965 O. Njastad [2] introduced the notion of $\alpha -$ open set-in topological spaces. In 1986 D. Andrijievic [3] introduced the notion of semi pre open set-in topological spaces. In 2000 $\omega -$ closed sets were introduced and studied by P. Sundaram and M. Shrik John [4]. The concept of $\alpha\omega$- closed set was introduced and its properties were studied by M.Parimala [5] in 2017. The aim of this paper is to introduce the concept of $sg^*\alpha\omega -$ closed set and its properties.

2. $sg^*\alpha\omega$ closed sets and their properties.

Definition 2.1

A subsets A of (X,τ) is called a $sg^*\alpha\omega -$closed set if $cl(A) \subseteq U$whenever, $A \subseteq U$and U is $sg\alpha\omega$ – open in (X,τ). The complement of $sg^*\alpha\omega -$ closed set is $sg^*\alpha\omega -$open set.

Example 2.1

Let $X = \{a,b,c)\ \tau = \{X,\varphi,\{a,b\}\}$

Closed set are $\{X,\varphi,\{c\}\}$

$sg\alpha\omega\ -closed\ set\ are\ \{X,\varphi,\{c\},\{b,c\},\{a,c\}\}.$

$sg^*\alpha\omega\ -closed\ sets\ are\ \{X,\varphi,\{c\},\{b,c\},\{a,c\}\}$

Theorem 2.1

Every closed set is $sg^*\alpha\omega - closed\ set.$

Proof:

Let $A \subseteq U and\ U\ is\ sg\alpha\omega -\ open\ in\ (X,\tau)$.

Since, A is closed, $cl(A) = A$

$cl(A) = A \subseteq U and\ U\ is\ sg\alpha\omega - open.$

Therefore $cl(A) \subseteq U and\ U\ is\ sg\alpha\omega - open$

$A\ is\ sg^{*}\alpha\omega - closed\ set.$

The converse of the above theorem need not be true which can be seen from the following example.

Example 2.2

Let $X = \{a, b, c)\ \tau = \{X, \varphi, \{a, b\}\}$

Let $A = \{b, c\}$

Closed set are $\{X, \varphi, \{c\}\}$

$sg^{*}\alpha\omega\ - closed\ sets\ are\ \{X, \varphi, \{c\}, \{b, c\}, \{a, c\}\}$

$A\ is\ sg^{*}\alpha\omega - closed\ set.\ but\ not\ a\ closed\ set\ in\ \{X, \tau\ \}.$

Theorem 2.2

Every $sg^{*}\alpha\omega - closed\ set\ is\ g - closed\ set.$

Proof:

Let $A\ be\ any\ sg^{*}\alpha\omega - closed\ set.$

Let $A \subseteq U and\ U\ be\ open\ in\ (X, \tau\ ).$

But every open set is $sg\alpha\omega - open\ set.$

$\therefore A \subseteq U and\ U\ is\ sg\alpha\omega - open$

We have $cl(A) \subseteq U, whenever\ A \subseteq U and\ U\ is\ sg\alpha\omega - open.$

Which implies $A\ is\ g - closed\ set.$

The converse of the above theorem need not be true which can be seen from the following example.

Example 2.3

Let $X = \{a, b, c)\ \tau = \{X, \varphi, \{a\}\}$

Let $A = \{b, c\}$

Closed set are $\{X, \varphi, \{c\}\}$

$g - closed\ set\ are\ \{X, \varphi, \{b\}, \{a, b\}, \{b, c\}, \{a, c\}$

$sg^{*}\alpha\omega\ - closed\ sets\ are\ \{X, \varphi, \{b, c\}\}$

$A\ is\ sg^{*}\alpha\omega - closed\ set.\ but\ not\ a\ closed\ set\ in\ \{X, \tau\ \}.$

Theorem 2.3

Every $sg^{*}\alpha\omega$ −closed set is $g\beta$ − closed set.

Proof:

Let $A\ be\ any\ sg^{*}\alpha\omega - closed\ set.$

Let $A \subseteq U and\ U\ be\ open\ in\ (X, \tau\ ).$

But every open set is $sg\alpha\omega - open\ set.$

$A \subseteq U and\ U\ is\ sg\alpha\omega - open$

$cl(A) \subseteq U\ whenever A \subseteq U and\ U\ is\ sg\alpha\omega - open.$

$cl(A) \subseteq U, U\ is\ sg\alpha\omega - open.$

$but\ \beta cl(A) \subseteq cl(A) \subseteq U$

$\beta cl(A) \subseteq U, whenever\ A \subseteq U, U\ is\ open$

$A\ is\ g\beta - closed\ set.$

The converse of the above theorem need not be true which can be seen from the following example.

Example 2.4

Let $X = \{a, b, c)\ \tau = \{X, \varphi, \{a\}\}$

Let $A = \{a\}$

Closed set are $\{X, \varphi, \{c\}\}$

$closed\ set\ are\ \{X, \varphi, \{c\}\}$

$g - closed\ set\ are\ \{X, \varphi, \{a\}, \{b\}, \{a, b\}, \{b, c\}, \{a, c\}$

$g\beta - closed\ set\ are\ \{X, \varphi, \{a\}, \{b\}, \{c\}, \{b, c\}, \{a, c\}$

$sg^{*}\alpha\omega\ - closed\ sets\ are\ \{X, \varphi, \{c\}, \{a, c\}, \{b, c\}\}$

$A\ is\ g\beta - closed\ but\ not\ a\ sg^{*}\alpha\omega - closed\ set\ in\ \{X, \tau\ \}.$

Theorem 2.4

Every $sg^{*}\alpha\omega\ - closed\ set$ is a g s-closed.

Proof:

Let $A\ be\ any\ sg^{*}\alpha\omega - closed\ set.$

Let $A \subseteq U and\ U\ be\ open$

But every open set is $sg\alpha\omega - open\ set.$

Then, $A \subseteq U and\ U\ is\ sg\alpha\omega - open$

We assumption, $cl(A) \subseteq U\ whenever A \subseteq U and\ U\ is\ sg\alpha\omega - open.$

$but\ scl(A) \subseteq cl(A) \subseteq U$

$scl(A) \subseteq U$

$A\ is\ gs - closed\ set.$

The converse of the above theorem need not be true which can be seen from the following example.

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Example 2.5

Let $X = \{a, b, c)\ \tau = \{X, \varphi, \{a\}\}$

Let $A = \{a, b\}$

$closed\ set\ are\ \{X, \varphi, \{c\}\}$

$gs - closed\ set\ are\ \{X, \varphi, \{b\}, \{c\}, \{a, b\}, \{b, c\}, \{a, c\}$

$sg^{*}\alpha\omega\ - closed\ sets\ are\ \{X, \varphi, \{b, c\}\}$

$A\ is\ gs - closed\ but\ not\ a\ sg^{*}\alpha\omega - closed\ set\ in\ \{X, \tau\ \}.$

Theorem 2.5

Every $sg^{*}\alpha\omega\ - closed\ sets$ is rg-closed set.

Proof:

Let $A\ be\ any\ sg^{*}\alpha\omega - closed\ set.$

Let $A \subseteq U and\ U\ be\ open$

Then, $cl(A) \subseteq U and\ U\ is\ sg\alpha\omega - open$ since every open set is $sg\alpha\omega - open\ set.$

$cl(A) \subseteq U\ whenever A \subseteq U and\ U\ is\ sg\alpha\omega - open.$

$but\ bcl(A) \subseteq cl(A) \subseteq U$

Therefore $bcl(A) \subseteq U$

$A\ is\ gb - closed\ set.$

The converse of the above theorem need not be true which can be seen from the following example.

Example 2.6

Let $X = \{a, b, c)\ \tau = \{X, \varphi, \{a\}\}$

Let $A = \{a\}$

$closed\ set\ are\ \{X, \varphi, \{c\}\}$

$b - closed\ set\ are\ \{X, \varphi, , \{b\}, \{a\}, \{a, b\}, \{b, c\}, \{a, c\}$

$gb - closed\ set\ are\ \{X, \varphi, \{a\}, \{b\}, \{c\}, \{b, c\}, \{a, c\}$

$sg^{*}\alpha\omega\ - closed\ sets\ are\ \{X, \varphi, \{c\}, \{a, c\}, \{b, c\}\}$

$A\ is\ gb - closed\ but\ not\ a\ sg^{*}\alpha\omega - closed\ set\ in\ \{X, \tau\ \}.$

Theorem 2.6

Every $sg^{*}\alpha\omega\ - closed\ sets$ is rbg-closed set.

Proof:

Let $A\ be\ any\ sg^{*}\alpha\omega - closed\ set.$

Let $A \subseteq U and\ U\ be\ regular\ open$

Since, regular open $\Longrightarrow$ open

Then,$A \subseteq U, U\ is\ open$

But every open set is $sg\alpha\omega - open\ set.$

Then, $A \subseteq U and\ U\ is\ sg\alpha\omega - open$

Since A is $sg^{*}\alpha\omega - closed\ sets\ we\ have\ cl(A) \subseteq U\ whenever A \subseteq$

$U and\ U\ is\ sg\alpha\omega - open.$

$but\ bcl(A) \subseteq cl(A) \subseteq U$, Uis regular open

$bcl(A) \subseteq U, U\ is\ regular\ open$

$A\ is\ rgb - closed\ set.$

The converse of the above theorem need not be true which can be seen from the following example.

Example 2.7

Let $X = \{a, b, c)\ \tau = \{X, \varphi, \{a, b\}\}$

Let $A = \{a, b\}$

$closed\ set\ are\ \{X, \varphi, \{c\}\}$

$b - closed\ set\ are\ \{X, \varphi, \{b\}, \{a\}, \{a, b\}, \{b, c\}, \{a, c\}$

$Regular\ open\ sets\ are\ \{X, \varphi\}$

$rgb - closed\ set\ are\ \{X, \varphi, \{a\}, \{b\}, \{c\}, \{a, b\}, \{b, c\}, \{a, c\}$

$sg^{*}\alpha\omega - closed\ sets\ are\ \{X, \varphi, \{c\}, \{a, c\}, \{b, c\}\}$

$A\ is\ rgb - closed\ but\ not\ a\ sg^{*}\alpha\omega - closed\ set\ in\ \{X, \tau\}.$

Theorem 2.7

Every $sg^{*}\alpha\omega - closed\ sets$ is sbg -closed set.

Proof:

Let $A\ be\ any\ sg^{*}\alpha\omega - closed\ set.$

Let $A \subseteq U and\ U\ semi\ open$

Since every semi-open set is $sg\alpha\omega - open\ set$ we have $A \subseteq U and\ U\ is\ sg\alpha\omega - open$

Therefore we have $cl(A) \subseteq U\ whenever A \subseteq U and\ U\ is\ sg\alpha\omega - open.$

$but\ bcl(A) \subseteq cl(A) \subseteq U$ and therefore $bcl(A) \subseteq U, U\ is\ semi - open$

This implies $A\ is\ sgb - closed\ set.$

The converse of the above theorem need not be true which can be seen from the following example.

Example 2.8

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Let $X = \{a, b, c)\ \tau = \{X, \varphi, \{a, b\}\}$

$closed\ set\ are\ \{X, \varphi, \{c\}\}$

Let $A = \{a\}$

$semi - open\ sets\ are\ \{X, \varphi, \{a, b\}\}$

$b - closed\ set\ are\ \{X, \varphi, , \{b\}, \{a\}, \{a, b\}, \{b, c\}, \{a, c\}$

$sgb - closed\ set\ are\ \{X, \varphi, \{a\}, \{b\}, \{c\}, \{b, c\}, \{a, c\}$

$sg^*\alpha\omega\ - closed\ sets\ are\ \{X, \varphi, \{c\}, \{a, c\}, \{b, c\}\}$

$A\ is\ sgb - closed\ but\ not\ a\ sg^*\alpha\omega - closed\ set\ in\ \{X, \tau\}.$

Theorem 2.8

Every $sg^*\alpha\omega\ - closed\ sets$ is gp -closed set.

Proof:

Let $A\ be\ any\ sg^*\alpha\omega - closed\ set.$

Let $A \subseteq U and\ U\ be\ open$

Since every open set is $sg\alpha\omega - open\ set$we have $A \subseteq U and\ U\ is\ sg\alpha\omega - open$

By our assumption, $cl(A) \subseteq U\ whenever A \subseteq U and\ U\ is\ sg\alpha\omega - open.$

$but\ pcl(A) \subseteq cl(A) \subseteq U,$ and hence $pcl(A) \subseteq U, U\ is\ open$

Therefore $A\ is\ gp - closed\ set.$

The converse of the above theorem need not be true which can be seen from the following example

Example 2.9

Let $X = \{a, b, c)\ \tau = \{X, \varphi, \{a, b\}\}$

$closed\ set\ are\ \{X, \varphi, \{c\}\}$

Let $A = \{a\}$

$pre - open\ sets\ are\ \{X, \varphi, \{a\}, \{b\}, \{a, b\}, \{b, c\}, \{a, c\}\}$

$gp - closed\ set\ are\ \{X, \varphi, \{b\}, \{a\}, \{a, b\}, \{b, c\}, \{a, c\}$

$sg^*\alpha\omega\ - closed\ sets\ are\ \{X, \varphi, \{c\}, \{a, c\}, \{b, c\}\}$

$A\ is\ gp - closed\ but\ not\ a\ sg^*\alpha\omega - closed\ set\ in\ \{X, \tau\}.$

Theorem 2.9

Every $sg^*\alpha\omega\ - closed\ sets$ is αg -closed set.

Proof:

Let $A\ be\ any\ sg^*\alpha\omega - closed\ set.$

Let $A \subseteq U and\ U\ be\ open$

We know that every open set is $sg\alpha\omega - open\ set.$

Then, $A \subseteq U and\ U\ is\ sg\alpha\omega - open$

By our assumption, $cl(A) \subseteq U\ whenever A \subseteq U and\ U\ is\ sg\alpha\omega - open.$

$but\ \ \alpha cl(A) \subseteq cl(A) \subseteq U$, and hence $\alpha cl(A) \subseteq U, U\ is\ \ open$

Which implies $A\ is\ \alpha g - closed\ set.$

The converse of the above theorem need not be true which can be seen from the following example

Example 2.10

Let $X = \{a, b, c)\ \tau = \{X, \varphi, \{a\}\}\ and\ closed\ set\ are\ \{X, \varphi, \{c\}\}$

Let $A = \{a, b\}$

$\alpha - closed\ sets\ are\ \{\ X, \varphi, \{a\}, \{b\}, \{c\}, \{b, c\}\}$

$\alpha g - closed\ set\ are\ \{X, \varphi, \{b\}, \{a\}, \{a, b\}, \{b, c\}, \{a, c\}$

$sg^*\alpha\omega\ \ - closed\ sets\ are\ \{X, \varphi, \{c\}, \{b, c\}\}$

$A\ is\ \alpha g$ -closed set. $but\ not\ a\ sg^*\alpha\omega - closed\ set\ in\ \{X, \tau\ \}.$

Theorem 2.10

Union of two $sg^*\alpha\omega - closed\ sets\ is\ sg^*\alpha\omega - closed\ set.$

Proof:

Let A and B be two $sg^*\alpha\omega - closed\ sets.$

Let $A \cup B \subseteq U\ and\ U\ be\ any\ sg^*\alpha\omega - open\ set\ in\ (X, \tau).$

Then $A\ \subseteq U\ and\ B \subseteq U$

Since, A and B are $sg^*\alpha\omega - closed\ set\ \ we\ have\ cl(A) \subseteq U\ and\ cl(B) \subseteq U$

$\Longrightarrow cl(A) \cup cl(B) \subseteq U$

$but\ cl(A) \cup cl(B) = cl(A \cup B)$

$\Longrightarrow cl(A \cup B) \subseteq U$

Hence $A \cup B\ is\ sg^*\alpha\omega - closed\ sets.$

3. SOME CHARACTORIZATIONS

Theorem 3.1

If a subset A is $sg^*\alpha\omega - closed\ sets$ in $\{X, \tau\}$ then $cl(A) - A$ does not contain any non- empty $sg\alpha\omega - closed\ sets\ in\ \{X, \tau\}.$

Proof:

Let A be $sg^*\alpha\omega - closed\ sets$ and F be a non – empty $sg\alpha\omega - closed\ subset$ of $cl(A) - A.\ \ ie)F \subseteq cl(A) - A$

Then $F \subseteq cl(A)\ and\ F \subseteq X - A$

$F \subseteq cl(A) \cap X - A$

Since, F is $sg\alpha\omega - closed\ set$ then X-F is $sg\alpha\omega - open\ set, A \subseteq X - F.$

Since A is $sg^{*}\alpha\omega - closed$ then $cl(A) \subseteq X - F.$

$\Longrightarrow F \subseteq X - cl(A)$

$\therefore F \subseteq cl(A) \cap \big(X - cl(A)\big) = \varphi$

$\Longrightarrow F = \varphi$

Hence the theorem.

Theorem 3.2

If A is $sg^{*}\alpha\omega - closed\ sets$ in X then $A \subseteq B \subseteq cl(A), then\ B\ is\ also\ sg^{*}\alpha\omega - closed\ sets\ in\ X$

Proof:

Suppose A be $sg^{*}\alpha\omega - closed\ sets$

Assume that A is $closed = cl(A) = A.\ \ Therefore\ cl(A) - A = \varphi$

But, φ is $sg\alpha\omega - closed$ therefore $cl(A) - A\ is\ sg\alpha\omega - closed$

Conversely assume that $cl(A) - A\ is\ sg\alpha\omega - closed$

Then $cl(A) - A = \varphi,\ since$ A be $sg^{*}\alpha\omega - closed\ sets$

$\Longrightarrow cl(A) - A = \varphi$

$\Longrightarrow A\ is\ closed.$

Hence the theorem.

Theorem 3.3

Let A be$sg\alpha\omega - closed$ and $sg^{*}\alpha\omega - closed\ sets$ in X then A is closed.

Proof:

Suppose A is $sg\alpha\omega - closed$ and $sg^{*}\alpha\omega - closed\ sets$ in X.

Since $A \subseteq A, then\ we've\ cl(A) - A = \varphi$

but $A \subseteq cl(A).\ \ \therefore cl(A) = A$

$\Longrightarrow A\ is\ closed\ set\ in\ X.$

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SIGNIFICANCE OF PANCHA BHUTHAS AND PANCHA BHUTHA STHALAS COMPOSITIONS

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Abstract

Pancha Bhutha are the five great elements , also five physical elements is a group of five basic elements which according to Hinduism is the basis of all cosmic creation. These elements have different characteristics and these also account for different faculties of human experience. The entire world is occupied with Pancha bhuthas. Pancha Bhuthas are Prithvi, Appu, Agni, Vayu and Akasha. These elements are essential for human body. This Pancha Bhuthas are associated with overall health of human being. To insist the importance of Pancha Bhuthas Many saint composers have composed Padigams, Keerthanas and Kritis in praise of Pancha Lingam and Stala. Increasing and decreasing level of Pancha Bhuthas in our body creates lot of complications in the form of disease. Pancha Bhutha Nadi in our wrist shows the level of Pancha Bhutha in our body. It helps to find out the bhutha status in our body to keep the pancha Bhutha level equal. While visiting the Pancha Bhutha shrine and chant the padigams and sing the kritis in praise of Pancha bhuthas and lingam keeps our body fit. The purpose of this article is to impart the significance of Pancha Bhutha Stala compositions and the role of Pancha bhootha in our body. Pancha Linga Stala Kirtanas composed by Sri Muthuswamy Dikshitar in Pancha Bhutha Sthalas. Pancha Bhuthas are the basic building blocks of the Universe, human beings, animals and plant. Five bhuthas are equally important and inter related. After analysing the Sthala history and Pancha Bhutha Sthala compositions and Padigams those who recite and sing the padigams and Kriti composed in praise of Pacha Bhutha Sthalas with complete devotion Pancha bhuthas in our body will remain balance.

Keywords : Pancha Bhuthas, Prithvi, Appu, Theyu, Vayu, Akasha, Sthala, Lingam, Nadhi, Padigams, Garbhagraha, Avatar , Pradakshinam, Nadi, Sorkattu, Mudra

Introduction

Pancha Bhutha are five great elements and also five physical elements, is a group of five basic elements which, according to Hinduism is the basis of all cosmic creation. These elements are Prithvi - Earth, Appu - Water, Agni - Fire, Vayu - Air, and Akasha - Space. They represent the physical and energetic qualities of the human body and of the physical world. The ebb and flow of these five elements influence our physical, mental and emotional wellbeing. Muthuswamy Dikshithar one among the trinity has composed the Pancha linga Sthala Kritis to

insist the importance of Pancha Bhuthas to human being. Most of the composers have composed many padigams and compositions in praise of Pancha Bhuthas. While reciting and singing the padigams and compositions in praise of Pancha Bhutham and visiting the Pancha Bhutha stalam will reduce the complication created by Pancha Bhutham in our body and keep our body fit. For this article I have analyze Muthuswami Dikshithar's Pancha Linga Sthala Kritis.

Pancha Bhutha or Five Elements

Pancha Bhuthas are Earth(Prithvi or Bhoomi), Water-Appu (Jala or Varuna), Teyu – Fire (Agni), Vayu – Air , Space(Akasha). Pancha Bhuthas are the basic elements that make up any living organism on Earth or anywhere else in the Universe. Below table gives a reference on what component of the human body is associated with these elements. Each of the five finger in human beings is also associated with a particular element.

Table 1: Pancha Bhuthas and Human Body

Bhutha (Element)	**Human Body Component**	**Associated Finger**	**Associated consort**	**Characteristic principle**	**Sense Organs**
Akasha/Dyaus (Space)	Astral body	Middle Finger	Bhumi/Prithivi	Sound	Ears
Vayu (Air)	Air	Index Finger	Lehari	Touch	Skin (*tvac*)
Agni (Fire)	Body Heat	Thumb	Swaha	Form-colour (*Rupa*)	Eyes
Jala/Varuna (Water)	Water (incl blood)	Little Finger	Varuni	Taste (*rasa*)	Tongue
Bhumi/Prithivi *(Earth)*	Flesh, bones & organs	Ring Finger	Dyaus/Akasha	Smell	Nose

Nadi Pariksha can accurately dignose physical, mental and emotional imbalances as well as diseases happening by Pancha bhutha. Following pictures represents the Pancha bhuthas occurs in Right and Left hand. While examine this nadi by experts they will easily diagnosis the Pancha bhutha fluctuation in our body.

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Pancha Bhutha Nadis

Right Hand First Nadi represents Air
Left hand First Nadi represents Fire

Right Hand second Nadi represents Earth
Left hand second Nadi represents Space

Right Hand Third Nadi represents Fire
Left Hand Third Nadi represents water

Pancha Bhutha Sthalas

Pancha means five, Bhutha means elements, Sthala means place. Pancha Bhutha Sthala refers to five temples dedicated to Shiva, each representing a manifestation of the five prime elements of nature; Earth- Kanchipuram, Water - Thiruvanaikkovil, Fire- Thiruvannamalai, Air- Kalahasthi and Space- Chidambaram. The temples are located in South India. Among five, four are located in Tamil Nadu and the remaining one is located in Andra Pradesh. The five elements are believed to be enshrined in the five Lingas. Muthuswami Dikshithar one among the Musical Trinity has composed Panch Linga sthala kritis in praise of the above Pancha Bhutha Lingas. Apart from Muthuswami Dikshithar, Saint composers like Sambandar, Appar, Sundarar, Arunagirinathar, Manikkavasagar and composers lived in the recent past Veena Kuppaiyar,Ramalinga Vallalar, Papanasam Sivan, Periyasami thooran,

Gopalakrishna Bharathy, Suddananda Bharathi, Sri Neelakanda Sivan, Mahavaidhyanatha Iyer, Muthuthandavar, Marimuthapillai, Arunachalakavirayar, Ramaswami Sivan, Ponnaiya etc were composed in praise of Pancha bhutha stala deity. Dikshithar's Pancha linga sthala kriti is taken for this research article.

Prithivi –(Earth)- Kanchipuram

Prithvi Linga is in Ekambaranatha temple at Kanchipuram. In this temple, Shiva in the form of earth is worshipped. Ekamranatha, residing at the root of a mango tree. The mango tree is 3500 years old tree to produce four different kinds of Mangoes. The mango tree is preserved till date. A panel depicting Shiva as Somaskanda (Shiva with Parvathi and Skanda) is below this mango tree . Behind the Prithvi (Earth) Linga in the Garbhgraha Shiva Parvati marriage scene is depicted. The journey to consciousness begins at Prithivi, the Earth element. Earth manifests in the body in the solid structures of our bones, muscles, nails, hair, and teeth. Its associated sense organ is the nose. Muthuswamy Dikshithar has composed Chinthayama Kriti in Bhairvi Raga and Rupaka Tala in praise of Prithvi Linga. The anupallavi states that Shiva's feet provide empires. An empire is also an earthly possession. In the charanam, there are allusions to the God of Love and the God of Death (Shiva excels Madana in beauty and quelled Yama) both important personages for humans. The last lines speak of the deity as Bhairavi prasanga (embraced by Parvati). This brings in the raga mudra and also refers to the purana here where Parvati worshipped Shiva in the form of linga made of sand. While singing and reciting the Kritis and hymns in praise of this Prithivi lingam with repeatedly devotion and the physical presence in this sthalam Our body organs related to this Earth will be fit.

Appu-(Water) - Thiruvanakkovil

Thiruvanakkovil is the Appu (water) Sthala. The Jumbukeswara temple, located in Thiruvanaikoil, represents the element water. Water is important for all the human beings in the world. Equal ratio of water must be present in our body. Water manifests in the body as blood, lymph, tears, saliva, sweat, urine, semen, and breast milk. To insist the importance of water Dikshithar and many composer have composed many padigams and kritis. The sanctum of Jambukeswara has an underground water stream and in spite of pumping water out, it is always filled with water. Lord Shiva sent Parvati to Earth to do penance after she mocked him. Parvati took on the avatar of Goddess Akilandeswari and came to the Jambu forest. She made a Shiva lingam out of the waters of river Cauvery and worshipped it. Moved by her penance,

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it is said that Lord Shiva finally came down himself and taught Akilandeswari the Siva Gnana. Parvathi in the form of Akilandeswari as per Shiva's wish found Jambu (the white Naval tree) forest (Thiruvanaikoil) to conduct her penance. Dikshitar has composed Jhambu pathey kriti in Yamuna Kalyani raga. This is a song steeped in fluid symbolism. The pallavi asks the Lord to give the nectar of bliss. The anupallavi states that He is worshipped by Brahma who is seated on the lotus which is born in water and that He quenches the fires (sorrows) of the heart. Then it states that He is the Lord of the rivers Sindhu, Ganga, Kaveri, Yamuna (also the raga mudra) and Goddess Akhilandeshwari who has a throat like a conch (which is of water origin). The charanam refers to the sthala puranam and says that the Lord here is the water Linga worshipped by the daughter of the mountains and residing at samajatavi (the forest of elephants).To maintain balanced water element in our body we must visit the Appu Sthala and chant padigams and kritis.

Agni - Thiruvannamalai

The Arunachaleswarar Temple depicts the Fire element bestowed by Shiva and is represented by the *Agni Lingam*. Fire is an essential element in our body Fire element represents in the body as Hunger, thirst, fear, sleep, lethargy and tiredness. The Lord manifests as fire at Tiruvannamalai. Called Arunachalanatha. Once upon a time, Goddess Parvathi playfully closed the eyes of Shiva. This led to a blackout in the universe for thousands of years. Upon penance by His devotees, Shiva appeared as a column of fire on the Annamalai hill in Thiruvannamala. When Lord Vishnu and Lord Brahma contested for superiority, Shiva appeared as a flame and challenged Them to find His source. Lingothbhava appeared .Brahma and Vishnu failed to find the source.

Muthuswamy Dikshithar's kriti in Saranga raga, arunacalanatham, Taking fire as the theme, he says the Lord is like many suns at dawn. The charanam says that He is the ancient effulgent Shiva Linga. It has been scientifically proven that the rock of Arunachala is one of the oldest on earth and has a fiery origin, either a volcanic eruption or a meteor strike. The Linga itself is unusual for it is grey in colour bringing to mind a stone of volcanic origin. Dikshitar states that the Lord bears a Saranga (deer) in His hand, thereby bringing in the raga mudra. The last line once again brings in the fire motif – the Lord's effulgence puts the sun, the moon and fire to shame. sAranga is a synonym for camphor, an easily flammable substance. While singing the compsititions and doing pradakshinam in this temple the sthala vibration will reach our body and maintain the above organs normal.

Vayu (Air)- Kalahasthi

Kalahasthi is the Vayu Sthala. It is located at Andrapradesh. Lord shiva is present here in the form of Air. Air is the essential element for all the human beings. Without air nobody will alive. Air manifest in the body by Swift movement, jump, eating, contraction and expansion. Lord Shiva present inside in each and every human being in the form of Air Srikalahasti gets its name from Sri – a spider, Kala – a snake, and Hasti – an elephant. These creatures had pleased Shiva with their selfless devotion. shri kalahastisha in raga Huseni is on Shiva as Vayu Linga composed by Dikshithar. A lamp that keeps flickering in the rather airless sanctum shows the manifestation of Shiva as air here. The song says Shiva is like the zephyr to his devotees. The anupallavi states that He is the life breath of the Gods and manifests as the five elements, for all five have shrines for themselves here. The shrine is referred to Dakshina Kailasa (the Southern equivalent to Kailasa). The charanam says the Lord here is the consort of Gnanaprasoonambika. The last line speaks of Kannappa Nayanar as the lowly huntsman who worshipped the Lord here and made the shrine famous. By praying inside and outside we can keep the Air element present in our body balanced.

Akasa (Space)- Chidambaram

Chidambaram represents Akasa sthalam. Akasa element quality in our body is Anger, jealousy, shame, fear and delusion The word Chidambaram derives from ‘Chit’ which means ‘conscience’ and ambaram is ‘heaven’ This refers to the Chithakasam. Chidambaram is the shrine where Shiva is worshipped as Space. The sanctum has the world-famous icon of Nataraja, the dancing deity beside which is an empty space referred to as Chidambara Rahasyam or the secret of Chidambaram. The very word Chidambaram is full of cosmic symbolism for it refers to the space within the heart of the devotee where the Lord is said to be in cosmic dance as depicted by Nataraja. Dikshitar’s kriti here is Ananda natana prakasham in raga kedara. The song opens with the lines describing the Lord as being effulgent in dance and as the Lord of Sivakamavalli. The first lines of the anupallavi, emphasising the space motif, describe the Lord’s effulgence as being equal to many suns. The last line of the anupallavi has the legend behind the temple as it states that Shiva displayed himself with an uplifted foot to Patanjali and Vyaghrapada here. The charanam, continuing on the space theme, says the Lord bears the moon and the Ganga (which is believed to be of heavenly origin) and has a blue neck, the colour blue once again indicating space. The importance of Chidambaram as the foremost Shaivaite shrine is emphasised when the composer says Nataraja here is the basis for all shrines beginning with Kedara. The raga name is also incorporated here. Legend has it that 3000 sages

left for Chidambaram from Kailasa and on reaching their destination found one missing. The Lord then indicated that He was that person and counting Him in would make 3000. This is highlighted in the line "bhusura trisahasra munishvaram". The song, in keeping with one dedicated to a dancing deity has sollukattus to be sung at the end of the anupallavi and charanam. Each and every human being should pray the almighty to improve good qualities and to reduce unwanted qualities in this sthala with deep devotion.

Conclusion

The existence of Pancha Bhuthas in our body and in the universe created by god is a wonderful thing. Maintaining these pancha Bhuthas in a required level both in the universe and in our body is more important. Earth, Water and Fire are tangible things that can be touched or seen; they exist as matter. Space and Air are intangible yet they exist everywhere around us, even though we cannot see it. Earth, Water and Fire are therefore easier for us to understand than Space and Air because they have more concrete forms. However, all five elements are equally important and interrelated. .Each Pancha Bhutha sthala creates positive energy. Pradakshidanam done by the devotees in these temples keeps our body fit. The songs in praise of these pancha bhutha sthalam and lingam by Muthuswami Diskshithar, Saint composers and various composers have given and insists the importance of Sthala, Element importance, puranic story etc., Human beings must understand the importance of these sthalas and maintain their health by keeping Pancha bhuthas in its level.

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ROLE OF CONDIMENTS AND SPICES AS FUNCTIONAL FOODS

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Abstract

Condiments and spices and aromatic herbs have been used as preservatives, colorants, and flavor enhancers. Condiments and spices, which have long been the basis of traditional medicine in many countries, have also been the subject of study, particularly by the chemical, pharmaceutical, and food industries, because of their potential use for improving health. Both in vitro and in vivo studies have demonstrated how these substances act as antioxidants, digestive stimulants, and hypolipidemic and also show antibacterial, anti-inflammatory, antiviral, and anticancerogenic activities. These beneficial physiological effects may also have possible preventive applications in a variety of diseases. The aim of this review is to present an overview of the potential of condiments and spices as functional foods.

Keywords: Condiments, Aromatic herbs, Functional foods

Introduction

Functional foods are described as "foods that provide health benefits beyond basic nutrition". These condiments and spices are needed for normal bodily functions to continue(1). Condiments and spices play a vital role in this scenario in a variety of ways. Identifying specific bioactive compounds and their benefits play a vital role in human health, cancer, and mental health and cognition. Future studies of condiments and spices' exhibit possible contributions to health and wellbeing(2). The true benefits of including them in one's diet, as with most foods, are likely to emerge with a greater understanding of the health attributes best supported by food. Currently, guidelines for the consumption of foods high in bioactive ingredients, such as condiments and spices, are required in present situation(3). In these context .the current review are done to see more clinical evidences supporting the advantages of condiments and spices in overall health maintenance and disease prevention.

Aniseeds

Aniseed plant is one of the oldest medicinal plants. Primarily aniseed is grown for its fruits called aniseeds. The suitable harvest period is between August and September. This medicinal plant has many functions for our body. Consumption of these seeds in lactating women increases milk secretion and hence it can be used as good and safe lactogogue in lactating mothers. Apart from this consumption of these seeds improve our digestive system and relieving gastro intestinal spasms and constipation(4). In the food industry it is used as flavoring agents for fish products, ice creams, gums. This can also be used as a disinfectant. In the traditional medicine it is used as a diuretic.

This can be considered as anti bacterial, anti fungal , anti viral, muscle relaxant, anticonvulsant ,analgesic, antiulcer, hypolipidemic and antioxidant.

Dhania Seeds

This belongs to the family of functional food. Here seeds are widely used in medicine, pharmaceutical industry and food industry. These plants are rich in essential oil that gives a characteristic aroma .These plants have potent antioxidant and antimicrobial activities. They have hypoglycemic and hypolipidemic effects(5). These plants are also considered to have anti cancerous properties. This Apiaceace plants are determined by the roles and functions of there essential oils(6).

Asafoetida

The main role of asafoetida is to treat functional dyspepsia. Though many drugs are available for functional dyspepsia asafoetida is considered to be the safest drug for treating functional dyspepsia(7). Pharmacological studies have reported the antioxidants, antiviral, antimicrobial, antidiuretic and gastro protective activities of asafoetida(8).

Good digestion is essential component for good quality of life and well being .Though number of botanical supplements are currently available for GUT health , the majority of them have failed to provide satisfactory results. Hence, asafoetida is one of the most common food additives in India and other Asian countries for good digestion(9).

Cardamon

Cardamon is one of the richest food additives. The main role of cardamon is to prevent oxidative stress in many degenerative diseases(10). The cardamon contains

flavonoids, vitamin C and essential oils which are known potential antioxidants compounds. Hence, cardamon is considered to be a potential functional food ingredient(11).

Cinnamon

Cinnamon is a spice obtained from the inner bark of several tree species from the genus Cinnamomum. Cinnamon is used mainly as aromatic condiment and flavoring additive in wide variety of sweets, breakfast, cereal snacks, teas and traditional foods. The aroma and flavour of cinnamon derive from its essential oil and principal component, cinnamaldehyde(12).

The barks, leaves, twigs, roots , wood and fruits of cinnamon can be easily utilized for producing volatile oils. The age of barks and leaves of cinnamon significantly influence the chemical composition of volatile oils. Cinnamon is considered to be a traditional remedy and used as a medicinal plant in many countries around the world. Cinnamon shows anti inflammatory activity, anti cancerous activity and also beneficial in peptic ulcer disease, gastric cancer and cardio vascular diseases(13). In particular cinnamon essential oil has the ability to prevent the cervical cancer. Cinnamon is also good antidiabetic and prevents the micro vascular complications like retinopathy, nephropathy, neuropathy, cardiovascular diseases, stroke, depression , dementia and sexual dysfunction(14). It is also considered as a good agent to reduce cholesterol and triglyceride levels. It increases the Good cholesterol (HDL)level in the blood. Recent studies have shown cinnamon can prevent microorganism induced food spoilage. This can also be considered as antioxidant(15).

Bay Leaves

Bay leaves provide minimal calories but excess fibre, vitamins , minerals and antioxidants. These leaves are good source of Vitamin A, Vitamin B6 and Vitamin C. These vitamins support the human immune system. Apart from this it improves digestion and reduces the risks of Type 2 Diabetes mellitus. Bay leaves can also be given in pregnancy and breast feeding period. Bay leaves will improve insulin functions and prevents the complications of Type 2 Diabetes mellitus(16).

Cloves

Red clover extract is an active antioxidant. It is a rich source of isoflavones which have good estrogenic effect. Red clover is regarded as potent antioxidant and good scavenging agent and used as functional food ingredient in dietary food supplementation .This can also been used

as alternative hormone replacement therapy as selective estrogen receptive modulators and can be used in the management of menopause. As this is having free radical scavenging activity it can prevent atherosclerosis and cardio vascular diseases. Apart from this it also has many other biological activities including vasodilatation, anti inflammatory, anti allergic, antiviral, antibacterial and inhibition of specific enzymes.

Conclusion

Today the incidence of degenerative diseases is getting higher. Oxidative stress is a major factor in the development of degenerative and chronic diseases, such as cancer, arthritis, aging, autoimmune, cardiovascular and neurodegenerative diseases. Endogenous and exogenous antioxidants work as free radical scavengers, by protecting cells from attack by Reactive Oxygen Species (ROS) and Reactive Nitrogen Species (RNS) or repairing them. These antioxidants can also increase immunological defenses and reduce some of the risks of degenerative diseases. The functional components present in condiments and spices play a crucial role in preventing many degenerative diseases.

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HEALTH CONSEQUENCES OF JUNK FOODS

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Abstract

Maintaining a healthy diet and lifestyle is crucial for longevity. Unfortunately, our modern world has become accustomed to a food consumption system that has numerous detrimental effects on our health. Globalization and urbanization have greatly influenced our eating habits, compelling many individuals to indulge in fancy and high-calorie fast foods, commonly referred to as "Junk foods". Extensive research has shed light on the potential health hazards associated with the consumption of such high-calorie foods. To address this issue, it is imperative to provide comprehensive knowledge regarding eating habits, nutritional aspects, the quality of unhealthy foods, their impact on health, and preventive measures. This will help create awareness and promote health education, fostering a shift towards better eating practices. By prioritizing health education and awareness, we can combat this issue and encourage individuals to make informed choices that contribute to their overall well-being.

Keywords: Diseases, Health, Junk food, Lifestyle

Introduction

Good health is the necessity of living a healthy existence for every person which needs to maintain a healthy diet and healthy habits throughout the life. Concepts, relationships, lifestyles are metamorphosed to accommodate the new jet age and eating habits too is no exception. Healthy nutritious foods have been replaced by the new food mantra - JUNKFOOD! It seems to have engulfed every age; every race and the newest entrants on stage are children, school going in particular.

USA, Canada, Britain, Australia, Japan, Sweden etc. are the countries with most junk food consumption around the world. India is no exception to this changing fast-food trend. Statistics place India in 10^{th} place in fast food per capita spending figures with 2.1% of expenditure of annual total spending.

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Definition

Michael Jacobson Director of the Center for Science, Washington D.C. aptly coins the phrase junk food in 1972. Junk food simply means a calorie rich food which is easy to carry, purchase and consume. It is also called as HFSS (High fat, sugar or salt).

Composition

Junk food comprises of anything that is quick, tasty, convenient and fashionable. It contains high levels of refined sugar, white flour, trans fat, poly unsaturated fat and salt. It is given a very attractive appearance by adding food additives such as monosodium glutamate and tartrazine, colours to enhance flavour, texture and for increasing long shelf life. At the same time, it is lacking in proteins, vitamins, minerals and fiber.

Types

Various types of junk food are available in market out of which the most popular junk foods are soft drink, pizza, hamburgers, potato chips, ice-creams, hot dog, pakora, chowmins, french fries, cheese chili, pav bhaji etc.

Reasons for Popularity

1.Time: Junk food addiction is so high because of its simplicity, easy to prepare and are very tasty. Junk foods such as potato wafers and Cheetos do not even need cooking or heating.

2.Taste: Great taste, to an extent influences them to opt for junk food and is due to lavish usage of oils, salts and sugar.

3.Advertisement: Junk food advertising has a major role and children are easy and potential target for junk food.

4.Shelf life: Junk food may not require refrigeration for most products like chips and wafer.

5.Transportation: Ease of transportation and availability increase the popularity of junk food day by day.

6.Cost: Junk food is popular due to less cost and easy access to all classes of population.

7.Attractiveness: Attractive appearance is done by adding food additives and colors in addition to enhancement in flavor [1].

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Children and Junk Food

Children find themselves amidst a complex society that is undergoing breaths taking changes. Wafers, chips, colas, pizzas and burgers are suddenly the most attractive food items among children. Children rapidly seem to have stepped into a world of fast foods and vending machines, totally unaware of the havoc they are creating for themselves and their impact on their health. Good nutrition is of utmost priority in children at the time of steady growth between the ages of 6 to 12 years. Eating habits in such age group not only has an impact on their growth but also on their concentration, feeling and behaviour. With vast majority of women with school children are working class which has led to leaving behind the traditional foods at home and offering of fast foods by parents to their children. The commonest scenario noticed in most homes is a child who returns from school hangs himself in front of the television, faithfully accompanied by a bowl of wafers, a packet of chips and a can of cola. Such nutritionally weak foods become quickly addictive and can sow the seeds of infirmity and debilitating disease, which ultimately leads to many an incurable disease. School days are full of educational challenges that require long attention spans and stamina. Poor nutritional habits can undermine these pre-requisites of learning, as well as deplete the strength that children need for making friends, interacting with family, participating in sports and games or simply feeling good about them. Nutritionists agree that the reason for kids with Attention Deficit Hyperactivity Disorder is largely the kind of food children eat. Experts warn that eating too much junk food is one of the factors that have contributed to the current childhood obesity epidemic[2].

Harmful Impact on Health

They cause a lot of harmful effect on the body like obesity, diabetes, heart disease and various types of skin cancers.

1.Poor concentration: People have a sumptuous junk meal rich in oil and they feel drowsy and fail to concentrate. Lack of vital nutrients and protein particularly can stale their brain cells temporarily.

2.Obesity: Hamburgers, pizza, fried chicken and chips have loads of saturated fats and cause people to put on weight and which is a risk to the health of heart.

3.Hypertension: Junk food often have too much salt, so people are getting more salt than they need when they eat junk food which is unhealthy for an individual. Salt abundance raises the blood pressure which can causes hypertension.

4. Diabetes: Over 90% cases are Type II diabetes due to junk food consumption.

5.Heart diseases: Junk food brings about plaque formation in arteries which is a major cause of heart disease, myocardial infarction and severe heart failure.

6.Dental cavities: Excess consumption of junk food causes accumulation of food on teeth spaces and plaque formation occurs which finally results in dental cavities.

7.kidney disease: Junk food, rich in salt, sugar and fat causes kidney impairment like polyuria, renal failure and hyperuricemia.

8.Neurological disorders: Excessive intake of junk food results in mental disorders i.e. drowsiness, laziness, dyslexia, Attention Deficient Hyper activity Disorder [ADHD], loss of balance and lack of concentration.

9.Skin rashes: Junk food consists of a lot of additives and chemicals which cause's skin rashes.

10.Cancer: Obese people have an increased risk of colon, breast, prostate, gallbladder, ovarian, skin cancer and uterine cancer.

11.Hypoxia: Accumulation of fat in the bronchioles causes lack of oxygen supply in the body leading to hypoxia.

12.Asthma: It is chronic pulmonary obstructive disorder which occur due to artificial flavoring and coloring agents present abundantly in junk food.

13.Behavioural problems: Consumption of junk in early childhood can be results in behavior associated problem like hyperactivity, aggressiveness etc [3].

Metabolic Consequences

Food dense in calories, when oxidized in the body causes enormous formation of Acetyl CoA which results in excess fatty acid and cholesterol formation. Due to high levels of sugar in junk food, pancreas secrete high amounts of insulin to prevent a dangerous spike in blood sugar levels. Inadequate amounts of protein and good carbohydrates, drops the blood sugar levels suddenly after eating, resulting with grumpy, fatigued feeling and a craving for sugar. Another pathway which acetyl CoA is involved is in formation of ketone bodies, which is inactive when

energy levels are high, but is active in case when impaired glucose tolerance sets in. Fried and processed food, contains oxy cholesterol which may prove to be a lethal compound to heart health. A high sodium level affect renin-angiotensin system in kidneys. High cholesterol from junk food also affects liver on the long run where it is metabolized as it strains liver, damaging it eventually.

Means to Avoid Junk Food

Junk food - the name itself is tempting enough. Eliminating the temptation is one way to avoid it. Awareness on junk food facts is lacking amongst every individual in the community. One way to avoid junk food is to encourage eating healthy snacks and more of foods, which are usually considered to be a part of a healthy diet. School administration along with parents should educate children about avoiding junk foods. Developing awareness for fitness will certainly separate junk food and good diet [4].

Conclusion

Junk foods have certainly carved up the Third World due to globalization. It is an integral part of life in the developed and also the developing world, and coming with it is a massive increase in health-related problems. Junk food is a kind of addictive in spite of knowing that it is unhealthy, most of the people get hooked on to it and continue consuming it in an uncontrolled way. It is not impossible to win war with junk foods against healthy foods. To start with, a simple change that one could make is to successively reduce the frequency of eating junk food and eat more frequently homecooked food including plenty of fresh foods and vegetables. Homemade food is a better option than junk food because it has higher nutritional value, good quality, better health, time saving, mental satisfaction etc. It is all in our hands to choose junk food or health. Avoid Junk, Accept Health! No Junk, Know Health!

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ULTRASONIC VELOCITY, DENSITY AND VISCOSITY STUDIES OF A POLYMER BLEND IN AQUEOUS SOLUTION AT 302 K

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Abstract

Polymers play an important role in all types of industries. Many notable advances in the technology have followed the exploitation of properties offered by new polymeric materials like blends, composites, etc. Polymer blends are prepared by physical mixing of two or more polymers. Blending of polymer is one of the simplest methods to obtain a variety of chemical and physical properties from the constituent polymers at molecular level. Usage of blended polymer is the most effective way to produce new multipurpose materials. Recently, researchers have paid considerable attention in the study of polymer blends. In the present work, Polyethylene Glycol (PEG 6000) along with Maltose in aqueous solution. The miscibility nature of the poly blend is analyzed by density, viscosity, refractive index and ultrasonic velocity techniques at 302K.Miscibility studies of Polyethylene Glycol (PEG 6000) and Maltose in mixed common solvent aqueous solution have been carried out in different composition ranges. The ultrasonic velocity, viscosity, density, and refractive index have been measured at room temperature. The molecular interaction parameters and acoustical parameters have been obtained using the above measurements. From the obtained results miscible nature of poly blends have been revealed.

Keywords: Polymer blends, Ultrasonic velocity, viscosity, Density, Refractive index, Miscibility.

1. Introduction

The importance of polymer blending has been increased in recent years, because of the preparation of polymeric materials with desired properties, low basic cost and improved process ability [1]. When two or more polymers or copolymers are physically mixed, polymer blends are resulted. This polymer blends often exhibit properties that are superior to any one of the component polymers [2].Blending of polymers is one of the simplest methods to obtain a variety of physical and chemical properties from the constituent polymers at a molecular level [3]. A combination of synthetic and natural polymers results in new materials, which have specific properties of synthetic components (good mechanical

properties, easy possibilities, low production, and transformation costs) and biocompatibility nature of biopolymers[4,5].These blends have already been utilized as biodegradable biomaterials [6], drug delivery systems, membranes, materials for agricultural applications, and so forth. The compatibility of synthetic polymer blends is gaining increasing attention due to inter polymer interactions which enable the preparation of new materials with biomedical applications. The gain in newer properties depends on the degree of compatibility or miscibility of the polymer at a molecular level. There have been various techniques of studying miscibility of polymer blends [7]. Chee [8] and Sun et al [9] used the Viscosity method for the study of the polymer-polymer miscibility. Singh and Singh [10] used Ultrasonic and Viscosity methods for investigating polymer-polymer miscibility. They showed that the variation of Ultrasonic velocity and viscosity with blend composition is linear for miscible blends and non-linear for immiscible blends. Varada Rajulu et al [11-14] used viscosity, ultrasonic velocity, refractive index and density measurements for probing the miscibility of several polymer blends. In the present study PEG and Maltose blend solutions were prepared in water and their miscibility was studied by using viscosity, ultrasonic velocity, and refractive index measurements. PEG is biocompatible and biodegradable polymer and has adhesive and flocculent properties. The low molecular weight of PEG makes it the most suitable material to be classified as an impact modifier for copolymers, due to its miscibility, biodegradability, and food contactable applications. Maltose, also known as maltobiose or malt sugar, is a disaccharide formed from two units of glucose joined with an α bond.

2. Materials and Methods

PEG(Mv=6000) and MALTOSE(Mv=342.3g/mol) were employed in the present study. The blends of PEG and MALTOSE of different compositions 0/50, 10/40, 20/30, 25/25, 30/20, 40/10, 50/0 were prepared in aqueous solution at 302 K. The total weight of two components in that solution was always maintained at 2g/mol. The densities of the solution were measured at 302 K by specific gravity bottle. The ultrasonic velocity of the blend solution was measured by an ultrasonic interferometer technique [15]. The relative viscosities of the blend solutions were measured at 302 K using viscometer. The refractive index of blend solutions was measured with an Abbe refractrometer, thermostated with a water circulation system at 302 K [16].

3. Results and Discussion

The measured values of ultrasonic velocity, density and refractive index of blend

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solutions have been studied.

3.1. Viscosity study

The absolute viscosity versus concentration for the blends of polyethylene glycol (PEG) and Maltose in aqueous solution at 302 K for different compositions is shown in Figure 1.

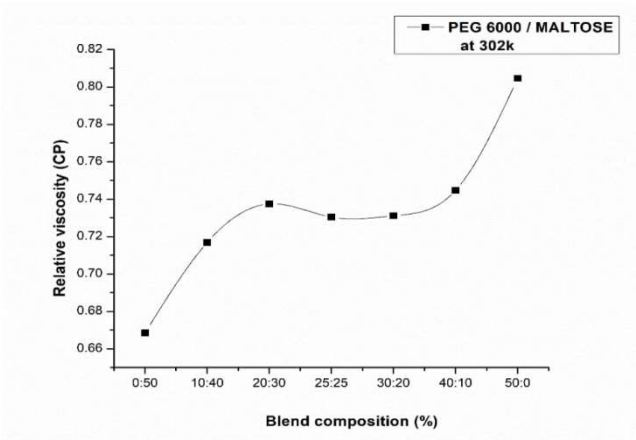

Figure 1. Variation of viscosity with blend composition of PEG6000/MALTOSE

It was well established earlier by many workers [17,18] that the variations of viscosity versus concentration of blend composition plots are linear for compatible blends and nonlinear for incompatible blends. From this figure, the variation is linear from 0:50 to 20:30 blend compositions and from 40:10 to 50:0 blend compositions. Non-linearity is observed at a double point at 25:25 and 30:20 blend composition. It is clearly evident that the nature of variation is in-between linear and non-linear for the system under study showing multiphase nature in the blend. Thus, the blend is **semi-compatible.**

3.2. Density, Ultrasonic velocity and refractive index studies

In order to evaluate simplified techniques to investigate the miscibility of polymer blends under study, the variation of ultrasonic velocity and refractive index of the polymer blend solutions with composition have been depicted in figures 2-4 respectively [19].

Density values are used to compute some of parameters such as Molar volume and apparent molecular volume. These parameters are helpful in the investigation of molecular interaction and to tackle the problems relating to the properties of a given system.

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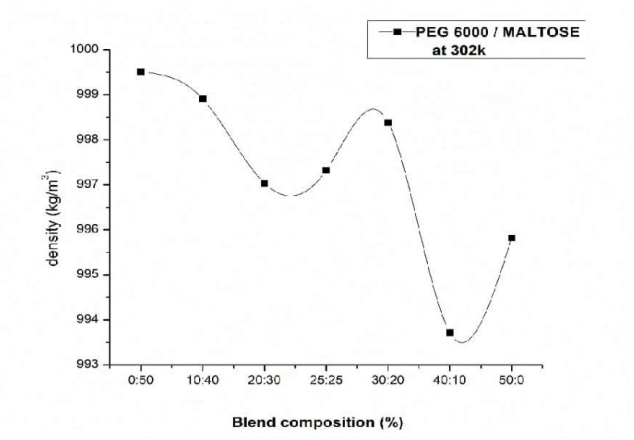

Figure 2. Variation of Density with blend composition of PEG 6000/MALTOSE

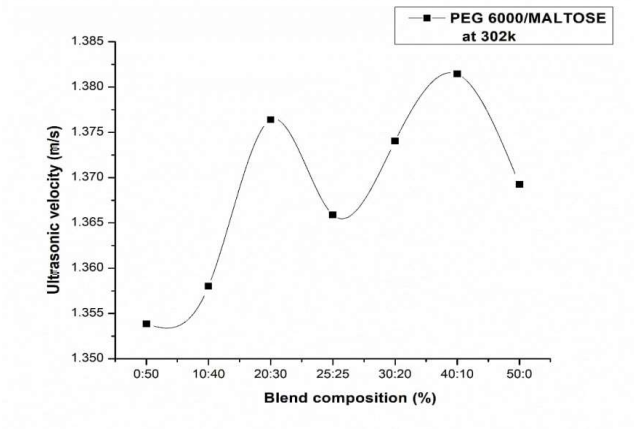

Figure 3. Variation of Ultrasonic Velocity with blend composition of PEG 6000/MALTOSE

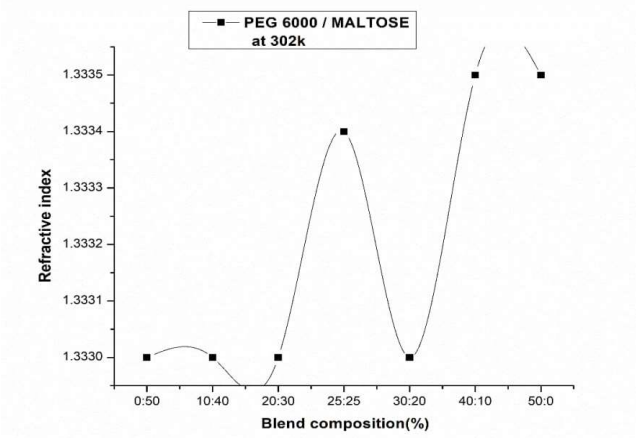

Figure 4. Variation of Refractive index with blend composition of PEG 6000 /MALTOSE

Varada Rajulu et al [16] have been used these techniques for the miscibility study, where non-linear variation of the density, ultrasonic velocity and refractive index with blend

composition was attributed to the immiscible behavior of the blend. Similarly, the linear variation of the ultrasonic velocity and refractive index with blend composition was attributed to the miscible behavior of the blend. From the figure 2 the variation of density is found to be linear and non-linear. Therefore, in the present study the blend is assumed to be semi compatible in nature. Similarly, from the figures 3 and 4 the variations are found to be linear and non-linear. Thus, the blends of ultrasonic velocity and refractive index are assumed to be **semi-compatible**.

Conclusion

Based on viscosity, density, ultrasonic velocity, and refractive index measurements, it can be concluded that the blends of Polyethylene glycol (PEG-6000)/MALTOSE is found to be completely semi-compatible over all the composition range at 302 K.

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VIBRATIONAL SPECTROSCOPIC STUDIES AND DFT CALCULATIONS OF N-ACETYL-L-LEUCINE

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Abstract

The spectroscopic investigations (FT-IR and Raman spectra) of N-Acetyl-L-leucine (NALL) have been recorded and analyzed. The equilibrium geometry, various bonding and vibrational wavenumbers have been calculated with the help of density functional theory(DFT) using standard B3LYP/6-311G(d,p). The assignments proposed based on the experimental IR and Raman spectra have been reviewed and complete assignment of the observed spectra have been proposed. The Molecular Electro Static Potential (MESP) is established to interpret the electron excess area and electron deficiency area. The MESP map shows that the negative potential sites are localized on oxygen atom(O3) as well as the positive potential sites are identified around the hydrogen atom(H23). The HOMO-LUMO analysis was carried out with different applied electric fields. The global reactivity descriptors were calculated to understand the relationship between structure, stability and global chemical reactivity. The thermodynamic properties which includes Rotational constants, Rotational Temperatures, Thermal energy, Molar capacity, Entropy are evaluated.

Keywords*:* NALL, FT-IR, FT-Raman, DFT.

1.Introduction

An amino acid is a biomolecule which is vital to all living organisms for survival. They areimportantfor the synthesis of body proteins and other important nitrogen-containing compounds, such as creatine, peptide hormones, and some neurotransmitters. These molecules are considered in several scientific research studies related to nutrition, drug delivery and plant protection. Chemically, an amino acid is a molecule that has a carboxylic acid group and an amine group that are each attached to a carbon atom**.** The carboxylic acid group offers its proton to the amino group. Hence, in a solid state, amino acids exist as zwitter ion [1].

Leucine is branched chain and non-polar amino acid. The primary metabolic end products of leucine metabolism are acetyl-CoA and acetoacetate. Consequently, it is one of the two exclusively ketogenic amino acids, with lysine being the other is one the most important ketogenic amino acid in humans. Acetyl-CoA which is the precursor of ketone bodies and

myelin, particularly during early childhood, when the developing brain requires high rates of myelin synthesis. Along with ketogenic amino acid leucine helps to produce energy in body muscles, promotes protein synthesis and growth hormones. It is also reported that leucine has a regulatory role in the chemical reactions that drive the weight loss effects of high-protein diets [2].

N-Acetyl-L-leucine is a derivative of L-leucine (NALL). N-acetyl-l-leucine can exist as a neutral species and passively cross membranes at low pH which can be considered as desirable characteristics. Having a role as a metabolite this bioactive molecule plays vital role in symptomatic treatment of acute vertigo, restless leg syndrome, ataxia-telangiectasia,traumatic brain injury and even more[3-5]. A survey shows that the computational studies of the title compound has not been conducted. The aim of the work is to describe and characterize the molecular structure and theoretical vibrational properties of N-Acetyl L-leucine.

2. Experimental and Computational details

The quantum chemical calculations for N-Acetyl-L-leucine were performed by density function methods in B3LYP/G311 using Gaussian software. The compound under investigation, NALL was purchased from TCI Chemicals (India) Pvt. Ltd. FT-IR spectra of the title compound was recorded in the region 4000-400 cm^{-1} using Perkin Elmer Spectrometer (model two). The FT-Raman spectrum has been taken from chemical book and the vibrations observed ranges from 3500-200 cm^{-1}. The DOS spectrum supports the energy gap calculated by HOMO-LUMO analysis.

3. Results and Discussions

3.1. Molecular Structure

Molecular structure of N-Acetyl-L-leucine (NALL) is shown in Figure 1. The title molecule has no ring structure and recognized as asymmetric top molecule. Substitution reaction doesn't take place in NALL. According to the calculated values of B3LYP/6-311G, the bond length for C1-C2, C5-C6, C9-C10, C10-C11, C10-C12 holds the same value and it is 1.54 Å. The bond length of C-H atoms is 1.07 Å. The bond length of C-O atoms is 1.2584 Å. The title molecule is composed of only one O-H and N-H bond. The bond length of O7-H23 and N4-H24 is 0.96 Å and 1.0 Å respectively.

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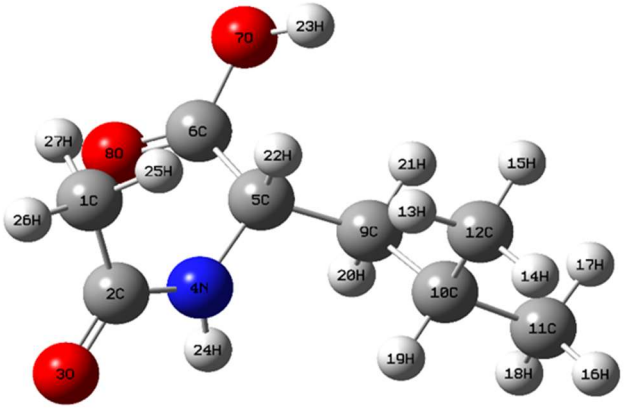

Figure 1. Optimized Structure of N-Acetyl-L-leucine

3.2. Vibrational Spectral Analysis

The vibrational spectral analysis is done to discover the vibrational modes associated with specific molecular structures of the title sample. The title compound N-Acetyl-L- leucine (NALL) consists of 27 atoms ($C_8H_{15}NO_3$). The experimental and theoretical FT-IR spectra is shown in Figure 2 and FT-Raman spectrum in Figure 3.

The total number of vibrations for a non-linear molecule can be calculated by 3N-6, where N is the total number of atoms. The total number of vibrations taken place is found to be 75 and its is distributed as

Total vibrations = 51A' (in-plane) + 24A" (out-of-plane)

here, A′ represents stretching and in plane bending vibrations and A" represents out of plane bending vibrations[6].

The band assignment of complex molecules was determined by combining vibrational spectroscopy and quantum mechanical calculations, which serves as a most useful technique to study the hydrogen bonded complexes.

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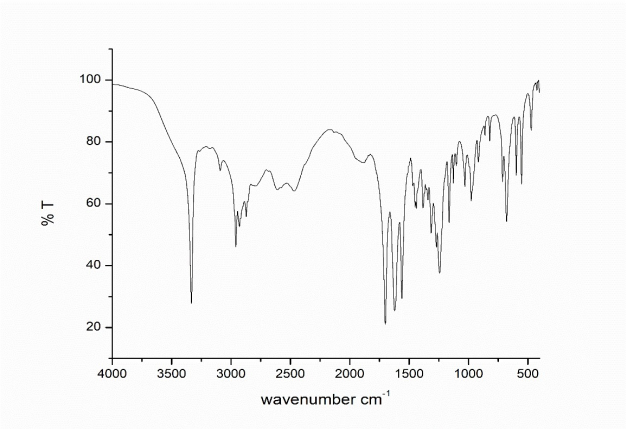

Figure 2. (a) Experimental IR spectrum

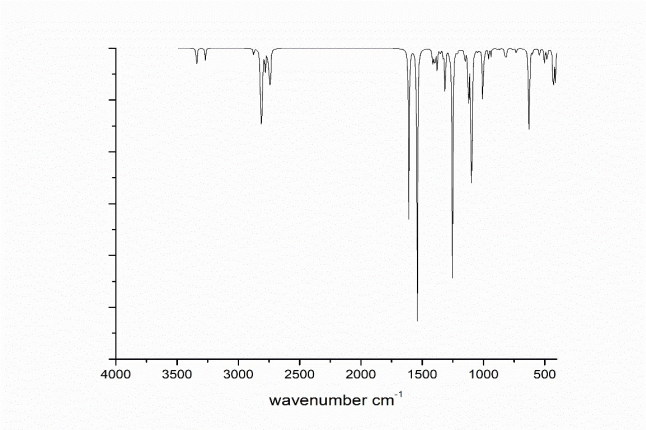

Figure 2. (b) Theoretical IR spectrum

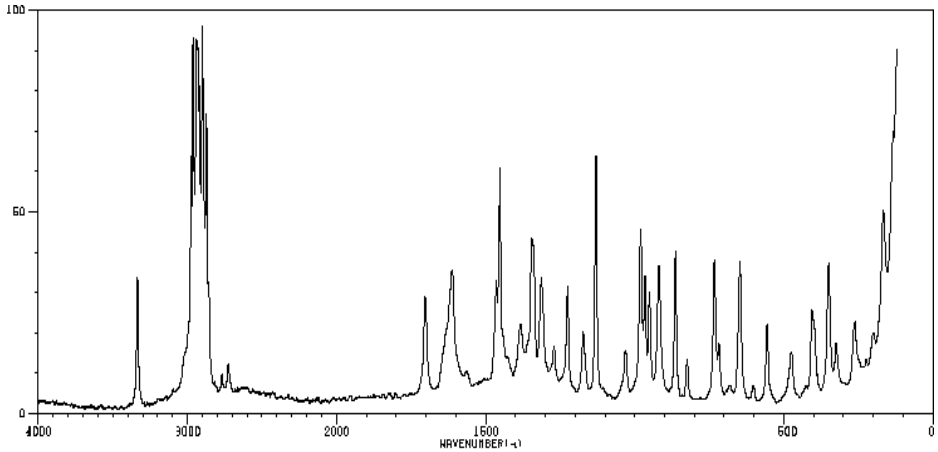

Figure 3. FT-Raman spectrum of NALL

C-CH_3 group vibrations

NALL has three methyl groups in the side chain. The vibrations of CH_3 stretching and deformation are more or less localized, and give rise to appreciable group wavenumbers. The stretching vibrations of the CH_3 is assigned a number of sharp bands in the region 2980–2875

cm^{-1} and in Raman spectrum it is in the region 2963 cm^{-1} -2873 cm^{-1}. The observed medium band at 2960 cm^{-1} is assigned for methyl group 1 and the vibrational assignment 2872cm^{-1} is assigned for methyl group 3 and 2929cm^{-1} for methyl group 2. Generally, the bending vibrations for methyl group occurs in the region 1450-1375 $cm^{-1.}$ [7]. The bending vibration of methyl group appears at 1469 cm^{-1},1450cm^{-1} and 1385 cm^{-1} for NALL.

C-C and C=O group vibrations

The C-C stretching vibration for NALL it is observed between 1102 – 679 cm^{-1}. The calculated frequencies lie in the region 1102-804 cm^{-1}. The stretching vibrational assignment 1701cm^{-1} is assigned for C=O. In the IR spectra the stretching vibration of C=O causes characteristics bands and hence the intensity can be increased by hydrogen bond formation.

O-H and C-H group vibrations

The stretching vibration for O-H bond has occurred at 3333 cm^{-1} and in Raman spectra it is observed at 3335 cm^{-1}. Peaks observed at 472 cm^{-1} and 477 cm^{-1} are recognized as C-C-O bending vibration. The vibrational assignment for N-H stretching appears at 3176 cm^{-1}. In plane bending vibration for H-C-H appears at 1469 cm $^{-1}$. In FT-Raman spectra the out of plane bending of C-C-C-C and O-C-O-C appears at 351 cm^{-1} and 648 cm^{-1}.

The twisting vibration of H-C-C-N occurs at 952 cm^{-1}. In FTIR the twisting vibration of H-O-C-C occurs at 404 cm^{-1}. All vibrational assignments are found to be agreeable with literature values.

3.3. Molecular Electrostatic Potential

The charge distribution of molecules in three dimensions can be illustrated by Molecular Electro Static Potential (MESP) or (MEP) surface. It can interpret a map area of electron excess and electron deficiency thereby illustrating chemically active sites [8]. Molecular electrostatic potentials have been extensively used in biochemistry and pharmacology to identify characteristic patterns of positive and negative potentials that either promote or inhibit particular types of biological activities [9]. The electrostatic potential energy data is interpreted as a color spectrum with red as the lowest electrostatic potential energy value (electron excess region) associated with reactive electrophilic sites. The blue colour represents positive MEP. In this region proton is repelled by the atomic nuclei (electron

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deficient region) representing the suitable centre of the nucleophilic attacks. The green region shows zero electrostatic potentials i.e.,the location of the mean potential, the averageof the two extremes. The MESP surface showing the charge distribution of NALL is shown in Figure 4.

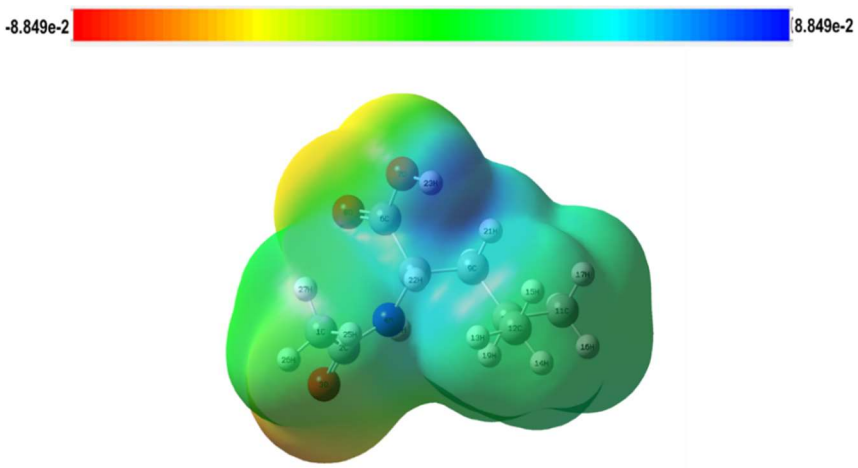

Figure 4. MESP image of N-Acetyl L-leucine

The MESP map shows that the negative potential sites are localized around oxygen atom (03). The positive potential sites are identified around the hydrogen atom (H23). The mild positive MESP is established around C-C-H bond. The positive segment is red and the negative one is green. The potential values in this molecule ranges from $8.849e^{-2}$ a.u. (deep red) to $8.849e^{-2}$a.u (deepest blue).

3.4. HOMO-LUMO Analysis

The highest occupied molecular orbital (HOMO) and lowest unoccupied molecular orbital (LUMO) energies are very significant parameters in quantum chemistry. The HOMO energy describes the electron stability so energetically it is the easiest to remove electrons from this orbital. This could be simply donating electron density to form a bond (act as a Lewis base) or it could be oxidation. The LUMO is the lowest energy place to put or excite an electron so energetically it is the easiest to add more electrons into this orbital (Lewis acid) or it could be reduction[10]. The HOMO to LUMO transition shows the electron density transfer from the electron donor to the electron acceptor. The energy gap between the HOMO and LUMO energies reflects the chemical stability of the molecular system under investigation. A large

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HOMO-LUMO gap implies high stability for the molecules in the sense of its lower reactivity in chemical reactions[11]. The HOMO-LUMO gap has also been used as an approximation to the lowest excitation energy of the molecule[12]. The structures of the HOMO and LUMO calculated by DFT/ B3LYP/6-31G is given below:

HOMO energy = - 7.0186 eV

LUMO energy = -0.8982 eV

HOMO–LUMO energy gap = 6.1204 eV

The Figure 5 shows the surfaces for orbitals that define the NALL bonding scheme. The DOS spectrum which supports the energy gap calculated by HOMO-LUMO analysis is shown in Figure 6. The molecule has a large energy gap is known as hard and having a small energy gap is known as soft molecule. The hard molecule is not more polarizable than the soft ones because they require immense energy for excitation.

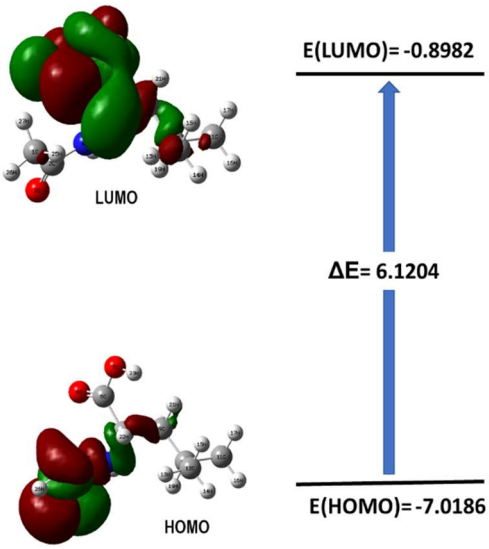

Figure 5. Energy band gap images of N-Acetyl L-Leucine

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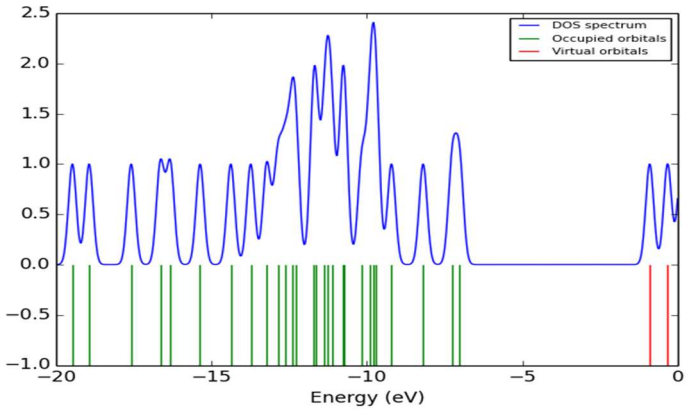

Figure 6. DOS spectrum of NALL

3.5. Global Reactivity Descriptors

These global parameters help understand behavior of a system and lead to widely applicable and useful principle of maximum hardness. The calculated global reactivity descriptors ionization potential(I.P), electronegativity (χ), hardness(η), chemical potential(μ), electron affinity (E.A), softness(S), electrophilicity index (ω), electronic charge transfer (ΔN_{max}), nucleofugality (ΔE_n), electrofugality (ΔE_e), electron back donation ($\Delta E_{back\text{-}donation}$) are tabulated in Table 3.

Table 3: Molecular properties of NALL from orbital energies calculated by B3LYP/6-311G method

Chemical parameters	**Values(in eV)**
E_{HOMO}	-7.0185
E_{LUMO}	-0.8982
Energy gap	6.1202
Ionization potential (I)	7.0186
Electron affinity (A)	0.8982
Electronegativity (χ)	3.9584
Global hardness (η)	3.0601
Chemical potential (μ)	-3.9583
Global Electrophilicity (ω)	2.5601
Softness(S)	0.3268
Charge transfer ($\Delta N_{max.}$)	1.2935
Electronic back-donation ($\Delta E_{back\text{-}donation}$)	-0.76505
Nucleofugality(ΔE_n)	0.1318
Electrofugality(ΔE_e)	8.0486

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3.6. Thermodynamic Parameters

The thermodynamic data provide helpful information for the further study of NALL. The values of thermodynamic parameters such as zero-point vibrational energy, thermal energy, specific heat capacity, rotational constants and entropy of the title molecule were calculated by B3LYP/ 6-311G method and listed in Table 4. The equations used for computing thermochemical data in Gaussian programs are derived from statistical thermodynamics. Two key ideas of statistical thermodynamics are the Boltzmann distribution and the partition function[13,14] The partition function is like a thermodynamic wave function, in the sense that it contains all thermodynamic information about the system, just as the quantum mechanical wave function contains all dynamic information[15]. The importance of computation of thermodynamic properties of molecules lies in thermochemistry and chemical equilibrium.

The vibrational zero-point energy is the energy difference between the lowest point on the potential energy surface (equilibrium energy) and the energy of the vibration less energy level (v=0). The ZPE can be approximated as half the fundamental vibrational frequencies.

The rotational temperature is commonly used in thermodynamics, to simplify certain equations and the rotational contribution to molecular thermodynamic properties. It has units of temperature and is defined as the ratio of Rotational constant and Boltzmann constant The rotational temperature is used commonly when finding the rotational partition function.

Thermal energy, internal energy present in a system in a state of thermodynamic equilibrium by virtue of its temperature.

Molar specific heat capacity at constant volume is the amount of heat energy required to raise the temperature of one mole of a substance through 1K or 1∘C at constant volume, denoted by C_V. Entropy is a measure of the unavailable energy in a closed thermodynamic system that is also usually considered to be a measure of the system's disorder, that is a property of the system's state, and that varies directly with any reversible change in heat in the system and inversely with the temperature of the system. The dipole moment and its principal inertial axes strongly depend upon the molecular conformation. Dipole moment reflects the molecular charge distribution and is given as a vector in three dimensions. Therefore, it can be used as illustrator to depict the charge movement across the molecule. The dipole moment of NALL was observed as 2.1747 Debye.

Table 4: Thermodynamic parameters of NALL

Parameters	Values
Zero-point vibrational energy (kcal mol^{-1})	144.2581
Rotational constants (GHz)	
A	0.9986
B	0.6272
C	0.4680
Rotational temperatures (Kelvin)	
A	0.0479
B	0.0301
C	0.0225
Thermal Energy (kcal mol^{-1})	
Total	153.215
Translational	0.889
Rotational	0.889
Vibrational	151.438
Molar Capacity at constant volume (cal mol^{-1} kelvin)	
Total	50.767
Translational	2.981
Rotational	2.981
Vibrational	44.805
Entropy (cal mol^{-1} kelvin)	
Total	121.583
Translational	41.354
Rotational	31.373
Vibrational	48.857
Dipole moment (Debye)	
Total	2.7147
μ_x	-1.7985
μ_y	2.0292
μ_{xz}	-0.1312

Conclusion

Theoretical calculations on frequency assignment of the normal modes of NALL was done utilizing quantum chemical theory. The completed molecular optimized geometries of the compound have been obtained from DFT-B3LYP calculations with 6-311 basis set. The vibrational frequencies of the fundamental modes of the compound have been precisely assigned and analyzed and the theoretical results were compared with the experimental vibrations. The difference between the observed and scaled wave number values of most of the fundamentals is very small. The MESP, HOMO-LUMO, Thermodynamical parameters and

Global reactivity descriptors have been determined by B3LYP/6-311G.This study demonstrates that the title compound has a band gap of 6 eV which denotes that, the title compound is stable and may be used as an insulating material.

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வீரமாமுனிவரின் உயிர்க்குண வகைப்பாடு (தொன்னூல் விளக்கம்)

க. உமாராணி
தமிழ்த்துறை, சீதாலட்சுமி இராமசுவாமி கல்லூரி, திருச்சிராப்பள்ளி.

ஆய்வுச்சுருக்கம்

தென்திராவிட மொழிக்குடும்பத்தில் தனிச்சிறப்பைப் பெற்ற மொழியாக தமிழ்மொழி காணப்படுவதற்கு அதன் இலக்கண, இலக்கிய வளங்களே ஆதாரங்களாகின்றன. மாறி வரும் தொழில்நுட்ப யுகத்திலும் வளர்ந்து வருகின்ற மொழியாக, ஆய்வுக்களங்களை உருவாக்கித் தரும் மொழியாக, உலகத்தோரால் கற்கப்பட்டு வருகின்ற மொழியாக விளங்கி வரும் தமிழ்மொழியின் இலக்கிய வரலாறு நீண்ட நெடிய பாரம்பரியம் கொண்டதாகும். கி.மு.வில் தொடங்கி இன்றளவு வரையிலும் படைப்புகள் பல்நோக்கில் வெளிவருகின்ற மொழியாக இருந்து வருகின்றது. இத்தாலி நாட்டிலிருந்து சமயப்பணியின் பொருட்டு இந்தியாவிற்கு வந்து தமிழகத்தில் நாயக்க மன்னர்கள் ஆட்சி புரிந்த காலத்தில் தமிழில் ஏராளமான இலக்கண, இலக்கியங்களைப் படைத்தளித்தவர் கான்ஸ்டன்ஸ் யுசேபியுல் ஜோசப் பெஸ்கி எனும் இயற்பெயர் கொண்ட வீரமாமுனிவர் ஆவார்.

தமிழைக் கற்றுத் தேர்ந்து சமயப்பணியோடு தமிழ்ப்பணியினையும் சேர்த்து ஆற்றிய பெருந்தகையாளர். அவரின் இலக்கணப் படைப்பாக விளங்கும் தொன்னூல்விளக்கம் எழுத்து, சொல், பொருள், யாப்பு, அணி என்ற ஐந்திலக்கணம் கூறும் நூலாகும். அந்நூலில் சொல்லதிகாரத்தில் உரிச்சொல்லியல்(Attributives) எனும் பிரிவில் அமைந்துள்ள 139-ஆவது சூத்திரத்தில் அறிவு முதலாக மறவி ஈறாக உள்ள உடம்போடு கூடிய உயிர்க்குணங்களின் முப்பத்திரண்டு வகைப்பாடுகள் பற்றியும், துய்த்தல் முதலாக உய்த்தல் ஈறாக உள்ள உயிரின் ஆறு தொழிற்குணங்கள் பற்றியும் குறிப்பிட்டுள்ளார். தொல்காப்பியர் குறிப்பிட்ட உயிர்களின் வகைப்பாடான ஒன்றறிவதுவே உற்றறிவதுவே எனும் நூற்பாவைத் தனது விளக்கவுரையில் மேற்கோளாகக் காட்டுகிறார் வீராமாமுனிவர். தொன்னூல் விளக்கம் சுட்டும் உயிரின் குணங்களையும், தொழிற்குணங்களையும் இக்கட்டுரை விளக்குகின்றது.

திறவுச்சொற்கள்: திராவிட மொழிக்குடும்பம், தொன்னூல் விளக்கம், ஐந்திலக்கணம், உயிரின்குணங்கள், தொழிற்குணங்கள்

Abstract

In the South Dravidian language family Tamil is the most distinguished language. Its grammatical and literary resources are the evidence that the literary history of Tamil has a long tradition as it is a growing language in the changing technological age, a language that creates research fields, and a language that is being learned by the people of the world. Beginning in BC and till date, works have been a language that has been published in many ways. Veeramamunivar, whose real name was Constantine Eusebiul Joseph Beschi, who came to India from Italy for the purpose of religious work and created a lot of grammar and literature in Tamil during the reign of the Nayaka kings in Tamil Nadu.

He was a generous man who learned Tamil and did Tamil work along with religious work. His Grammatical work, Thonnul vilakkam, have been published for to explain the Tamil traditional grammar works. The human body have 32 types of features, and the six functional qualities of living beings, classified by Veeramamunivar in his Tamil grammatical book Thonnul vilakkam. In this book the author quotes Tolkappiyar's classification of lives ‘onerarivathuve uttrarivathuve'. This article explains the qualities of the living beings and the work qualities of the same which is explained in Thonnul vilakkam.

Keywords: Thonnul Vilakkam, Grammar, Classification of lives, Dravidian Language

காலந்தோறும் வளர்ந்து வருகின்ற மொழியாக, சமூக, ஊடக மாற்றங்களுக்கும், முன்னேற்றங்களுக்கும் ஈடு கொடுக்கின்ற நிலையில் இணைய வழியிலும் தனக்கென ஓர் தனித்த இடத்தைத் தக்கவைத்துக் கொண்டிருக்கும் மொழியாக திகழ்ந்து வருவது செந்தமிழ்மொழியாகும். சங்க காலத்தில் கபிரால் தமிழ் அறிவுறுத்தப்பட்ட ஆரிய அரசன் பிரகதத்தன் தமிழ்ப்பாட்டு எழுதும் அளவிற்குத் தக்க புலமை பெற்றான் என வரலாறு சுட்டுகிறது. இவ்வாறே பிற்காலத்தும் வெளிநாட்டவர்கள் இங்கு வந்து தமிழினைக் கற்றுப் பாடிச் சிறந்து விளங்கினார்கள். மேலும் தமிழுக்கு இலக்கணம் செய்யவும் முற்பட்டு அத்துறையிலும் புகழ் பெற்றார்கள். இத்தகைய தமிழ்த் தொண்டுகளில் முன்னின்ற கிறித்தவர்களில் போற்றுவதற்கு உரிய புலமையர் வீரமாமுனிவர். இவர் இயற்றிய தொன்னூல் விளக்கம் ஐந்திலக்கணமும் கூறுகிறது. ‘அருந்தமிழ் இலக்கணம் ஐந்தையும் விரித்து விளக்கினன் வீரமாமுனியே’ என்பது தொன்னூல்

விளக்கப் பாயிரம். இத்தகு தொன்னூல் விளக்கத்தில் கூறப்பட்டுள்ள உயிர்க்குண வகைப்பாடு பற்றி விளக்குவதாக இக்கட்டுரை அமைந்துள்ளது.

தொன்னூல் விளக்கம் (18ஆம் நூற்.)

தமிழ்மொழியை வளப்படுத்தியவர்களுள் தமிழர்கள் பிறமொழியாளர்கள் மட்டுமின்றி வேற்று நாட்டவரும் அடங்குவர். தமிழ்த் தொண்டுகளில் முன்னின்றவர்களுள் சிறப்பாகக் குறிப்பிடத்தக்கவர்கள் கிறித்தவர்கள் ஆவார்கள். வீரமாமுனிவர் குறளின் நயமும் சிந்தாமணியின் செழுமையும் கம்பனின் கவிநயமும் ததும்பத் தேம்பாவணி என்னும் தித்திக்கும் தமிழ்க் காவியத்தைப் பாடினார். இலக்கியச் சோலையில் தேன் ததும்பும் இலக்கியப் படைப்புகளைப் படைத்ததோடு இலக்கணத்திலும் தனது பங்களிப்பைத் தொன்னூல் விளக்கம் எனும் ஐந்திலக்கண நூலைப் படைத்ததன் வாயிலாக நிறைவேற்றினார். பெரும்பாலும் நாயக்கர்கள் அனைவரும் தெலுங்கு மொழிக்கு முக்கியத்துவம் கொடுத்தனர். இருப்பினும் "விஜயரங்க சொக்கநாத நாயக்கர் (1706-1732) காலத்தில் தான் வீரமாமுனிவரால் இந்நூல் எழுதப்பட்டுள்ளது"[1] என்பதை வரலாற்றாசிரியர் சுவாமிநாதன் குறிப்பிடுகின்றார்.

தொன்னூல் பொன்னூலாக இலங்குகிறது என்பார் சேதுப்பிள்ளை[2]. . இந்நூல் 370 சூத்திரங்களை உடையது. அவை

எழுத்ததிகாரம் - 3 இயல்கள் 40 நூற்பாக்கள்
சொல்லதிகாரம் - 12 இயல்கள் 102 நூற்பாக்கள்
பொருளதிகாரம் - 13 இயல்கள் 100 நூற்பாக்கள்
யாப்பதிகாரம் - 3 இயல்கள் 52 நூற்பாக்கள்
அணியதிகாரம் - 6 இயல்கள் 76 நூற்பாக்கள்

என்ற நிலையில் நூற்பாக்கள் இடம்பெற்றுள்ளன. தொன்னூலுக்குத் ~தெருட்குரு| என்றொரு பெயரை அந்நாள் அறிஞர் சூட்டினர் என்பதை

"**மருட்களை நூக்கிப் பொருட்பயன் சூட்டி வருத்துதலால்**
தெருட்குரு நாமம்தொன் னூல்விளக் கிற்குச் சிறந்ததுவே"

என்று கலித்தொகைக் கூறுகின்றது.

வீரமாமுனிவரின் இலக்கணப்புலமை

இலத்தீன் மொழியைத் தாய்மொழியாகப் பெற்றிருந்த போதிலும் தமிழ் மொழியைக் கற்றுத் தேர்ந்து அதில் இலக்கண, இலக்கியப் படைப்புகளை

உருவாக்கித்தந்த வித்தகராக முனிவர் விளங்குகின்றார். இலத்தீன் மொழியில் இவரால் 1730-இல் எழுதப்பட்ட செந்தமிழ் இலக்கணம் 1822-இல் ஆங்கில மொழிபெயர்ப்புடன் வெளியிடப்பட்டது. ஆங்கிலப்பதிப்பில் **A Grammar of the high dialect of the Tamil language termed as Shentamil to which is added an introduction to poetry' என்ற** தலைப்பு காணப்படுகிறது. இதன் பொருள் செந்தமிழ் என்ற தமிழின் உயர் வழக்கிற்குரிய இலக்கணத்தோடு தமிழ்ச்செய்யுளுக்கரிய அறிமுகமும் இணைக்கப்பட்டுள்ளது என்பதாகும். வீரமாமுனிவர் செந்தமிழ் இலக்கணம் என்ற நூலின் முன்னுரையில் சொல்லியிருக்கின்ற செய்திகளை சண்முகம் தனது நூலில் பின்வருமாறு குறிப்பிடுகின்றார்.

செந்தமிழ் படிப்பது கடினமான செயல். ஆனால் முயன்று படிப்பதற்கேற்ற பலன் உண்டு. தாய்மொழிக்காரர்களிலும் ஒரு சிலரே இந்த உயர் வழக்கைக் கற்றவர்கள். அதன் சில அடிப்படை உண்மை தெரிந்தவர்கள் கூடத் தமிழர்களால் மதிக்கப்படுகிறார்கள். செய்யுளை மேற்கோளாகக் காட்டுபவர்கள் மதிப்புக்கும் மரியாதைக்கும் உரியவர்களாகக் கருதப்படுகிறார்கள். ஆகையால் வெளிநாட்டார் செந்தமிழைக் கற்றால் அவர்களால் பெரிதும் மதிக்கப்படுவார்கள். தாங்கள் மதிக்கிறவர்கள் சொல்லும் கருத்துக்களையும் அறிவுரைகளையும் கவனமுடன் கேட்பார்கள். இந்தக் காரணம் ஒன்றுக்காவது வெளிநாட்டார்கள் செந்தமிழைப் பயல வேண்டும்.

செந்தமிழில் எழுதப்பட்ட நூல்கள் பெரும்பான்மையும் செய்யுள் வடிவத்திலேயே உள்ளன. சமயப் பிரச்சாரகர்கள் இலக்கிய மேற்கோள் காட்டுவது மரபுதான். மேலும் தமிழகத்தில் அதற்கு அதிக மதிப்பு உண்டு. ஏனென்றால் தமிழர்கள் எப்பொழுதும் பகுத்தறிவுக்கு முக்கியத்துவம் கொடுப்பதைவிடச் சான்றோரின் சொல்லுக்கு மதிப்பு கொடுப்பார்கள் செ.தஇ.ப.9)[3] என்று கூறியிருப்பதன் மூலமாக கிறித்துவ பாதிரிமார்கள் சமயப்பணியின் பொருட்டு தமிழ்மொழியைக் கற்றுத்தேர்ந்திருந்தனர் என்பதை உணர முடிகின்றது.

'வீரமாமுனிவரின் தமிழ் இலக்கணப் புலமைக்கு 1730-இல் அவர் எழுதிய தொன்னூல் விளக்கம் எனும் நூல் சான்றாக அமைகின்றது. இது எழுத்து, சொல், பொருள், யாப்பு, அணி என ஐந்திலக்கணங்களின் அடிப்படையில் அமைந்தாலும் புதிய இலக்கணச் செய்திகள் எதையும் கூறவில்லை"[4] என க.வீரகத்தி குறிப்**பிடுகிறார்**. எனினும் தொன்னூல் விளக்கம் பற்றி மற்ற பிற அறிஞர்களும் தங்கள் கருத்துக்களை வெளியிட்டுள்ளனர். அவ்வரிசையில்,

'தமிழை தமது பூர்வீக மொழியாகக் கொண்டிராத வீரமாமுனிவரின் இத்தகைய துணிகரமான முயற்சி வரவேற்கத்தக்கது. ஏனென்றால் அவர்

இவ்வாறான இலக்கண நூலின் மூலம் தமது இலக்கண, இலக்கியப் புலமையை வெளிப்படுத்தியுள்ளார். மேலும் 'இந்நூலின் உரையாசிரியரும் இவராகவே இருப்பதனால் தான் கூற விரும்பும் கருத்தை நூற்பாவில் சுட்டுவிட்டுத் தேவைப்படும் இடங்களிலெல்லாம் விரிவாக விளக்கமாக உரையில் தெளிவாக்குவதற்கு வாய்ப்பைப் பெற்றுள்ளார். ஆசிரியரின் எண்ணங்களை முழுமையாகப் புரிந்து கொள்ளவும் மாறுபட்ட கருத்துக்களை தவிர்க்கவும் இந்நிலை உதவுகிறது. பல இலக்கணங்கள், இலக்கியங்களிடையே ஆசிரியர் பெற்றுள்ள பயிற்சியை உரையும் நூலும் வெளிப்படுத்துகின்றது"[5] என ச.வே.சுப்பிரமணியன் கூறுவதும் நோக்கத் தக்கது.

தொல்காப்பியரும் வீரமாமுனிவரும்

தொல்காப்பியரைப் பற்றிய வீரமாமுனிவரின் கருத்து செந்தமிழ் இலக்கணத்தில் இடம்பெற்றுள்ளது. அதில் முனிவர் கூறியிருப்பதாவது, **"one ancient work, written by a person called Tolcapiyanar (ancient author) is still to be met with. பழமையான நூல் ஒன்று தொல்காப்பியனார் என்பவரால் எழுதப்பட்டது இன்று நமக்குக் கிடைக்கிறது"**[6] என்கிறார். இதன் வழி வீரமாமுனிவருக்கு தொல்காப்பியம் என்ற பேரிலக்கண நூலின் வாசிப்பும், அனுபவமும் இருந்திருக்கின்றது என்பதை அறியமுடிகின்றது.

உயிர்களின் வகைப்பாட்டை விளக்க வந்த முனிவர் தொல்காப்பியரின் உயிரியல் வகைப்பாட்டை உணர்த்துகின்ற நூற்பாவை மேற்கோளாகக் காட்டியிருக்கின்றார். அதாவது,

"ஒன்றறிவதுவே உற்றறிவதுவே
இரண்டறிவதுவே அதனொடு நாவே
மூன்றறிவதுவே அவற்றொடு மூக்கே
நான்கறிவதுவே அவற்றொடு கண்ணே
ஐந்தறிவதுவே அவற்றொடு செவியே
ஆறறிவதுவே அவற்றொடு மனனே
நேரிதின் உணர்ந்தோர் நெறிப்படுத்தினரே" -
(தொல்.பொருள்.571)

என்கிறது தொல்காப்பியம். முழுமுதல் இலக்கண நூலில் உலக உயிர்களை ஓரறிவு முதல் ஆறறிவு வரையிலும் பாகுபடுத்திக்காட்டியுள்ள தொல்காப்பியரை அடியொற்றியே உயிர்களின் குணவகைப்பாட்டைத் தருகிறார் வீரமாமுனிவர்.

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உயிரின் குணமும் உயிரின் தொழிற்குணமும்

உடம்போடு கூடிய உயிரின் குணமாவது முப்பத்திரண்டு வகை என்பதனை தொன்னூல் விளக்கம் பின்வருமாறு எடுத்துரைக்கின்றது.

"அறிவருளாசை யச்சமான
நிறைபொறை யோர்ப்புக் கடைப்பிடி மைய
னினைவு வெறுப்புவப் பிரக்கநாண் வெகுளி
துனிவழுக் காறன் பெளிமை யெய்த்த
றுன்ப மின்ப மிளைமை மூப்பிகல்
வென்றி பொச்சாப் பூக்க மறமத
மறவியினைய வுடல்கொ ளுயிர்க் குணந்
துய்த்தறுஞ்ச றொழுத லணித லுய்த்தலாதி
யுடலுயிர்த் தொழிற் குணம்" -

(தொ.வி.139)

என்கிறது தொன்னூல் விளக்கம். அதாவது, **1.அறிவு 2.அருள் 3.ஆசை 4.அச்சம் 5.மானம் 6.நிறை 7.பொறை 8.ஓர்ப்பு 9.கடைப்பிடி 10.மையல் 11.நினைவு 12.வெறுப்பு 13.உவப்பு 14.இரக்கம் 15.நாணம் 16.வெகுளி 17.துணிவு 18.அழுக்காறு 19.அன்பு 20.எளிமை 21.எய்த்தல் 22.துன்பம் 23.இன்பம் 24.இளமை 25.மூப்பு 26.இகல் 27.வென்றி 28.பொச்சாப்பு 29.ஊக்கம் 30.மறம் 31.மதம் 32.மறவி** என்கிற முப்பத்திரண்டும் இவை போல்வன பிறவும் உயிரினுடைய குணங்களாகும் என்கிறார். இவற்**றை** நேர்மறைப்பண்புகள் **மற்றும் எதிர்மறைப்பண்புகள் என்ற அடிப்படையில் இருவகைகளாகப் பகுக்கலாம்**.

நேர்மறைப்பண்புகள்

அறிவு, அருள், மானம், நிறை, பொறை, ஓர்ப்பு, கடைப்பிடி, மையல், நினைவு, உவப்பு, இரக்கம், நாணம், துணிவு, அன்பு, எளிமை, இன்பம், இளமை, வென்றி, ஊக்கம், மறம் ஆகியனவாகும்.

எதிர்மறைப்பண்புகள்

அச்சம், ஆசை, வெறுப்பு, வெகுளி, அழுக்காறு, எய்த்தல், துன்பம், மூப்பு, இகல், பொச்சாப்பு, மதம், மறவி ஆகியனவாகும்.

பண்புப்பெயர்ச்சொற்கள்

மனிதனுடைய இயல்பான குணங்களாக இவ்விரண்டு வகையான குணங்கள் அமைந்துள்ளன என்பதை வீரமாமுனிவர் வகைப்படுத்திக் காட்டியுள்ளார். இவற்றில் கடைப்பிடி என்ற ஏவல் வினைச் சொல்லையும், எய்த்தல் என்ற தொழிற்பெயர்ச்சொல்லையும், தவிர்த்து ஏனைய சொற்கள் எல்லாம் பண்பினைக் குறிக்கும் பெயர்ச்சொற்களாகவே அமைந்திருப்பதைக் காணமுடிகின்றது.

வீரமாமுனிவர் தமிழின் ஐந்திலக்கணம் கூறுகின்ற நூலாகத் தமிழிலேயே தொன்னூல் விளக்கத்தை இயற்றி தாமே அதற்கு விளக்கவுரையினையும் வழங்கியிருக்கின்றார். அவ்வகையில் உடம்போடு கூடிய உயிரின் குணங்களாக மேற்குறிப்பிட்ட குணங்களைப் பட்டியலிட்டுக் காட்டும் முனிவரின் புலமை போற்றுதற்குரியது. பிறப்பு முதல் இறப்பு வரையிலான மனித வாழ்வில் இக்குணங்கள் இன்றி மனிதச் செயல்பாடுகள் இல்லை என்பதை உணரமுடிகிறது. உடலோடு கூடிய உயிரின் குணங்களாக முப்பத்திரண்டு குணங்களை வரிசைப்படுத்தி கூறிய பின்னர், தனது விளக்கவுரையில் உடம்போடு கூடிய உயிர்கள் என்பதனால் உடலில்லா உயிர்களும் உண்டு **என்ற செய்தியினையும் கூறி** அறிவுறுத்துகின்றார்.

உயிரின் தொழிற்குணங்கள்

உயிரைத் தாங்கி வாழும் உடம்பில் நிகழக்கூடிய தொழிற்குணங்களை **1.**துய்த்தல் **2.**துஞ்சல் **3.**தொழுதல் **4.**அணிதல் **5.**உய்த்தல் என்று வகைப்படுத்துகிறார் வீரமாமுனிவர். தொழிற்பெயர் விகுதியான -அல் விகுதியுடன் அமைந்துள்ள தொழிற்பெயர்களை உயிரின் தொழிற்குணங்கள் என்று சுட்டியிருக்கின்றார்.

துய்த்தல் - உண்ணுதல்
துஞ்சல் - தூங்குதல்
தொழுதல் - வணங்குதல்
அணிதல் - உடுத்துதல்
உய்த்தல் - அனுபவித்தல்

என்ற பொருளமைவில் இச்சொற்கள் அமைந்துள்ளன. உண்ணல், உடுத்தல், உறங்கல், வணங்குதல், அனுபவித்தல் என்பவை யாவும் இன்றியமையாத அடிப்படைச் செயல்பாடுகளாக உள்ளதை உணரமுடிகின்றது. உலக உயிர்களின் இயக்கங்கள் பல நிலைகளில் பலவாறாக அமைந்திருப்பினும் அவை யாவற்றையும் குறிப்பிடாது அடிப்படையாகத் திகழக்கூடிய செயல்பாடுகள் மட்டும் முனிவரால் எடுத்தாளப்பட்டுள்ளன. ஆகவே தான் தொழிற்குணங்களில் இவற்றை முன்னிலைப்படுத்தியிருக்கின்றார்.

இவ்வாறாக தொல்காப்பியத்தை அடியொற்றிய தொன்னூல்விளக்கத்தில் உயிர்க்குணங்களின் வகைப்பாடும், தொழிற்குணங்களின் வகைப்பாடும் வீரமாமுனிவரால் எடுத்துக்கூறப்பட்டுள்ளது. மரபிலக்கணங்கள் யாவும் காலந்தோறும் மொழியில் காணப்படுகின்ற மாற்றங்களைச் சொல்லிக்கொண்டே வந்திருக்கின்றன. அவ்வகையில் இவ்விலக்கண நூலும் பழந்தமிழ் மக்களின் வாழ்வியலில் பயன்படுத்தப்பட்ட சொற்களை வழங்குகின்றது. அக்காலக்கட்டத்தில் தமிழ்ச்சமூகத்தில் நிலவிய மானுட வாழ்க்கையின் பிரதிபலிப்பாகவே இக்குணச்சொற்கள் அமைந்திருக்கின்றன. மேலும் சமயப்பணியாற்ற வருகின்ற கிறித்தவ பாதிரிமார்கள் தமிழைக்கற்றுத் தேர்ந்த பின்னர், தமிழ் இலக்கணத்தை அறிந்துகொள்வதற்கு வாய்ப்பாகவே தொன்னூல்விளக்கத்தைப் படைத்தளித்துள்ளார் வீரமாமுனிவர். இலக்கண ஒப்பாய்வுகளுக்கான ஆய்வுக்களங்களை இந்நூல் உருவாக்கித் தந்துகொண்டே இருக்கின்றது. கலைச்சொல்லாக்க நெறிமுறைகளுக்கும் உட்படுத்தக்கூடிய வகையில் இவ்விலக்கணம் அமைந்திருக்கின்றது.

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நற்றிணையில் முருகன்

க. சுதா
தமிழ்த்துறை, சீதாலட்சுமி இராமசுவாமி கல்லூரி, திருச்சிராப்பள்ளி.

ஆய்வுச்சுருக்கம்

பண்பாட்டையும் நாகரிகத்தையும் அறிந்துகொள்ள இலக்கியங்கள் துணைபுரிகின்றன. சங்ககாலத்திய தெய்வவழிபாடு குறித்து நற்றிணை பதிவுசெய்துள்ளதை ஆராய்வதே இக்கட்டுரையின் நோக்கம். தொல்காப்பியம் சுட்டியுள்ள மாயோன், சேயோன், வருணன், வேந்தன் ஆகிய தெய்வம் என்னும் கருப்பொருட்கோட்பாடு நற்றிணையில் சொல்லப்பட்டுள்ளதைக் காணலாம். இதை ஆராயும் போது தெய்வங்கள் பற்றிய குறிப்பு மட்டுமே பெரும்பான்மையான பாடல்களில் இடம்பெற்றுள்ளதையும் குறிஞ்சிக்கடவுளாகிய முருகனின் வழிபாடு மட்டுமே மேற்கொள்ளப்பெற்றதையும் நற்றிணை பதிவு செய்துள்ளதை அறியமுடிகின்றது. களவுக்காலத்தில் வெறியாட்டு நிகழ்த்தப்பட்ட செய்தி வாயிலாக முருகவழிபாடே சங்ககாலத்தில் செல்வாக்கு பெற்றிருந்தது என்ற முடிவு பெறப்படுகின்றது.

திறவுச்சொற்கள்: தொல்காப்பியம், முல்லை, குறிஞ்சி, முருகன்

Abstract

Literature helps to understand the culture and civilization. The purpose of this article is to examine what is recorded in the Nattrinai about the worship of gods in the Sangam period. The Karuppporul theory of Mayon, Sayon, Varunan, Vendan which is pointed out by the Tolkappiyam, is told in the Nattrinai. When examining this way, the only reference to the gods is found in most of the Nattrinai and that of the Lord Muruga. It can be seen that only the worship was carried out in the records of Nattrinai. Through the worship of the Veriyattu during the Kalavu period, it can be concluded that the Muruga worship was influential during the Sangam period.

Keywords: Tholkappiyam, Mullai, Kurinji, Murugan

தொல்காப்பியம் காடு,மலை,வயல்,கடல் என்ற நானிலப்பகுதிகளை முல்லை,குறிஞ்சி,மருதம்,நெய்தல் எனும் நான்கு நிலப்பெயர்களில் வரிசைப்படுத்திக் கூறியுள்ளது. இவ்வாறு நிலத்தின் பகுப்பைக் குறித்து பேச வேண்டிய தொல்காப்பியம் நிலத்தோடு தெய்வத்தையும் தொடர்புபடுத்தியே உரைத்துள்ளது. மேலும் கருப்பொருளிலும் முதல் இடத்தை தெய்வத்திற்கே

தொல்காப்பியம் வழங்கியுள்ளது. இவற்றையெல்லாம் கருத்தில் கொண்டு சங்ககாலத்தில் விளங்கிய தெய்வம் பற்றிய உண்மையான புரிதலை வெளிக்கொணர்வதாக இக்கட்டுரை அமைகின்றது. நற்றிணையில் தெய்வம் பற்றிய செய்திகள் இடம்பெற்றுள்ள பாங்கினைக் கண்டறிவதே இக்கட்டுரையின் நோக்கமாய் அமைகின்றது.

கருப்பொருள்

இடத்தினாலும் காலத்தினாலும் தோன்றும் பொருளைக் கருப்பொருள் எனலாம். இது ஐந்துவகை திணைக்கேற்ப ஐந்து வகையாகத் தனித்து காணப்படும் தன்மை உடையது. "மக்களின் பண்பாடும் நாகரிகமும் கருப்பொருளில் அடங்கும் எனலாம்"[1] என்பார் சோ.ந.கந்தசாமி.

தொல்காப்பியம் கூறும் கருப்பொருட்கள்

இவையெல்லாம் கருப்பொருள் என்று தொல்காப்பியம் வகைப்படுத்தி உள்ளதைக் கீழே காணலாம்.

"தெய்வ முணாவே மாமரம் புட்பறை
செய்தி யாழின் பகுதியொடு தொகைஇய
அவ்வகை பிறவுங் கருவென மொழிப" (தொல்.பொரு.அக.19)

இந்நூற்பாவழி கருப்பொருளுள் தெய்வமே முதன்மையானதாகச் சுட்டப்பட்டுள்ளதை அறியமுடிகின்றது.

முல்லை - மாயோன்

நற்றிணையில் முல்லைத்திணை தெய்வமாகிய மாயோன் வழிபாடு எவ்விடத்திலும் இடம்பெறவில்லை. குறிஞ்சித்திணையில் உள்ள 32-ஆம் பாடலில் உவமையாக மட்டுமே மாயோன் பெயர் கூறப்பட்டுள்ளது. இதன் மூலம் நற்றிணை காலத்தில் வழிபாட்டு தெய்வமாக மாயோன் செல்வாக்கு பெறவில்லை என்பதை அறியலாம்.

"**மாயோன்**அன்ன மால்வரைக் கவாஅன்" (நற்.32-1)

மாயோனைப்போல பெரிய மலைத்தொடர் என்று முல்லை நிலத்தெய்வத்தின் பெயர் உவமையாக மட்டுமே இடம்பெற்றுள்ளதை மேற்சுட்டியுள்ள பாடலடி உணர்த்துகின்றது.

நெய்தல் - வருணன்

நற்றிணையில் 102 நெய்தல் திணைப்பாடல்கள் உள்ளன. கடவுள் எனும் சொல் தனிப்பட்ட எந்தவொரு பெருந்தெய்வத்தையும் சுட்டுவதாய் காணப்படவில்லை. பலியிட்டு நீர் வளாவும் தன்மையுடைய பனைமரத்து அடியில் உறையும் என்பதான குறிப்புகளே கடவுளைச் சுட்டும் இடங்களில் காணக்கிடைக்கின்றன. தெய்வம் அச்சம் செய்வது, இரவில் உலவுவது என்றும், அணங்கு என்பது பேய்கள் வெளிப்பட்டு உலவும் என்பதன் மூலமும் காணப்பட்டுள்ளது. இவை சிறுதெய்வவழிபாட்டை உணர்த்துவதாகவே கருத வேண்டியுள்ளது. மருதத்திணையின் 216-ஆம் பாடலில் மட்டும் கடவுள் என்ற சொல் பொதுநிலையில் கையாளப்பட்டுள்ளது.

பாலை - கொற்றவை

பாலைத்திணையில் உள்ள 106 பாடல்களில் ஒரு இடத்தில்கூட கொற்றவை பற்றிய நேரடியான செய்தி எதுவும் இல்லை. 2 இடங்களில் (189,343) மட்டுமே கடவுள் என்ற பொதுப்பெயரில் தெய்வம் சொல்லப்பெற்றுள்ளது.

குறிஞ்சி – தெய்வம்

தொல்காப்பியம் குறிஞ்சித்திணைக்குரிய தெய்வமாகச் சேயோனைச் சுட்டியுள்ளது.[2] "சேய் எனும் சொல்லிற்கு மலைச்சிகரம் என்னும் பொருள் உண்டு. ஆகவே சேயோன் என்பது மலைப்பகுதிக்கு உரியவன் என்ற வகையில் முருகனைக் குறிக்கிறது".[3] நற்றிணையில் ஐவகைத்திணைகளிலும் குறிஞ்சித்திணையில் மட்டுமே தெய்வம் பற்றிய செய்திகள் இடம்பெற்றுள்ளன. தெய்வம் பற்றிய குறிப்புடைய 131 குறிஞ்சித்திணைப்பாடல்கள் நற்றிணையில் அமைந்துள்ளது குறிப்பிடத்தக்கது. முருகனைத் தவிர வேறு எந்த தெய்வப்பெயரும் சுட்டப்பெறவில்லை. ஆகவே முருகனே தன்னிகரற்ற வழிபாட்டிற்குரிய பெருந்தெய்வமாகவும் தலைமைத்தெய்வமாகவும் முழுமுதற்கடவுளாகவும் விளங்கியதை அறியமுடிகின்றது. "ஆணாதிக்கச்சமூகத்தில் சேயோனுக்கும் கொற்றவைக்குமான உறவு உருவாக்கப்பட்டதை வானமாமலை எடுத்தியம்புவார்."[4] தமிழ்க்கடவுள், தொன்மைக்கடவுள் என்று முருகன் போற்றப்படுவதன் பொருத்தப்பாட்டைக் காண்பதற்கு நற்றிணைப்பாடல்கள் துணைபுரிகின்றன.

முருகன் என்ற தெய்வப்பெயர் நேரடியாக முருகு,நெடுவேள் ஆகிய இரண்டு பெயர்களில் நற்றிணையில் சுட்டப்பெற்றுள்ளது. இவ்விரண்டு பெயர்கள் தவிர கடவுள்,தெய்வம்,அணங்கு,வேலன் போன்ற பெயர்களில் மறைமுகமாக முருகன் குறிக்கப்பெற்றுள்ளமையை நற்றிணை வாயிலாகக் காணமுடிகின்றது.

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முருகன்	
நேரடி	**மறைமுகம்**
முருகு	கடவுள்
நெடுவேள்	தெய்வம்
	அணங்கு
	வேலன் (படிமத்தான்)

முருகு

மணம், அழகு, இளமை, தெய்வம் எனும் பல்வேறு பொருட்களை "முருகு" என்ற சொல் உணர்த்துகின்றது. 34,47,82,225 ஆகிய பாடல்களில் முருகு எனும் சொல் இடம்பெற்றுள்ளது.

அணங்கறி கழங்கிற் கோட்டங்காட்டி
வெறியென உணர்ந்த உள்ளமொடு மறியறுத்து
அன்னை அயரும் **முருகு**நின் (நற்.47.8-10)

இப்பாடலடியில் அன்னை வணங்கும் முருகன் என்ற செய்தி கூறப்பட்டுள்ளது.

முருகுறழ் முன்பொடு கடுஞ்சினஞ் செருக்கிப்
பொருத யானை வெண்கோடு கடுப்ப (நற்.225.1-2)

இவ்விடத்தில் முருகனைப் போல வலிமையான யானை என்ற குறிப்பு சொல்லப்பட்டுள்ளது.

நெடுவேள்

நெடுமால் என்ற பெயர் திருமாலைக் குறிப்பது போல் முருகனைச் சுட்ட நற்றிணையில் நெடுவேள் என்பது பயன்படுத்தப்பட்டுள்ளது. 173, 288 ஆகிய இரண்டு பாடல்களில் நெடுவேள் என்ற பெயர் காணப்படுகின்றது.

நெடுவேட்கு ஏதம் உடைத்தோ (நற்.173.9)

என நெடுவேள் எனும் பெயர் சுட்டப்பட்டுள்ளது.

கடவுள்

கடவுள் எனும் சொல் ஐந்து இடங்களில் மலையைக் காக்கும், கடவுள்தன்மை, பலிபெறும் கடவுள் என்ற குறிப்புகளோடும் முருகனைக் குறிக்கும்

வகையில் திகழ்கின்றது. 34, 83, 165, 251 ஆகிய பாடல்களில் இப்பெயர் இடம்பெற்றுள்ளது.

தெய்வம்

185, 201, 351 ஆகிய மூன்று இடங்களில் தெய்வம் என்ற பெயர் முருகனைச் சுட்டுவதாக அமைந்துள்ளது. இம்மூவிடங்களிலும் மலையோடு தொடர்புபடுத்திக் கூறப்பட்டுள்ளது.

தெய்வங் காக்குந் தீதுதீர் நெடுங்கோட்டு (நற்.201-6)

இங்கே தெய்வம் காவல் காக்கும் மலை என்ற செய்தி இடம்பெற்றுள்ளதை அறியலாம்.

அணங்கு

165, 288, 322, 376, 386 ஆகிய 5 பாடல்களில் அணங்கு என்ற சொல் இடம்பெற்றுள்ளது.

அணங்கொடு நின்றது மலைவான் கொள்கென (நற்.165-3)

தெய்வம் (அணங்கு) மலையில் வெளிப்பட்டு நின்றதை இப்பாடலடி உணர்த்துவதைக் காணலாம்.

வேலன்

வேலன் என்னும் சொல் இன்று முருகனைக் குறிக்கும் பெயராகத் திகழ்கின்றது. ஆனால் நற்றிணையில் முருகவழிபாட்டை முன்னின்று நடத்தும் படிமத்தானாகிய பூசாரியைக் குறிப்பிடுகின்றது. 34,51,268,273,282,322 ஆகிய ஆறு இடங்களில் இச்சொல் கையாளப்பட்டுள்ளது.

கார்நறுங் கடம்பின் கண்ணிசூடி

வேலன் வேண்ட வெறிமனை வந்தோய்

கடவுளாயினும் ஆக

மடவை மன்ற வாழிய **முருகே** (நற்.34.8-11)

இப்பாடலில் “கார்காலத்து மலரும் கடம்பமாலையை அணிந்து படிமத்தான் வேண்டுதலால் வெறியாடும் இடத்திற்கு பலி பெற வந்தவனே என்றும் நீ கடவுள் என்று வணங்கப்படும் சிறப்புடையவன்“ என்று வேலன் என்ற சொல்

படிமத்தானையும் முருகு என்ற சொல் முருகனையும் ஒரேபாடலில் குறிப்பிடுவதைக் காணமுடிகின்றது.

ஒரே ஒரு பாடலில் (82) மட்டும் முருகன் தன் துணையாகிய வள்ளி என்னும் பெண் தெய்வத்தோடு இணைத்து உவமையாகவும் கூறப்பட்டுள்ளதைக் காணலாம்.

முருகுபுணர்ந்து இயன்ற வள்ளிபோல நின் (நற்.82-4)

என்றவாறு வந்துள்ளது.

வழிபாட்டுமுறை

கழங்கு,கட்டுகூறுதல் என்பதும் ஒருவகை தெய்வவழிபாட்டு முறை, நம்பிக்கை என்று கருதலாம். வேலனைப் போன்று கட்டுவிச்சி எடுக்கும் முருகவழிபாடு வெறியாட்டு என்ற பெயரில் நிலைபெற்றது. இம்முறை இன்று காணும் சிறுதெய்வ வழிபாட்டுடன் ஒத்துள்ளது. மலர் தூவியும் கழங்கு எண்ணியும் ஆடு முதலானவற்றை பலிகொடுத்தும் வேலன் கள்ளுண்டு ஆடுவதாய் இவ்வழிபாட்டுமுறை அமையும். முருகவழிபாடு தொடர்பான பாடல்கள் நற்றிணையில் மிகுதியாய் இடம்பெற்றுள்ளன. (47,82,217,268,282,322 - 6 பாடல்கள்)

“அணங்குஅறிகழங்கின்கோட்டம்காட்டி

வெறியெனஉணர்ந்தஉள்ளமொடுமறிஅறுத்து

அன்னை அயரும் முருகுநின்” (நற்.47.8-10)

முருகதெய்வமேறி ஆடுபவன் கையில் வேல் கொண்டிருந்ததால் அவன் வேலன் எனப்பட்டான். இந்த வேலன் பல வகைப்படுவதைப் பின்வரும் கூற்று உணர்த்துகின்றது. “இன்றும் கேரளத்தில் பரதவேலன், கைவேலன், பனவேலன், மண்ணவேலன் என்று நான்கு பிரிவாய் இவ்வேலச்சமுதாயம் மருந்துத்தொழிலையே பின்பற்றி வருவதாய்” கூறுவர்.[5] அக வாழ்வியலில் மட்டுமல்லாமல் மக்களின் புற வாழ்வியலிலும் முருக வழிபாடு முதன்மையிடம் பெற்றதை “புறத்திலும் முருகவழிபாடு உண்டு. காந்தள், வாடாவள்ளி (வேறுவகை ஆட்டம் பெண்டிர் ஆடுவது) என்னும் வேறுபெயர்களில் போருக்குப் பின்னர் ஆடுவது”.[6] என்ற கூற்றின்வழி அறியலாம்.மேலும் முருக வழிபாட்டினைப் பெண்கள் மேற்கொள்வதாகவே பல்வேறு இடங்களில் நற்றிணை குறிப்பிட்டுள்ளதும் கவனிக்கத்தக்கது ஆகும்.

இன்று மனிதசமுதாயம் நிறம், இனம், மதம் போன்ற பல்வேறு பிரிவினைகளால் பல இன்னல்களை எதிர்நோக்குவது நாம் அறிந்ததே. சங்ககாலத்திலும் தெய்வம் என்ற கருத்தாடல் இன்றியமையாத இடம் வகித்ததை நற்றிணை வாயிலாக அறியமுடிகின்றது. இருப்பினும் கடவுளின்பெயரால் அரசியல் செய்யாததையும் மக்களின் வாழ்வியலோடு இணைந்து மட்டுமே தெய்வநம்பிக்கை ஏற்றுக்கொள்ளப்பட்டுள்ளதையும் நற்றிணை ஆணித்தரமாக வலியுறுத்துவதன் வாயிலாக அறியமுடிகின்றது. மேலும் களவுகால வாழ்க்கையோடும், நம்பிக்கைகளோடும் பின்னிப்பிணைந்த நிலையில் முருகன் மட்டுமே அச்சங்க சமுதாயத்தில் வழிபடுதெய்வமாக விளங்கியதை இக்கட்டுரை நிறுவுகின்றது.

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STUDIES ON THE IMPACT OF THE PESTICIDE CYPERMETHRIN ON AMMONIA AND UREA OUTPUT IN THE FRESH WATER FISH *Cyprinus carpio*

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Abstract

The Pyrethroid Pesticide Cypermethrin was used as the pesticide pollutant in the fresh water fish *Cyprinus Carpio*. The experiment was done at an interval of 2, 4, 6, 8, 24, 48 and 72 h.Prior to the experiment the water sample was taken from each glass container and the amount of ammonia and urea excreted out were estimated. The ammonia and urea excretion also varies fromfish to fish. The Pyrethroid Cypermethrin altered the excretory pattern of Ammonia and Urea output. The Results showed an initial short term (2 – 8 h) toxic response followed by a change in the long term (24 – 72 h) response and implied an effect on the nitrogen metabolism. Fishes being ammoniotelic excreted more ammonia than urea. Protein degradation resulted in the production ofmore ammonia than urea. The excretory pattern was changed due to hydrolysis of large quantitiesof proteins and amino acids in which urea deaminated. The cypermethrin are extremely toxic to fish and this toxicity increases the ammonia level of excretion than urea and it is reflected in the excretory output found in the water environment.

Keywords: *Cyprinus Carpio*, Cypermethrin – Pesticide, Ammonia, Urea Excretion, Toxicit

Introduction

The protection of the environment today is the concern of the people all around the world. Pollution is caused by the deliberate or accidental contamination of the environment with man's waste, and a continuation of this practice will eventually cause the whole planet to become uninhabitable. The pollution of our water is not just directly lethal for the fishes by poisoning, indirect damage is also caused. Pesticides not only produce biological or pathological changes butalso cause significant biochemical alterations in the living system. This increased use of pesticides over the last 25 years had been essential in the interests of food production to match the rise in the world population. These chemicals caused adverse physiological effects for the organisms in the environment. The ever increasing use of these chemicals has already resulted in a great deal of controversy about the effects of pesticides on the environment. The recently developed fourth generation pesticides are the pyrethroids. The pyrethroids are a class of

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insecticides of great importance to the protection ofman's crop and health. These new group of compounds have more favourable properties. Pyrethrum is one of the oldest insecticides known to man, the active principle of the pyrethrum flowers are pyrethria-I and II and Cinerin-I and II. This insecticide has a rapid knock-down action.

Synthetic pyrethroids are considered to show their toxic effects involving primarily the Central and Peripheral nervous systems Delauny suggested that a relationship exists between the nature of the principal nitrogenous waste product and the stress ofthe habitat of animals. Goldstein and Forster [1] estimated that 60%of ammonia us excreted through the gills, the reminder being contributed by the gill tissue. Variousinvestigators have shown a relationship between nitrogen waste product and pesticide toxicity. Rusco observed that the pyrethroids showed no direct action on fish and hence concluded that pyrethroids when sprayed on crop there is less chance of the insecticide remaining in water athigher concentrations to cause mortality. Therefore, the study was undertaken to determine the effects of the pyrethroid pesticide Cypermethrin to find out the ammonia and urea output of *Cyprinus carpio* in the water sample at lethal concentrations.

Materials and Methods

The commonly available fish *Cyprinus carpio* species was chosen for the present investigation. *C.carpio* is also used in certain ponds and wells as an agent to control various harmful insect larvae. Stocks of *C.carpio* with an average weight of 3 – 10 g. were collected fromTamil Nadu Fisheries Developmental Corporation Limited, Azhiyar in Coimbatore. The stock fishwere maintained in large rectangular glass aquaria (752 X 35 X 46 cm) and were acclimated to thelaboratory conditions at least for a month. The individuals were kept under natural light and dark condition.

As a routine the water was changed every day and were fed *ad libitum* with boiled egg during acclimation. Fishes were regularly checked for infection or disease if any and other unhealthy conditions. Unhealthy fish and those with infections were removed immediately. Afterthe period of group acclimation healthy fish groups having an average weight of 3 to 5 g. were selected for experiments. They were transferred individually in to the glass containers of the one litre capacity and were acclimatized to the experimental conditions for one week. The pyrethroid pesticide Cypermethrin was used as the pesticide pollutant in this investigation.

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Fresh water fish: ***Cyprinus carpio***

Evaluation of medium tolerance limit (LC50) for Cypermethrin pyrethroid:

LC50 is defined as that concentration of the substance which kills 50% of the test animals during the test period or it is the concentration of a poison, to one half of the test population [2]. In the early part of the experiment various groups of *C.carpio* were exposed to different concentrations of pyrethroid. Cypermethrin concentrations of 0.01, 0.02, 0.03, 0.04, 0.05, 0.06, 0.07, 0.08, 0.09 ppm were used to determine wide range of median tolerance limits. After determining wide range of median tolerance limits, appropriate narrow range was selected. Concentration of 0.003, 0.004,0.005, 0.006, 0.007, 0.008, 0.009 ppm (pyrethroid) were used to determine median tolerance limits and the mortalities were recorded every 24 h and 72 h responserange was determined for each concentration. From the results obtained, median tolerance limit has been arrived by using probit analysis method of Finny

Lethal studies:

Seventy two hour LC50 concentrations of pyrethroid were used for lethal studies and for each exposure period minimum six fish were exposed in the LC50 concentrations 2, 4, 6, 8, 24, 48, 72 h. Based on the requirement various groups of fish were exposed to lethal concentration of toxicant Cypermethrin pesticide. The experiment was done at an interval of 2, 4,6, 8, 24, 48, 72 h. Prior to the experiment, the water sample was taken from each glass container and then the amount of ammonia and urea excreted out were estimated. Ammonia concentration in the sample was estimated by the methods of Solorzano. Urea concentration in the samples was estimated by the method of Newell *et al* 1967).

The data were analyzed statistically and were expressed as mean ± standard deviation

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of the mean. The standard deviations were calculated by the procedure described by Ostle. Student 't' test was used to compare the means obtained between controls and experimental groups.

Results and Discussion

Based on bioassay method and probit analysis, the median tolerance limit (LC50) at 72 h. for the pyrethroid pesticide cypermethrin was found to be 0.006 ppm. The ammonia output of control *C. carpio* was estimated to be 58.66 mg/animal (Table 1; Figures 1 & 3).

Table 1: Effect of Lethal (LC50 72 h) concentration of Cypermethrin on ammonia and urea output (mg/fish) in the water samples.

Hours		Ammonia		Urea
	Control	Experimental	Control	Experimental
	58.66 ±17.074		6.66 ± 2.357	
2		NIL		NIL
4		61.33 ±32.55 ◦		4.16 ± 1.17**
6		32±17.074 **		4.166 ± 1.17**
8		5.13 ±24.26 *		3.333 ±1.17*
24		34±14*		4.583 ±3.02*
48		178.66 ±206.64 *		6.66 ±3.43**
72		64±16*		4.166 ±1.17*

Each value is the mean + S.D. at 6 animals

- Statistically significant at 5% level
- *Highly significant ** insignificant

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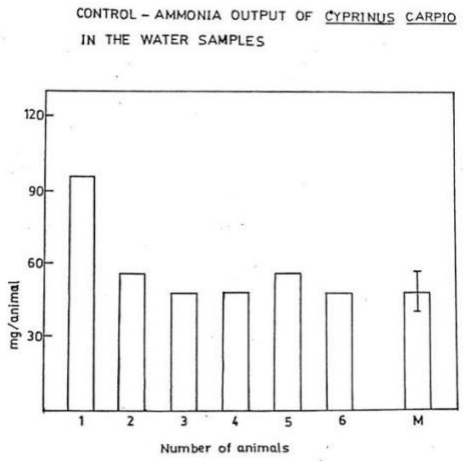

Figure 1. Bar graphic representation of ammonia output in the water sample of control *Cyprinus carpio.* Eachbar represents ammonia output in the water sample of different animals (Minimum 6 animals). The bar diagram with vertical line represents the average performance of 6 fish and the vertical line represents the standard deviation (M-Mean)

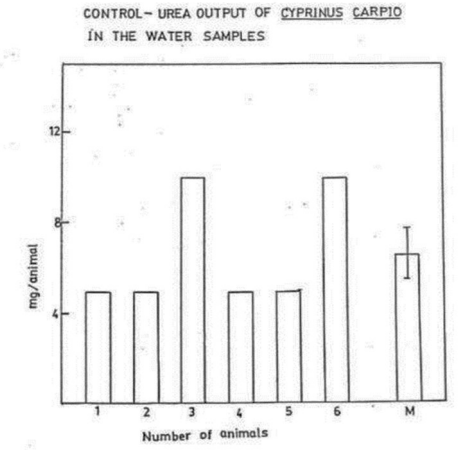

Figure 2. The bar graphic representation of urea output in the water sample of control *Cyprinus carpio.* Each barrepresents the urea output in the water sample of different animals (Minimum 6 animals). The bar diagram with vertical line represents the average performance of 6 fish and the vertical line represents the standard deviation (M-Mean)

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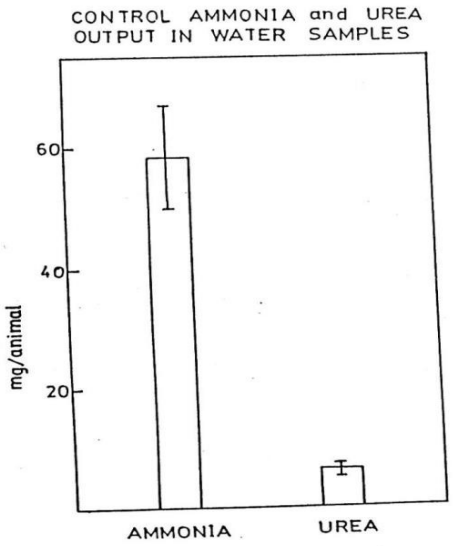

Figure 3. Bagraphic representation of ammonia and urea output in the water sample of control *Cyprinus carpio.*Each bar represents the average performance of 6 fish and the vertical line at each bar represents the standarddeviation (M-Mean)

Cypermethrin vs. Ammonia Output

Lethal exposure:

The ammonia outputs at lethal concentrations were 61.33, 32, 5.133, 34, 178.66 and 64 mg/animal at 4, 6, 8, 24, 24, 48, and 72 h of exposure, respectively. Ammonia output at 2 hour exposure did not reveal any appreciable amount. Thus, the percent change was 0, - 4.55, 45.4,91.2, 42,- 204.5, 9.1, at 2, 4, 6, 8, 24, 24, 48, and 72 h respectively (Table 1; Fig 1)

Urea output in control fish:

The urea output of control *C. carpio* in the water sample was estimated to be 6.66 mg/animal (Table 1; Fig 3).

Cypermethrin vs. Urea output

Lethal exposure:

The urea output at lethal concentrations were found to be 4.166, 4.166, 3.333, 4.583, 6.66 and 4.166 mg/animal at 4, 6, 8, 24, 24, 48, and 72 h of exposure periods respectively.At 2 hour exposure, the water sample did not reveal any appreciable amount. Thus, the percent change was 0, 37.4, 50, 31.2, 31.2, 31.2, and 37.4 at 2, 4, 6, 8, 24, 24, 48,

and 72 h respectively. (Table1; Fig. 2).

Cyprinus carpio excreted ammonia and urea as excretory products. The excretion of ammonia also was higher than the urea. The pyrethroid pesticide cypermethrin influenced the excretory pattern of the ammonia and urea as reflected in the excretory output found in the water environment. The findings showed an initial short term response (2 – 8 h) followed by a change in the long term response (24 – 72 h) and thus implied a change in the nitrogen metabolism due tocypermethrin pesticide toxic effect. Fishes being ammoniotelic excreted more ammonia than urea.Protein degradation resulted in the production of more ammonia than urea. In the fishes, the excretory pattern was changed due to hydrolysis of large quantities of protein and amino acid which urea deaminated as suggested by Munro. The pyrethroid pesticides are extremely toxic to fish. Factors such as pyrethroid and emulsifier interactions and pyrethroid stereo chemistrymay influence the toxicity of these insecticides to fish.

Toxicity tests revealed that the Indian cat fish is highly sensitive to cypermethrin. Biochemical studies confirmed this, showing that the effects on metabolites also revealed a time –dependent response. Hinks suggested that the insecticide toxicity is affected by a variety of factors including temperature presumably they reflect variationsin the interactions of the factors that contribute to the net toxic effect, rates of absorption, distribution, detoxification, excretion and differential target site interactions. McLeese demonstrated that some pyrethroids are highly toxic to fish and other aquatic organisms. Goldstein and Forster [1] estimated that 60% of the ammonia excreted through thegills of a sculpin (*Myoxocephalus scorpius*) can be accounted for by blood clearance, being contributed by the gill tissue. Freshwater fishes having the lower urea concentration that themarine . Maetz had shown that NH4+ in the blood of gold fish can be excreted in exchange in exchange for Na+ in the water.Thus, there may be two mechanisms for excreting ammonia, simple diffusion as well as exchangecomponent at the gills. The quantity of ammonia excreted in the urine of fishes in relatively smallcompared to gill excretion even though the urine of these species may be highly acidie.

Malla Reddy and Bashamohideen suggested that *Cyprinus carpio* were exposed to fenvalerate for 6, 12, 24 and 48 h. After each exposure the gill tissues was isolated and chilled in the box and used for the estimation of total, structural and soluble proteins ammonia urea and glutamine. Ammonia content decreased but the urea and the glutamine level increase. The decreaseof ammonia content in the gill suggests the excretion of ammonia from this tissue by the way of diffusion. The decreased levels of ammonia with increased urea content suggest the stephered up conversion of toxic ammonia to less toxic urea.

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FESTIVAL - A CULTURAL IDENTITY – WITH SPECIAL REFERENCE TO FESTIVALS OF MADURAI MEENAKSHI TEMPLE

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Abstract

A festival is an event ordinarily celebrated by a community, centering on some characteristic aspect of that community and its religion or cultures. Festivals often serve to fulfill specific communal purposes, especially in regard to commemoration or thanking to the gods and goddesses. Celebrations offer a sense of belonging for religious, social, or geographical groups, contributing to group cohesiveness. They may also provide entertainment, which is particularly important to local communities before the advent of mass-produced entertainment. Besides all it is also an aspect of tourism. Festival tourism is a concept that is progressing in the tourism industry today. Travel to visit festivals is called as festival tourism. Festivals in Indian context, is a major component of religion and culture. Most of Indian festivals are celebrated to pacify the gods and goddesses and also to preserve and spread the rich cultural heritage. India is a land of rich cultural heritage. India being a culturally diversified country, has a lot of cultural heritage monuments and temples. The tourist places in India speak dimensions of local culture and their social life. Tamil Nadu which is the third largest state in India, possess wide-ranging culture and they are depicted in the ancient monuments, temples and the festivals celebrated in the temples and villages.

Madurai which is called as the 'Athens of the East' is one of the important cultural centre of Tamil Nadu. Madurai is known as the 'Temple city' due to the presence of a large number of temples in the city. And for this reason, many tourists from within the country and abroad visit the place each year. The most important temple in Madurai is the Meenakshi temple. The temple has a 1000 pillars hall, 14 towers with remarkable art, architecture and paintings. Thirugnanasambandar, the Hindu Saint has mentioned the temple in his songs which goes back to the early 7^{th} century. It is one of the oldest cities in India and is popularly called 'Thoonga Nagaram' meaning the city never sleeps, on account of the active night life.

The city presents a combination of vibrant celebrations of festivals, traditional beliefs and customs with a slight spark of modernity. The culmination of cultural legacy of Madurai can be witnessed in the festivals celebrated with absolute gusto and enthusiasm every year. The major festivals celebrated in Madurai include Pongal, Jallikattu, Chithirai festival, Festival of the Cradle, Avanimoolam festival, Float festival, Dance festival etc. This paper tries to bring

out the festivals celebrated in Meenakshi Amman Temple. Apart from regular activities festivals introduce the visitors our cultural heritage. In Meenakshi Amman temple, in every Tamil month, a specific festival is celebrated and throughout the year some sort of festival is celebrated here. This paper tries to present a detailed account of the festivals celebrated in Meenakshi Temple.

Keywords: festival, festival tourism, cultural tourism, heritage.

Introduction

Travel for religious purposes assumed significant in all parts of the world. The practice of travelling for religious reasons, going on a pilgrimage for example, became a well established custom in many parts of the World. Travel was dominated by religious motivations. Religion is a great unifying force. Pilgrimages strengthen religious bonds. The religious tours and trader's voyages contributed to geographical unity, assimilation of people, integrity and prosperity of the nation.

In the Indian context, tourism is not intended only for pleasure[1]. Religion and economy were also important factors. In Indus valley civilization, travelling to distant land was found and some inscriptions from Egypt, Mesopotamia indicate trade relations between Indus valley civilization and contemporary western civilizations. Rigveda provides enough knowledge about pilgrimages, travelling for trade, adventurous tourism just like hunting expeditions.

The Mahakavyas provide vast knowledge of adventurous, hunting, educational tours etc. Some important places famous for pilgrimage are also mentioned in the Puranas. According to the Matsya Purana Kasi was famous tirtha and favourite of Lord Siva. In the Mauryan period, the accounts of Kautilya, Megasthenes and inscriptions of Asoka provide a lot of evidence about tourism, maintenance of roads and law and order. Fahien, Huen – T – sang described the rituals, ceremonies and festivals as instrumental in promoting tourism. Later on, the Gupta, Chalukya and Pallava arts gave boost to pilgrimage in ancient India.

In South India, Cheras, Cholas, Pandyas, Nayaks, Pallavas also added their contribution to the glory of art and architecture. Traditionally visitors came to India primarily for its ancient culture and way of life. But in the 80s the profile changed as India became an all season destination. The government is also proposing to capitalize on the ever increasing demand for conventions. Introduction of modern technologies brought a lot of changes in tourism and nowadays tourism is mentioned as an industry. Private and Government organizations play a vital role in further development of tourism. Because of the increasing and varied interests of the tourists, tourism took various dimensions like Eco tourism, Medical tourism, Adventure

tourism Rural tourism, Heritage tourism, Cultural tourism etc. Festivals attract more foreigners towards the temples and monuments. Festivals speak the cultural and social life of the people. Festivals are of various types on the basis of their motive and uniqueness. Religious festivals, art festivals, film festivals, food festivals, seasonal and harvest festivals.

This paper tries to bring out the festivals celebrated in Madurai, Meenakshi Temple, Tamil Nadu in detail, because temples, historical monuments and festivals speak the cultural history of the people.

Madurai is one of the oldest cities in India and in the world. Madurai is the city of mother Meenakshi. It was the capital of the Pandyas of Ancient Tamilaham.

Ptolemy described it as an "Emporium of the South". For centuries before Christ, Madurai had trade links with Greece and Rome and some other old cities abroad. In Kautilya's Arthasastra (4th century B.C) it says that Madurai was famous for its textile products and pearls.

Legend says that Lord Siva appeared in the dream on the then King, Kulasekhara Pandya. The king was amazed to see drops of nectar, "Madhu", falling down of earth from Lord Siva's matted hair. The "Madhu" was so sweet that the place where it fell came to be known as "Madhurapuri" which in course of time became "Madurai".

Tamil and Greek documents record its existence from the 4th century B.C. Being in the heart of Tamilnadu, Madurai has fostered Dravidian and Tamil Culture.

The Muslims invaded Madurai in the 14th Century. Later it came under the rule of the Nayaks of the Vijayanager Empire. Among the Nayaks, the rule of Thirumalai Nayak, remembered him as the Maker of "Modern Madurai".

Under the Vijayanager rulers Madurai improved well. They built many temples, palace, etc. and the Nayaks who followed the Vijayanager, not only preserved the work of the earlier kingdoms, but also enriched their traditions

The Meenakshi Temple

Sri Meenakshi Temple is one of the greatest temples of South India. It is situated in the heart of the city of Madurai. The city is planned around the temple and the streets around the temples are named in the names of Tamil months. The construction of Sri Meenakshi Amman Temple goes back to 2000 years ago. This is a twin temple one is dedicated to Sri Meenakshi and the other to Lord Sundareswar[2]. Here there is a custom that people visit Lord Meenakshi first and then go to Lord Sundareswar. Goddess Meenakshi is the main deity of the temple.

There are four main entrances. There are eleven gopurams at Madurai temple. The largest and the most beautiful of them is being the southern doorway. Taken singly, this is considered

to be the most impressive of the structures belonging to the Meenakshi temple. The structure of the temple is magnificent and it contains several unique features.

Thousand Pillared Mandapam

This store house of art was built in 1569 by Dalavoi Ariyanatha Mudaliyar. This mandapam is 250 feet long and 240 feet broad. This is filled with artistic beauty, now it is an art gallery. It also houses musical pillars inside[3].

There is a big Ganesha idol in this temple which is considered to be a special one. The temple is a store house of small shops of bangles and other special articles. People in and around Madurai especially the rural population often visit the temple and get blessings of goddess Meenakshi and Sundareswarar[4].

Festivals of Madurai

Chithirai Festival (Chithirai Month - April)

Chithirai festival attracts lakhs of pilgrims in and around Madurai. People who are settled in foreign countries and other states visit Madurai for attending this festival. It is celebrated for 12 days during the Tamil month of Chitrai (April in the English calendar) and begins with the flag hoisting on the first day. This is a local festival which brings the people in and around Madurai together. This flag remains as such till the festival ends. During the festival time the deities namely Meenakshi and Sundareswarar were brought in various chariots namely vahanams like Anna Vahanam, Kamadhenu vahanam or Kailasa Parvadham, Thanga Pallaku (Golden palanquin), Vedar Pari Leelai or Thanga Kuthirai Vahanam, Vrishaba Vahanam and Yaali vahanam. The next day, it is the Pattabishekam or coronation of Meenakshi, since she is the daughter of the Pandya king of Madurai.

Dikvijayam:

Meenakshi Amman is crowned as the queen of Pandya kingdom by her father. She had the most prominent war skills which made her even more powerful. After Dikvijayam Thirukalyanam that is Divine marriage celebration starts.

Meenakshi Tiukalyanam is the wedding celebration of Meenakshi Amman and Lord Shiva in Madurai. This is the most important occasion of Chithirai festival. The people in Madurai treat this occasion as their own home function, like their daughter’s marriage. All the people attend this wedding ceremony and change their Mangal Sutra in front of the deities.

The next day of the Thirukalyanam, Chariot Festival is conducted which is a big event at Chithirai Thiruvizha. Lord Sunderaswarar and Meenakshi will come to see their devotees in a very grandly decorated chariot. The scenic beauty of the King and Queen of Pandya dynasty

will be a splendid sight to see. Thousands of people will gather in the streets of Madurai to pull the chariot and to witness the celebration.

The next day after the chariot festival is the festival of Alagar celebrated, that is called Ethir Servai. Lord Kallalagar starts from Alagar kovil in the form of Kallar to attend the marriage of his sister Meenakshi and he reaches Madurai on Pournami (Full Moon day). This event is organized for welcoming Lord Alagar to Madurai by the residents of the city. People of Madurai welcome the Deity in a grand manner in their respective mandapas. Each community and region has their own mandapas and from that mandapas they offer a grand welcome to Azhagar.

Alagar Vaigai Eluntharulal

This marks the end of the grand annual celebration of Chithirai Thiruvizha. Only after the sacred marriage of Madurai Meenakshi Amman with Lord Shiva, her brother Alagar arrives at Madurai. Lord Alagar comes from Alagarkoil to Madurai in Golden Horse vahana slowly crossing the risky scenarios through the forests. When reaching the vaigai river bank, he hears that the marriage is over and so he gets infuriated. As a consequence, he returns to Alagarkovil delivering all the gifts which he bought to Meenakshi and Sundereswarar. This historical event is re-enacted in a mandapam in the middle of river vaigai at Chithirai festival. This festival attracts lot of rural people in and around Madurai. They offer various poojas and ceremonies to Azhagar and the scenario in Madurai on that day reminds the rural practices and their life style. The colour of dress that Azhagar is wearing during his entry into vaigai river also have significance.

Dasavatharam event is conducted in Ramarayar Mandapam in the Northern part of river Vaigai. The idol of Lord Vishnu will be shown in all the ten incarnations in an outstanding manner at Chithirai festival.

Poopalaku

After the Dasavatharam festival, in Meenakshi Amman temple, Lord Alagar is brought in a palanquin decorated with sweet smelling flowers. It is a tradition and custom followed by the devotees in order to show their reverence in welcoming the lord. With that Poopalaku the festival of Chithirai or Kallazhagar festival comes to an end. During this festival the whole city is decorated and all people are filled with happiness. It is a cultural festival where the culture of the society is depicted in each and every activity of the festival. Thus comes to the end of the Chithirai festival.

Month of Vaikasi (May)

The spring festival is hosted for ten days during this month. The Lord and Goddess proceed to the New Mandapam stay there and returned in procession. On the day of Moola star, the procession of 63 Saints is conducted in the morning and at night Thirugnanasambandar is taken in procession.

Month of Aani (June)

Oonjal festival is conducted for ten days during this month. On the 10th day, the triple fruit pooja is performed. Abhishekam is performed for Sivakami Amman and Arulmighu Nadarajar on the day of Uthiram. The Panchasabha Nadaraja Moorthy is taken out in procession along the Masi streets.

Month of Aadi (July)

The Aadi Mulaikottu festival is celebrated for 10 days during this month. The festival is confined to only Amman, who is taken in procession along Aadi streets.

Month of Aavani (August)

The Aavani festival is conducted for 18 days. During this festival the deities are taken in a procession around the four chithirai streets. A total of twelve 'Thiruvilayadals' (stories centering on various events in the lives of Lord Shiva's devotees) are performed.

Month of Purattasi (September)

The Navarathri festival is celebrated for Amman in a grand manner during this month. Amman appear every day and bless the devotees at the `kolu mandapam' in Amman Shrine. The entire temple complex is decorated in colour lamps and the dolls would be arranged in a manner to find a niche in the hearts of the devotees.

Month of Ayppasi (October –November), Karthigai (November –December)

Kolattam festival is celebrated.

Month of Margali (December –January)

Thiruvathirai – Arudhra Dharsan Festival and Thiruvembavai and Thiruppavai Festivals are celebrated.

In the month of Thai (January - February) Thepporstavam is performed in Arulmigu Meenakshi Sundareswarar temple.

In the month of Masi (February – March) Masi – Mandala utsavam for 48 days is celebrated.

Summer vasantham festival is celebrated in the month of Panguni (March – April).

The festivals celebrated in the temple shows the cultural life of the people. They consider each and every festival as their way of life rather than a function celebrated in the temple. That much association is seen between the temples, festivals and the culture of the people.

Conclusion

Indian culture, often labeled as an amalgamation of several cultures, spanning across the Indian subcontinent and has been influenced by history that is several millennia old. Many elements of India's diverse cultures, such as Indian religions, yoga and Indian cuisine, have had a profound impact across the world.

The Sanatan Dharma of India is the biggest attraction worldwide. India is the fountainhead of the civilization, the leader of knowledge and epitome of philosophy which led to achieve inner peace. There are 32 World Heritage Sites in India out of which 25 are Cultural Sites. Madurai Meenakshi Amman temple which is constructed more than two thousand years ago, explains the rich culture of the Tamils, through its daily Poojas and festivals. All the festivals celebrated here elaborately depict the cultural and social life of the people. Legendary works of great Saivite poets are enacted in the festivals. Chithirai festival and Jallikattu unites people of different regions and different countries. So festivals not only depict the culture of the people it also has a lot of tourism significance. Madurai as a cultural tourist centre provides our indigenous culture in the form of worshipping, religious and social festivals.

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EFFECTS OF A 12-WEEK YOGIC EXERCISE PROGRAM ON BODY COMPOSITION OF COLLEGE LEVEL OBESE WOMEN

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Abstract

The purpose of this study was to investigate the effect of yogic exercises program on body composition among college obese women. To achieve the purpose of the study, thirty obese women were randomly selected as subjects from Seethalakshmi Ramaswami College, Tiruchirappalli. The age of the subjects is ranged from 20 to 23 years. The subjects selected for this study were divided into two groups of fifteen subjects each. The experimental group I underwent yoga training and group II acted as control group. The Analysis of Covariance statistical technique was used to test the adjusted mean differences among the treatment groups. The experimental group had achieved significant improvement on body composition when compared to control group.

***Keywords*:** Yogic, Body Composition, Obese women.

Introduction

Obesity is a chronic state of being overweight. It's a life threatening condition and current research has shown that obesity is the leading cause for the increased health threats of those persons of the developed world. What worse is, over two third of the industrialized world's population is suffering from obesity and that's putting them in greater health dangers. Everyone desires good health and it is the ultimate objective of those who want happiness in life. Each and every one has to follow good health practices in the routine life. Minor health disorders are quite common to all. In the case of major health problems, the precautionary measures are plenty. Some people control their diseases like blood pressure, diabetes, acidity, asthma etc., by taking medicines regularly. But such practice does not in any way completely eliminate the health disorders. On the other hand, it leads to several other adverse health problems (Gillette & Elseman, 2003)(1).

The women of today's world are very much busy with their hectic schedules; the present professional world has drowned them neck-deep within the stressful conditions of the professional life. They are off late lacking energy, vitality of mind and fun. One of the most simple and effective ways to achieve their desire can be practicing Yoga. Going through a mere fitness itinerary, that is, going to a gym or practicing diet is not the correct path, as they do not always guide one to the right path. But doing some easy exercises or yoga can really impart

upon great spirit to their mind and soul. Yoga works on both the mind and body. It makes one strong both physically and emotionally to handle the challenges of life. Yoga practice provides natural relaxation which is not available with any other exercise. A yoga exercise stimulates all the body organs and endocrine glands (Pradhan, 2008)(2).

Review of Literature

Larcher, N. (2023) "Effects of a 12-Week Plant-Based Diet Program on Obese and Overweight Adults in Rural Michigan". The aim of the study was to investigate how a WFPBD will affect overweight and obese persons living in northern Michigan. The study's primary objective is to determine whether a 12-week online programme on a plant-based diet would improve participants' body mass index (BMI), waist circumference (WC), blood pressure (BP), fasting blood glucose (FBG), and serum lipid levels in this population. It also seeks to ascertain whether their self-efficacy and intake of plant foods would also improve after the WFPBD. A quasi-experimental one-group pre-test-post-test design was utilized for this study. The study's findings suggest that any shift in a WFPBD's direction is beneficial and may be linked to a lower risk of obesity and chronic diseases(3).

Kadam, Govind K., et al (2023) "Effect of 12-Week Yoga Asana On Basal Metabolic Rate Of Young Female Athlete. The intent of the study was to find out the impact of 12-week yoga asana on young female athletes' basal metabolic rate. For the current study, 30 female athletes with ages ranging from 19 to 21 were chosen as subjects. Group A and B participants received 12-weeks of yoga asana instruction to examine the impact. By using a paired t-test, the significance of the difference was evaluated for the basal metabolic rate. The study found that young athletes' basal metabolic rates significantly improved after practicing yoga poses for 12 weeks, as evidenced by changes in body mass index (BMI), waist and hip circumferences, fat-free mass, total cholesterol, high-density lipoprotein, and fasting serum leptin levels(4).

Methods

The purpose of this study was to investigate the effect of yogic exercises program on body composition among college obese women. To achieve the purpose of the study, thirty obese women were randomly selected as subjects from Seethalakshmi Ramaswami College, Tiruchirappalli. The age of the subjects is ranged from 20 to 23 years. The subjects selected for this study were divided into two groups of fifteen subjects each. The experimental **group I** underwent yoga training and **group II** acted as a control group.

Statistical Procedures

The Analysis of Covariance statistical technique was used to test the adjusted mean differences among the treatment groups.

Results and Discussion

Table 1: Computation of Mean and analysis of Covariance of body composition of Experimental and Control Groups

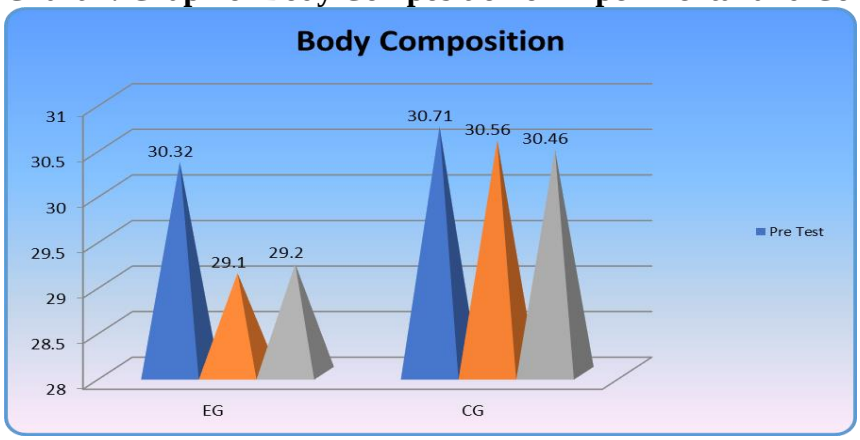
	Experimental Group	Control Group	Source of variance	Sum of squares	df	Mean square	F
Pre test mean	30.32	30.71	BG	1.16	1	1.16	0.36
			WG	89.88	28	3.21	
Post test mean	29.10	30.56	BG	15.98	1	15.98	7.33*
			WG	61.12	28	2.18	
Adjusted post mean	29.20	30.46	BG	11.78	1	11.78	8.35*
			WG	38.30	27	1.41	

* Significant at 0.05 level

Table value for df 1 and 28 was 4.20 Table value for df 1 and 27 was 4.21

The above table indicates the adjusted mean value of body composition of experimental and control groups were 29.20 and 30.46 respectively. The obtained F-ratio of 8.35 for adjusted mean was greater than the table value 4.21 for the degrees of freedom 1 and 27 required for significance at 0.05 level of confidence. The result of the study indicates that there was a significant difference among experimental and control groups on body composition. The above table also indicates that both pre and post test means of experimental and control groups also differ significantly. The pre and post mean values of body composition of both control and experimental groups are graphically represented in the Chart -1.

Chart 1: Graph of Body Composition of Experimental and Control Groups



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Conclusion

Yoga helps in physical and mental development also promotes the social and emotional well-being. The present study demonstrated that Effects of a 12 week Yogic exercise program on body composition of college level obese women. The findings of the present study demonstrated the experimental group had achieved significant improvement on body composition when compared to control group. Regular practice of yoga may be helpful to develop physical fitness, health, and help them to maintain disease free lifestyle and body composition, which in turn develops personality to become a good citizen in future.

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A STUDY ON EMPLOYEE RETENTION WITH SPECIAL REFERENCE AT NEXA-MARUTHI SUZUKI COMPANY INDIA PRIVATE LIMITED, TIRUCHIRAPPALLI

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Abstract

Retention of employees is an important function of the HRM. Employee retention is a process in which the employees are encouraged to remain with the organization for life time or maximum period of time. Employee retention is beneficial for the organization as well as the employee. They are not the ones who don't have good opportunities in hand. As soon as they feel dissatisfied with the current employer or the job, they switch over to the next job. It is the responsibility of the employer to retain their best employees. If they don't, they would be left with no good employees. A good employer should know how to attract and retain its employees. Most employees feel that they are actually paid. Pay is defined as the wages, salary, or compensation given to an employee in exchange for services the employee performs for the organization. Pay is more than "dollars and cents; "it also acknowledges the worth and value of the human contribution. What people are paid has been shown to have a clear, reliable impact on turnover in numerous studies. Employee comprises the most vital assets of the company. In work place where employees are not able to use their full potential and heard and valued, they are likely to leave because of stress and frustration. In a transparent environment while employees get a sense of achievement and belongingness from a healthy work environment.

***Keywords*:** Employer retain, Payment, Healthy work environment

Introduction

Employee retention is simple to understand, but at the same time it can be difficult to achieve. Knowing what employees want and need is a step in the right direction. Managers must acknowledge and accept that they are accountable for managing the factors within their control to help to retain their most valued employees. The performance of employees is often linked directly to quality of work, customer satisfaction and increased product sales and even to the image of a company. Whereas the same is often indirectly linked to, satisfied colleagues and reporting staff, effective succession planning and deeply embedded organizational knowledge and learning.

Employee retention in an organization issues such as training time and investment, lost knowledge, insecure employees and costly proposition for an organization.

Three R's of Retention

1. **Respect**

   It is esteem, special regard, or particular consideration given to people. As the pyramid shows, respect is the foundation of keeping your employees. Recognition and rewards will have little effect if you don't respect employees.

2. **Recognition**

   It is defined as "special notice or attention" and "the act of perceiving clearly." Many problems with retention and morale occur because management is not paying attention to people's needs and reactions.

3. **Rewards**

   It is the extra perks you offer beyond the basics of respect and recognition that make it worth people's while to work hard, to care, to go beyond the call of duty. While rewards represent the smallest portion of the retention equation, they are still an important one.

Objectives of the Study

- ✓ To study the Organizational factors influencing Employee Retention Strategies.
- ✓ To find the individual factors leading employees to leave the Organization.
- ✓ To examine the necessary conditions to retain the employees.

Research Methodology

Research methodology is the specific technique used to identify, select, process and analyse information about Employee retention and to solve the research problems systematically. It is a descriptive study. Both primary and secondary data were collected for the study. Primary data were collected through questionnaire and secondary data were collected from books, magazines and websites. The questionnaire were distributed among 100 respondents selected on the basis of convenient.

Need for the Study

This study emphasises employee retention strategies as a predictor of business performance as opposed to technology, as well as the degree to which individuals appreciate and believe in what they do. In addition, the study focuses on employee turnover and its

reasons. The potential for expansion and the value of the employee offer are also examined.

Review of Literature

According to Armstrong Employee retention is the ability of an organization to retain its best employees and hence, maintain a lower turnover.

Hausknechtet al, (2009) discovered in a research that compensation and benefits contribute to retention.

Goulet and Frank (2002) conducted a research in which organizational commitment in public, non-profit and profit sectors were studied and it was discovered that the workers from the profit sector was the most committed to their organization and next committed was non-profit and finally the public sector employees. Due to extrinsic and intrinsic motivation, the employees from the public & non-profit sectors were anticipated to have high organizational commitment but the study resulted against the expectation.

Company Profile

Maruti Suzuki India Limited, formerly known as Maruti Udyog Limited, is an automobile manufacturer in India. NEXA is Maruti Suzuki's premium sales channel. It marks the first initiative by an automobile company to go beyond selling cars and create a differentiated retail experience for its discerning customers. Launched in 2015, NEXA's philosophy creates. Inspire drives its endeavour to create inspiring experiences through its premium cars, innovative technologies and lifestyle experiences. Today, NEXA has a diverse range of premium cars that caters to every taste. The S-Cross was its debutant offering, which now has over one lakh customers. It was followed by the bold premium-hatchback, Baleno, the leader in its segment with over 7 lakh sales. Next came the tough Ignis, which marked NEXA's entry into the compact urban SUV segment. NEXA then welcomed the Ciaz into its family, offering sophistication to the aspirational and evolving customer. The most recent addition is the XL6, which has struck the right chord with customers, offering the style and comfort they seek. Beyond it showrooms, NEXA has created an exclusive world for those who value the finer things in life. Through its properties - NEXA Music, NEXA Lifestyle and NEXA Journeys, it offers premium and inspiring experiences, and in the process has evolved into a lifestyle brand. In just a period of 5 years, NEXA's customer base has grown to over 1.1 million. It is the third-largest automobile channel in India, in terms of sales, and has a network of over 370 showrooms across more than 200 cities.

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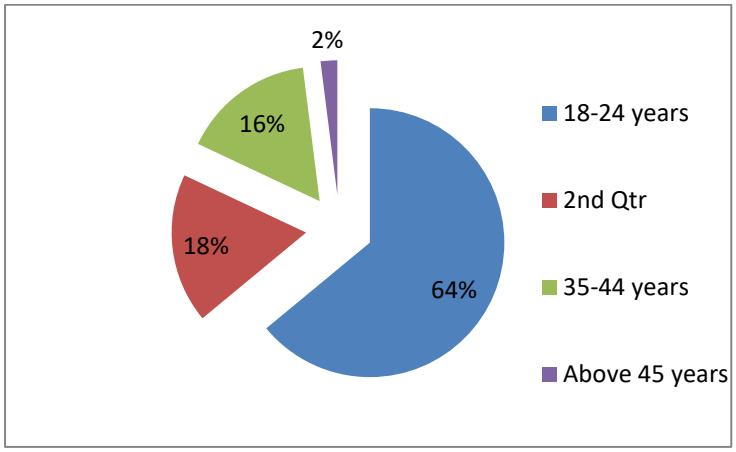
Data Analysis and Interpretation

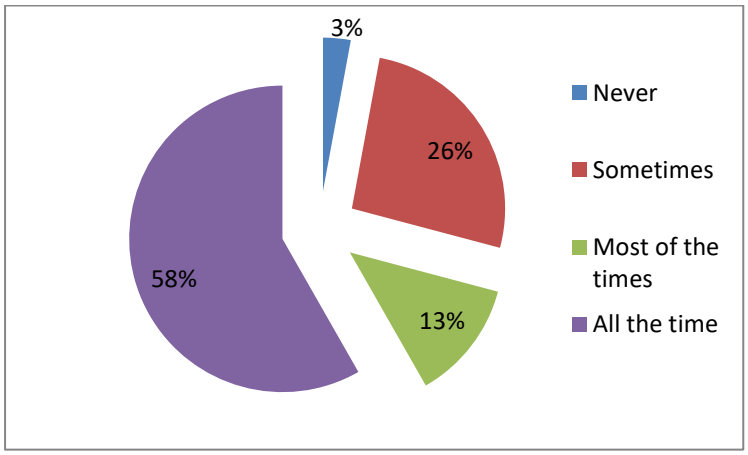
Chart 1: Age



Source: Primary data

The above chart shows that 64% of respondents are between the ages of 18 and 24, 18% are between the ages of 25 and 34, 16% are between the ages of 35 and 44, and the remaining are over 45.

Chart 2: Implementation of Three R's



Source: Primary data

The chart indicates, 58% of respondents believe that implementing the three R's will increase employee retention, 26% believe that it will increase employee retention most of the time, 13% believe that it will increase employee retention all of the time, and 3% do not believe that it will increase employee retention all of the time.

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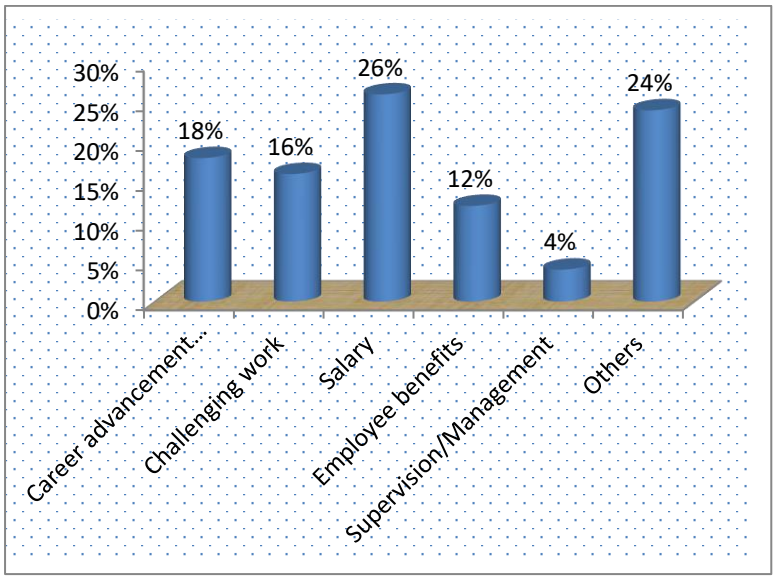
Chart 3: Retain Employment



Source: Primary data

The chart implies that 26% of respondents are interested in salary, 24% are interested in others, 18% are interested in career advancement opportunities, 16% are interested in challenging work, 12% are interested in employee benefits, and 4% are interested in supervision/management.

Table 1: Approach of Management during Retention

S.NO	MANAGEMENT	% OF RESPONDENTS
1	Excellent	26
2	Good	58
3	Average	16
4	Fair	-
	Total	100

Source: Primary data

The above table shows that,58% of respondents said the approach of management during retention was good, 26% said excellent, 16% said average, and none said fair.

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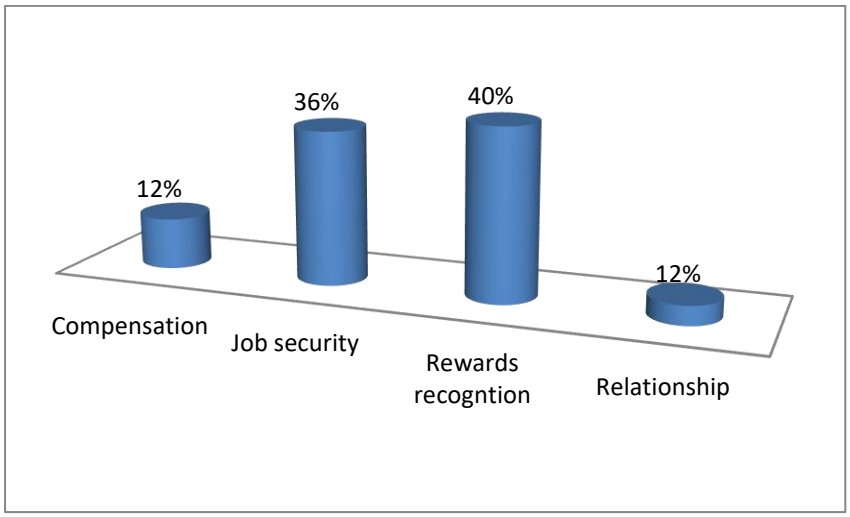
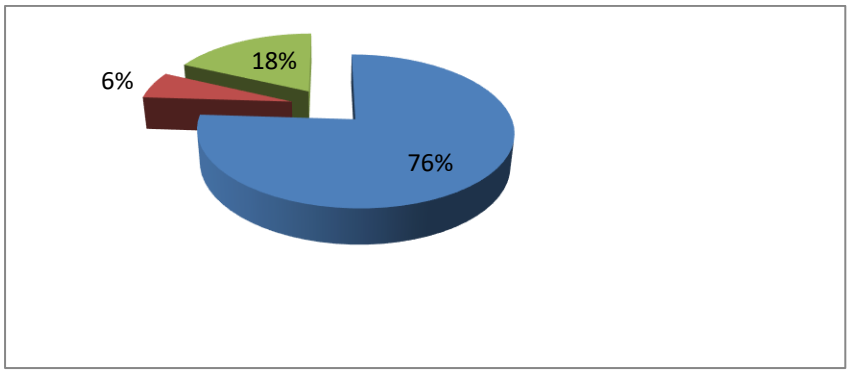
Chart 4: Retention in Same Company



Source: Primary data

The above chart shows that 40% of respondents said rewards and recognition, 36% said job security, and 12% said both compensation and relationship help to retain in the same company.

Chart 5: Additional Benefits other than Salary



Source: Primary data

The above chart implies that 76% of respondents agree, 18% are neither agree nor disagree, and the remaining 6% disagree with the additional benefits.

Findings

- 64% of the respondents are belongs to the age group between 18-24 years
- 58% of the respondents are said sometimes there will increase employees retention by the implementation of three R's (Recognition, Reward and Respect).

- 26% of the respondents are employed with this company only for salary.
- 58% of the respondents said that the approach of management during retention is good.
- 40% of the respondents retain in the same company it only because of their job security.
- 76% the respondents are agree with the additional benefit other than wages will present them from leaving the organization.

Suggestions

To the company

- Provide training to employer so that they get better knowledge, skills and attitude.
- The organization must give proper renunciation to the employer in order to retain them for long period of time.
- The employers are feeling over burden towards the workload. The organization must focus on their smooth workload to reduce the stress on the employees.
- The relationship between employees and management has to improve.
- Reward the employees in terms of bonus incentives according to their performance.
- Provide proper job the rotation to motivate the employees.
- Provide employee with work schedule which are flexible enough to shoot their needs.
- The management has to discuss career anchor to the employees in the organization.
- From this the management can retain their employees and develop the future plan of the company.

Conclusion

According to study, retaining employees is essential to the long-term health and prosperity of the company. Human resource managers unabashedly concur that keeping the best personnel leads to the best teamwork, customer satisfaction, product sales, goodwill for the company, etc. The goal of employee retention techniques is to enhance employee morale and increase employee satisfaction for the greatest possible employee retention. The personnel must have access to certain equipment and tools. By inspiring employees, we can help them work enthusiastically and fully, and by speaking or listening to them, we can learn more about their needs. It supports the business enterprise of the corporation. The three R's, then Recognition, Reward, and Respect are crucial in the process of retaining employees.

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A NOVEL METHOD OF BREAST CANCER DETECTION USING CLASSIFICATION TECHNIQUES

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Abstract

Data mining is a key step in the KDD (Knowledge Discovery in Database) process in voluminous databases, in which intelligent methods are applied to extract patterns. Breast cancer has become a major cause of death among women especially in developed countries. The most effectiveway to reduce breast cancer deaths is early detection. Doctors can use it to differentiate between infected and non infected breast tumors without the need for surgical biopsies when making an early diagnosis with the available accurate and reliable diagnostic procedures. The characterization of breast tumors has been an important issue for many years. This research work studies several data extraction techniques in breast cancer (BC) detection. The purpose of these predictions is to assign patients to both groups, benign and non-benign or cancerous "malignant." The purpose of this proposed work is to improve the diagnosis and prediction of BC by applying data extraction techniques by creating a novel algorithm to improve the breast cancer detection with the application of data mining techniques. Experiments have been performed on computed tomography images of breast cancer. The results of the proposed experiments are evaluated using metrics: sensitivity, specificity, and classification.

Keywords: Classification, Cancer Analysis, Malignant, Detection

I. Introduction

Cancer is a major public health problem in today's world. According to the International Organization for Health Research International Agency for Research on Cancer (IARC), 8.2 million people died of cancer in 2012, with an estimated 27 million new cases. 2030. BC is one of most common type of cancer among women. Detection and diagnosis of BC can be achieved by imaging procedures such as mammography (X-ray), magnetic resonance imaging, ultrasound (ultrasound) and thermal. Images for cancer detection have been studied for more than forty years. However, if cancer does exist, biopsy is the only method that can confidently diagnose. Among the biopsy techniques, the most common are fine needle aspiration, needle aspiration biopsy, vacuum assisted biopsy and (open) surgery (SOB). This process involves collecting cell or tissue samples, fixing them on a glass microscope slide, followed by staining and microscopy.

This paper proposes a novel hybrid algorithm to characterize different levels in malignant breast cancer tissue slice image pattern. Unlike most other research studies cell populations from the high magnification imaging were studied. The ratio of image is applied to derive the diagnostic routine clinical practice based on the degree of the organizational part of the structure. Before classification, several texture features are extracted from each histology images based on the correlation of pixels from the statistical analysis. After each classification performance is compared to the results.

The paper is organized as follows: Section II elaborates on image classification techniques proposed in past, Section III describes the issue handled, Section IV describes the methodologies adapted to solve the issue, Section V explains the novel hybrid algorithm, Section VI discusses the experimental results and the last section concludes the paper.

II. Literature Survey

Anitha, V and others, the main idea in a large number of previous studies related to any classification method is to improve the accuracy of classification. The real need is to achieve better classification accuracy by extracting a collection of more relevant features after dimension reduction. There is a balance between precision and the number of feature sets. Therefore, thepurpose of this study was to implement discrete cosine transform (DCT) in several types of brain tumor images. Later,sequentially, apply the K-means algorithm to DCT coefficients used to group feature sets. In this study [1], the grouping information is proposed as a fine feature set and classified using a support vector machine (SVM)

Akhila E. and others, Digital image processing is relevant because several techniques such as magnetic resonance imaging, computed tomography, laparoscopic and endoscopic surgery, and cancer diagnostic tools are currently used. This paper proposes an image segmentation method based on fuzzy restriction between regions. The result of this segmentation technique is then analyzed for detecting the influence of tumors and cancer [2].

Rangaraj M. propose a metric based on the image edge contour region that characterizes the transition of the density of the region of interest (ROI) along the normal to the ROI in each extreme pixel. It studied the possibility of acuity to quantify the sharpness of tumor boundaries and proposed its application to distinguish between benign and malignant mammography tumors. In addition, it studies the complementary use of various form factors based on ROI form, such as compactness, Fourier descriptor, momentum statistics and chord length to distinguish between restrictive tumors and tumors with arteries [3].

Levente Ficsor, and others, uses Thirty-eight cell count Morphometric based parameters

were determined in cells, glands and superficial epithelium. Fourteen tissue cell count parameters based on tissue compartmental relationships were also calculated. Leave-one-out discriminant analysis was used for classification of the samples groups. The most discriminatory parameter is the proportion of cells in the gland and the entire slide, the proportion of biopsies / gland surface. These differences lead to a general accuracy of 88%.

III. Problem Description

The purpose of this study is to investigate the classification accuracy of three different pattern recognition techniques in the image characterization of breast cancer at different malignant degrees (grades I to III). Compared to most other studies based oncell-group high-magnification image analysis, this study uses x100 to increase routine clinical practice to obtain diagnostic levels based on tissue section structure. Before classification, this work is based on the statistical analysis of pixel correlation to extract texture features from each histological image. In this work three different pattern recognition techniques to study the accuracy of different classifications of breast cancer image features in tissue sections while most other studies were based on large magnified image analysis cell populations.

After obtaining the best combination of image features, the performance of each classifier is compared to each other. The best classifier is capable of producing nearly 90% of the general classification accuracy. The key differences and summary of the work in this study can be compared below with previous similar studies:

- A low-frame frame-to-frame texture analysis was studied, in contrast to other studies in each core that focused on morphology and texture appearance.
- Materials that are routinely stained with hematoxylin and eosin, as opposed to FNA cytology materials,
- The accuracy of the prediction is obtained by an external cross-validation method that can be used to estimate the performance of the system to generalized unknown data, in contrast to the internal methods implied by other studies that can introduce. There is a bias in the classification results.

IV. Methodology

A. Unsupervised Learning

In machine learning, unsupervised learning refers to the problem of finding out hidden objects' structures in unlabeled data. Since the example given to the trainee is not marked, there are no errors or reward signals to evaluate the potential solution.

Unsupervised learning seems to be much more difficult: the goal is to learn how to do something that we don't tell you how to do. In fact, there are two ways to learn without supervision. The first method is to Teaching agent, not through classification, but using a reward system to express success. Keep in mind that this type of training is usually appropriate for the framework of decision-making, because the goal is not to generate a ranking, but to make a decision that maximizes rewards. In the real world, agents can be rewarded for performing certain operations and punished for doing others.

B. K-Nearest Neighbor Classifier

In pattern recognition, the nearest neighbor algorithm (KNN) k is a method based on object classification to train samples that are closest to the feature space. KNN is the simplest and simplest of them straightforward data extraction techniques. It is called a memory-based classification because the training examples must be in memory at runtime. When continuous attributesare involved, the difference between the attributes is calculated using the Euclidean distance. If the first instance is (a1, a2, a3… an) and the second instance is (b1, b2, b3… bn), the distance between them is calculated by the following formula:

$$\sqrt{(a_1 - b_1)^2 + (a_2 - b_2)^2 + \cdots (a_n - b_n)^2} \quad (1)$$

A major problem when it comes to the Euclidean distance formula, the frequency of large values floods to a minimum. For example, in a heart disease record, cholesterol measurements vary between 100 and 190, while age measurements vary between 40 and 80. Therefore, the effect of measuring cholesterol will be greater than age. To overcome this problem, continuous attributes are normalized so that they have the same effect on the distance metric between instances.

KNN usually handles continuous attributes, but it can also handle discrete attributes. When it comes to discrete attributes, if the values of the two instances a2, b2 are different, then the difference between them is equal to one, otherwise it is equal to zero.

C. Support Vector Machines (SVM) Classifier

Recently, vector machines have received particular attention as a classification method. SVMs generally provide better classification results than other widely used pattern recognition methods, such as maximum likelihood and maximum likelihood neural network classifiers.

Therefore, SVM is very attractive for the classification of data obtained by remote sensing. The SVM method attempts to find the best separation hyper plane between classes, with an

emphasis on training cases at the edge of class descriptors. The complete representation of the support vector machine can be found in several publications. Here, the basic principles will be presented and then their implementation and application to Object Based Image Analysis will be evaluated.

The goal is to search for the hyper plane that leaves the maximum margin between classes. In order to find a super optimal plane, a support vector must be defined. The support vectors lie on two hyper planes which are parallel to the optimal and are given by:

$$w\cdot x_i + w_0 = \pm 1 \qquad (2)$$

If a new ratio of super parameters w and w0 is made, the margin can be expressed as 2 /‖w‖. The optimal hyper plane can be found by solving the following optimization problem:

$$\text{Minimize } \tfrac{1}{2}\|w\|^2 \qquad (3)$$

Subject to $y_i(w\cdot x_i + w_0) - 1 \geq 0$ i = 0, 1, … N

D. PNN Algorithm

Probabilistic neural networks are primarily classifiers. NNP use a supervised training set to develop a probability density function in the pattern layer. This is a model based on competitive learning, in which "winner needs all attitudes" is based on the core concept of multivariate probability estimation. Probabilistic networks (PNN) have a similar architecture but a fundamental difference to the general regression neural network (GRNN). The general regression neural network performs regression, in which the target variables are continuous, and the probabilistic networks are classified, where Objective Variables are classified.

V. Proposed Novel Hybrid Algorithm

The proposed work hybrid algorithm, applies a hybrid approach (KNN-SVM) for the image classification. In the training stage, the SVM is utilized to reduce the training samples for each of the available categories to their support vectors (SVs). The nearest centroid classifier approach is combined with the SVM. NC-SVM provides the accurate image classification as better performance than K-nearest neighbor. Even though the nearest neighbor and support vector machine involves high effective classification at individual works they are combined to produce more accurate segmentation.

There are two categories of data points which have been mapped into the vector space, represented by ‒circle‖ and ‒square‖ respectively. Based on the optimal separating hyper-plane can be constructed by maximizing the margin of d1 + d2. After identifying the

SVs of each of the features, the rest of the training data points could be eliminated. On the classification stage, the optimal separating hyper-plane is discarded since its role in making the classification decision has been replaced by the distance function.

The Algorithm

Input: MRI Breast cancer image dataset

Output: Measure the threshold to predict tumor.

Step 1: Calculating the distance of input record from all training records

D21k = (xk-vi)T(xi-vi),1 ≤ i ≤ c, $1 \leq k \leq N$

Step 2: Arranging training records based on the distance and selection of K-nearest neighbor

Step 3: Using the class which owns the majority among the

K-nearest neighbors

Step 4: measuring the similarity between two instances with n attribute values.

Dist (A, B) > 0 and Dist (A, B) =0 iff A=BDist(A,B) = Dist(B,A)

Dist (A, C) < Dist (A, B) + Dist(B,C)

Step 5: Measured input distance pixel information moved to SVM algorithm

Step 6: Given a training set of instance label pairs (xi,yi),i=1,…,l where xi €Run and y€(1,-1) l, the SVM require the solution ofthe following optimization problem.

Step 7: Min w, b, £1/2w^Tw + c Σ ^{1} =1εI

Step 8: Subject to $y_i(w^T Ø(x_i) +b)>1-ε^I$, $ε_i>=0$.

Step 9: Furthermore, $k(x_i,x_j)$ =Ø (x_i) Ø (x_j) is called the kernel functions.

Step 10: if($k(x_i,x_j)$<3) Ø= {x_i*x_j linear (γxixj+coeff)d polynomial Exp (-γ|xi-xj|2) RBF Tanh (γxixj+coeff)sigmoid} endif

Step 11: The SVM is the maximum margin hyper plane that lies in some space.

Step 12: The kernel is then modified in data dependent way by using the obtained support vectors. The modified kernel is usedto get the final classifier.

VI. Experimental Results

A. Image Preprocessing

Pre-treatment plays an important role in any CAD system. The image pre-processing stage is necessary to improve image quality and make the feature extraction stage more reliable. The Wiener filter attempts to construct the best estimate of the original image by applying a small mean square error constraint between the estimate and the original image. Wiener's purpose filter is to minimize the mean square error. Wiener filter can handle

degraded functions and noise. According to the degradation model, the error between the input signal f(m,n) and the estimated signal f(m,n) is given by:

$$E(M,N)=F(M,N)-F(M,N) \quad (1)$$

Square error is given by

$$[F(M,N)-F(M,N)]^2 \quad (2)$$

Mean square error is given by

$$E\{[F(M,N)-F(M,N)]^2\} \quad (3)$$

Wiener filters are a class of optimal linear filters that occupy a linear estimate of the preferred signal sequence of another correlation sequence. It provides the best way to reduce the noise component in order to provide the best reconstruction of the original signal. It can be applied spatially, ie delta or pixel function, Fourier basis, ie frequency component, wavelet base, etc. Wiener filtering is the general method of finding the best reconstructed signal. It is applied on the basis of any orthogonal function, and different cardinalities give different results. In the proposed system, a Wiener filter is used. The following image isan example of Wiener filter. Figure 1 depicts a Weiner filter for mammograms and a simulation result for database images, image images, salt and pepper noise images, Gaussian noise images, mottled noise images, salt images and reconstructed peppers, reconstructed Gaussian images, Reconstructed mottled image.

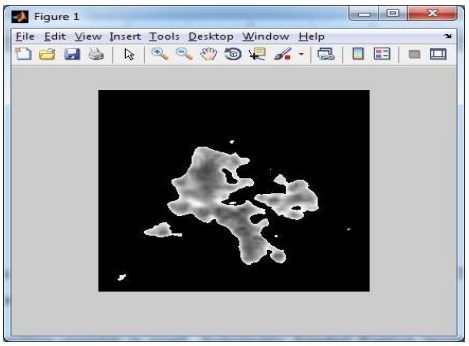

Figure 1. Image Preprocessed Image

B.Segmentation

In the segmentation method, the image is divided into small segments. The goal of segmentation is to identify the correct area and analyze the diagnosis.

In this proposed system active counter is used. Automatic Seeded Region increasing using haralick texture features are as follows Divide improved ROI into RxR nonoverlapping blocks. If the block is too small, the difference in quality texture starting with a typical

texture cannot be well characterized. If it is too large, the result may be too common: calculating the characteristics of the Haralick texture initiates the gray level dependence matrix (SGLD) of each block. Select significant features that can easily distinguish mass and non mass region. Select blocks that contain mass based on features.

- Maximum gray level of that block is seed point.
- The growth of the region starts at this point, then iteratively rises and adds pixels with similar properties.
- Approximate segmented mass to a circle. Estimate radius of circle and compare it with ground truth data.
- This comparison will provide the results of how much truth is segmented by an expert radiologist.
- Extract the mass region from original image that is used as an input for classification.

C.Classification

Classification algorithms such as KNN, PNN and Support Vector Machine (SVM) are based on the principle of structural risk minimization based on statistical learning theory [14]. These algorithms are also suitable for different real-world problems suchas facial recognition, cancer diagnosis and text categorization. The idea of minimizing structural risk is to find the hypothesis h with the lowest true error. Vapnik connects the bounds on the true error with the margin of separating hyper planes. In their basic form, the support vector machine finds a hyperplane separates the training data from the maximum margin. Proposed system is a useful technique for data classification. Classification tasks typically involve training data and tests consisting of some data instances.

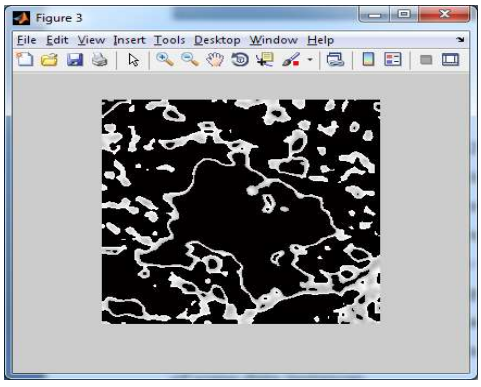

Figure 2. Breast Tissue Classified Image

According to the proposed experimental protocol, the BreaKHis data set is divided into training (70%) and testing (30%). To ensure that the classifier summarizes the invisible

patients, the data set is divided so that the patients used to construct the training set are not used for the test set. The result of this work is the average of five trials. This protocol is applied independently to each of the four available increments.

There are two ways to do this report results when talking about medical images.

In the first case, the decision is the patient, so the recognition rate is calculated at the patient level. Let NP be the number of cancer images of patient P. For each patient, ifthe NREC cancer image is correctly classified, the patient score can be defined as

Patient Score = Nrec/ NP

and the global patient recognition rate as

Patient Recognition Rate = ∑ Patient Score/Total Number of Patients

In the second case, the recognition rate is computed at the image level (i.e., the patient information is not taken into account), thus providing a means to estimate solely the image classification accuracy of the KNN models. Let Nall be the number of cancer images of the test set. If the system classifies correctly Nrec cancer images, then the recognition rate at the image level is: **Image Recognition Rate = Nrec/Nall**

The KNN models were trained on a NVIDIA Tesla K40m GPU using the Caffe framework. These models will be made available in the Caffe format at http://web.inf.ufpr.br/vri/breast-cancer-database. Training took about 40 minutes for the sliding window strategy and 3 hours for the random patch strategy, which contains a much bigger training set.

One advantage of using deep learning techniques is that they do not require domain experts to design feature extractors, but allow the models to learn them. We can see the feature detector that the model learns in the first convolutional layer, considering the weights in the mapping of learning features. Figure 6 displays the 96 feature maps learned on the first convolutional layer of the KNN. We can see that the model learns filters for horizontal and vertical edges, and learns alsofilters that resemble Gabor filters (edgedetectors).

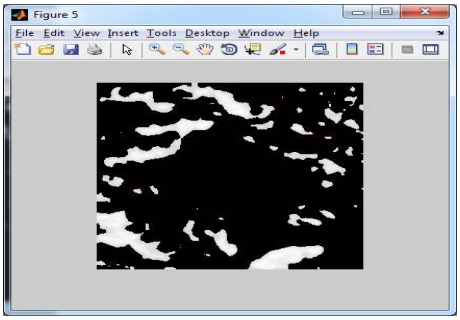

Figure 3. Convolutional Applied Image

D. Tools to Implement

MATLAB (matrix laboratory) is a numerical computing environment and fourth-generation programming language. Developed by Math Works, MATLAB allows matrix manipulations, plotting of functions and data, implementation of algorithms, creation of user interfaces, and interfacing with programs written in other languages, including C, C++, Java, and Fortran.

E. Performance Measures

Two measures are mostly used in validation of results namely sensitivity and specificity. Confusion matrix measures the sensitivity and specificity. True positives- Correctly identified means breast cancer disease found as breast cancer disease. True negatives- Correctly rejected means non breast cancer disease found as non- breast cancer disease. False positives- Incorrectly identified means non- breast cancer disease found as breast cancer disease. False negatives- Incorrectly rejected means breast cancer disease found as non- breast cancer disease. Sensitivity is a proportion of patients with disease to test positive. Hence the formula for sensitivity is given by:

Sensitivity = TP/(TP+FN)

Specificity is a proportion of patients without disease to test negative. Therefore the formula for specificity is given by: Specificity= TN/(TN+FP)

The total accuracy is the estimated likelihood of brain tumor before the test is done. The overall accuracy measure using a particular notation is given by

Accuracy=(TP+FN)/(TP+FP+TN+FN)

Table 1. Performance measures of proposed work

ALGORITHM	SENSITIVITY	SPECIFICITY	ACCURACY RATE
KNN	94.4	89.1	92.9
SVM	96.3	93.8	95.4
PNN	98.33	97.14	97.9
Novel Hybrid	98.66	98.33	98.4

VII. Conclusion

In this study, the problem of identifying the histological grade of breast cancer tissue sections based on pattern classification and image analysis algorithms was investigated. The main contribution of this research work has emanated from the requirement to develop a robust method for histological grade classification using tissue section images of low

magnification. The employment of image-derived textural features that describe the spatial correlations of the grayscale pixels on the image proved a promising approach for the quantification of the architectural pattern of the lesion, and consequently, for the identification of the degree of malignancy (i.e., grade) of the lesion. Image analysis and pattern recognition methods have been previously proposed for the classification of histopathological images of breast cancers, but have been rather focused on textural, morphological, and/or architectural features extracted from the cell nuclei. These features are typically viewable in ×40 magnification.

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RECENT TRENDS AND APPLICATIONS IN THE FIELD OF NANOTECHNOLOGY

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Abstract

Nanotechnology is the art and science of manipulating matter at the nanoscale to create new and unique materials and products. The development of nanotechnology is diverse in interdisciplinary field including biology, biotechnology, physics, chemistry, material science, electronics, and information technology. Nanorobotics is an emerging field of nanotechnology which deals with design and construction of devices at an atomic, molecules or cellular level. This paper benefits the computer research scientists which specify the outline of Nanobots in Nanotechnology.

Keywords: Nanolithography, Nanorobotics, Nanowires, Nano sensors

I. Introduction

Nano Computers, Nano Computing and Nano Technology

Nano computer is a computer whose physical dimensions are Microscopic. A field of Nano computing is a part of the emerging field of Nano technology. Nano computer would work by storing data in the form of atomic quantum states or spin. Nano Computing describes those components that uses extremely small or nano scale device. It comes from two sources; it will be integrated into existing products and technology. New products, software, architecture will be developed. In the computer industry, the ability to shrink the size of transistors on silicon microprocessors will soon reach its limits of speed and miniaturization [1].

II. Definition of Nano Technology

Nanotechnology can be defined as methods that create materials or structures with designed features in the 1-100nm size range. Nano prefix meaning is “one billionth”. Nanotechnology is commonly considered to deal with particles in the size range less than 100 nm, and with the nano materials manufactured using nano particles.

Nanotechnology is the science of the nanoscale, objects around a nanometer in size. Nano technology allows the construction of smaller circuits and computers. Smaller circuits have greater computational speed. Nano materials can make the computers to have a much longer life. It increases the efficiency.

Nanotechnology includes the development of man-made or engineered particles and molecular structures that have dimensions in the nanometer range. Nanotechnology is all about building things atom by atom and molecule by molecule. Goal of this technology is to make tiny devices called “Nanomachines”. Nano technology in Computers, the Computer processors are more powerful, it has Ultra high density memories.Silicon transistors are replaced by transistors based on carbon nano tubes, size of the microprocessors are reduced to greater extend [2].

III. Types of Nano Computers

Nano Electronic Computers. (Bits), Nano Chemical Computers. (CHEMICAL REACTIONS), Nano Mechanical Computers. (NANO GEARS), Nano Quantum Computers (SEM+QUANTUM DOTS).

Nano Electronic Computers (Bits)

Nano Electronic refer to the use of nanotechnology on electronic components, especially transistors. Nano Electronic are often refered to transistor or devices that are so small, the transistors can be made of nanowires, transistor are packed into a single chip with uniform and symmetrical structure of nano tubes. It increases the density of memory chip and decreases the weight and thickness of the screens. It also reduces the size of transistors with less power consumption used in integrated circuits. Nano sized magnetic rings are used in field of electronics and using the electrodes made from nanowires. Nano wires are microscopic wires that have a width measured in nanometers. Nanowires are widely used for Datastorage , transistors, LED, Optic electronic devices, Bio Chemical Sensors.

Nano Wires

A nanowire is a Nanostructure in the form of wire with the diameter of the order of a Nanometre. It is extensively used in nanoelectronic devices as a connectors for the transportation of electrons.Cobalt, copper, silicon,gold have been utilized to make Nanowires. It is also known as Quantum wires. Nano wires are wires which is also used to build tiny transistors for computer chips and other electronic devices.

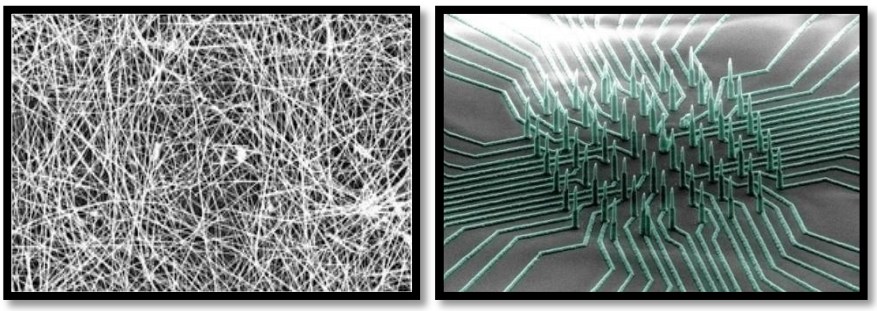

Figure 1. Silicon Nano wires

Nanowires can be synthesized by, Top-Down method and Bottom-Up method. Top-Down method: Reduces a large piece of materials to small piece, by means of Lithography. Bottom-Up method: Fundamental atoms are combined to nanowires.

Nano Chemical Computers (Chemical Reactions)

Chemical computer would store and process the information in terms of chemical structures and interactions. Chemical computer is one that process information in terms of making and breaking chemical bonds and store resulting information in terms of chemical structures. Chemical and Bio Chemical nano computing allows the information storage in organic compounds [3].

Nano Mechanical Computers (Nano Gears)

Tiny machines and computer would be assembled by the mechanical positioning of atoms or molecular building blocks, one atom or molecule at a time. This process is known as "**Mechanosysthesis**". Mechanical Nano Computers use tiny moving components called Nanogears to encode information. By using the Nano gear, we are able to move nano particles from one place to another place in the area. Nanogears are used for the movement of the Nano cars. Goal of nano technology is to make tiny devices called "Nanomachines."

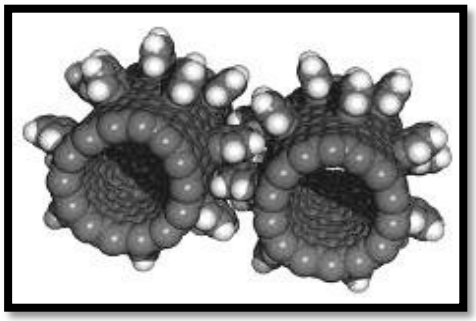

Figure 2. Nanogears

Mechanical Nano computing lead to nanobots, nanoscale devices that could greatly improve small scale surgery techniques.

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Nano Quantum Computers

The Field of Quantum Computing focuses on the development of computer technologies based on the principles of quantum theory. Quantum theory explains the behavior and nature of matter and its energy at the quantum level. Quantum dots are nanometer scale semiconductor crystals. Quantum dot is a nano crystal made of semiconductor materials that are small enough to exhibit quantum mechanical properties.

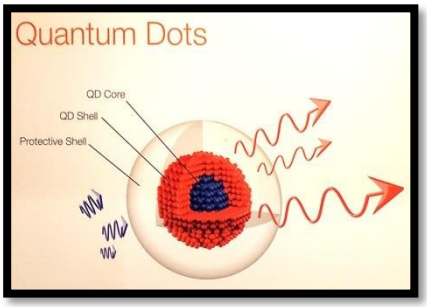

Figure 3. Quantum Dots

Quantum computers can handle more than just the binary information which conventional computers operate on. Quantum computers can also handle data in between a 0 or 1 bit, which should, in turn, provide new types of simulation and calculations.

IV. Applications of Nanotechnology

Nano Technology is widely used in the field of Medicine, Bio Medicine and drug delivery, Bio Technology, Computation, Communication, Energy production and storage, Electronics, Environmental conservation, and Food safety. Fields and the Application of Nano Technology are

- **Devices:** Sensors, Lithium-Ion Batteries, Thin Film Solar Panels
- **Sports:** Sport equipment such as Bats, Bicycle are sometimes built using Nanomaterials including Carbon Nano Tubes. Nano tubes improve strength, durability and decreases the weight of the equipments. Titanium Nano particles are also used in the manufacture of sport equipments.
- **Environment Conservation:** Nano technology is widely used for the Water and Air Purification, Detection of harmful chemicals, Oil Spills.
- **Agriculture:** Smart monitoring of Agricultural Land using the Nano sensors. Nanofiber membranes used for the water purification. Nano Fertilizers, Nano Pesticides and Nano materials are used to improve the field of the agriculture.

- **Health Care and Antimicrobial Uses:** ECG, Blood Pressure, Oximeter data are defined and generated using the Nano Sensors. Medical Nanotechnology expected to employ Nanorobots to treat the patient for the various diseases.

V. Nano-Robotics (Nanobots)

Nanorobotics is an emerging field of nanotechnology, advancement in technology is more essential for the treatment of many problems such as implant of bones and membranes. One such technique flourishes robots using nanotechnology which are known as **nanobots**. The goal of nanorobotics is to incorporate robot functions, sensing, processing of information, some form of action and possibly communication at a scale that is much smaller than a single cell or a microprocessor.

Nanobots will help to build a platform between the technological gaps of physics, chemistry, and biology on the nano-scale. These nanobots can address the path to many creative approaches and will result in new methods and products for both technological and medical- pharmaceutical applications. Continuous monitoring and diagnosis from the inside is possible with the help of the NanoRobots. Nano-carriers such as liposomes, micelles, dendritic macromolecules, quantum dots, and carbon nanotubes have been widely used in cancer treatment. Nanoparticles are a promising treatment option for cancers that are resistant to common therapies. Magnetic nanoparticles damage the tumor cells and remains the healthy cells active [4].

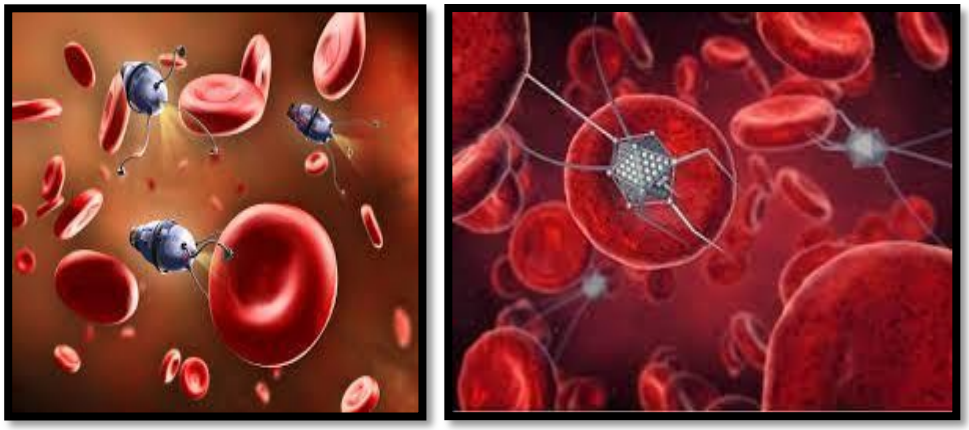

Figure 4.1and 4.2 . Nanomites and NanoBots-NanoRobots

Nanorobots in Cancer Treatment

Nanorobots with chemical biosensors are used for detecting the tumor cells in early stages of cancer development inside a patient's body. An injection of a nanorobot seeks out cancer cells and destroy them and leaving the healthy cells untouched. The patients

have no awareness of devices working inside them. NanoRobots are tiny machines used to cure diseases in human or in an any organism. It performs task at nanoscale dimensions [5].

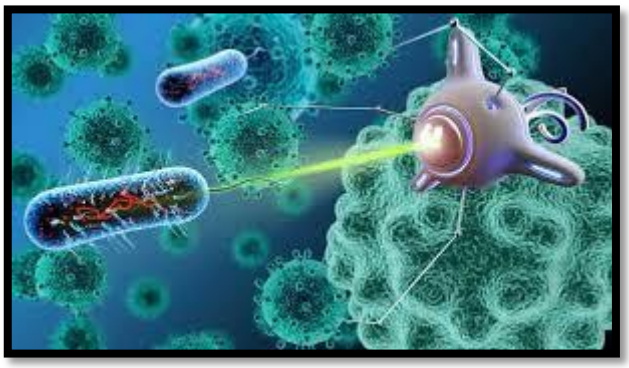

Figure 5. Nanobots destroys the Cancer Cells in the Human Body

Components of Nanorobots

a) **Micro Cameras:** The Nanorobot may include a Miniature camera. The operator can steer the nanorobots when navigating through the body. The information received from the MicroCamera can be stored in the NanoComputers.

b) **Lasers:** NanoRobot lasers could burn the harmful material like blood clots and other cancer cells.

SIZE AND SHAPES OF NANOROBOTS: Nanobots, Nanoids, Nanites, Nanomachines, Nanomites, Nanospiders.

Nanobots in the Field of Medical Science

Robots have recently been introduced to undertake basic surgical procedures, and with the help of nanobiotechnology, another dimension of robotics has been developed. This is commonly known as **nanorobots** or nanobots. Nanoinformation processing and programmability for programming and controlling nanorobots (autonomous nanorobots). Nanobots in healthcare primarily focus on medical diagnosis and monitoring. The nanobots enter the body through direct injection into the bloodstream and then act as an internal surveillance system for the human body. Nanobots are robots made of nanomaterials. Clinically relevant applications of nanotechnology in surgical specialties include development of surgical instruments, suture materials, imaging, targeted drug therapy, visualization methods and wound healing techniques [6].

VI. Advantages Of Nano Technology in The Field of Medicines

With Nano technology, we can create unique materials and products which are stronger, lighter, cheaper, durable, and precise. Field of Medicines, Spherical shaped Nanospheres are used for the drug delivery and tissue regeneration. For the controlled drug delivery, Anti- cancer, shell&core combination Nanocapsules and Cylindrical Carbon tubes are used. Nano sensors is used for fast and accurate diagnostics in the field of healthcare and biological nano science.Nano technology and Nanocomputing benefits the Energy sector in more effective way. Using the technology energy producing, energy absorbing and energy storage devices are manufactured inan efficient way [7].

VII. Conclusion

As the development progress in development of nanotechnology diverse in interdisciplinary field including biology, biotechnology, physics, chemistry, material science, electronics, engineering, computer science and information technology. Each field has better roles in the field of nanotechnology and great advancement in nanotechnology in future establishment. This paper outlines the Nanotechnology, Nanocomputers, Types of Nanocomputers, Electronics Nanocomputers, Advantages of NanoRobots, NanoRobots in the field of the medical sciences, Applications of Nanotechnology. This paper also suggested the possible risks in nanotechnology.

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"THE SYMBOL DAWN" IS THE INTRODUCTION TO SRI AUROBINDO'S *SAVITRI* : *A LEGEND AND A SYMBOL*

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Abstract

Sri Aurobindo started the practice of Yoga in 1905. Within a few years, he had several realizations. After few years, he withdrew from politics and went to Pondicherry to begin his spiritual journey. Then he developed a new spiritual path, the Integral Yoga. His ultimate aim is the transformation of life by the power of a supramental consciousness. With the help of the Mother, he founded Sri Aurobindo Ashram. His vision of life is portrayed innumerous works of prose and poetry. *Savitri: A Legend and a Symbol* is Aurobindo's magnum opus. It is one of his greatest works and it has a special place in world literature. It is not only divine mystic poetry, but also the greatest spiritual revelation. Sri Aurobindo spent more time and energy on Savitri. He developed certain specific spiritual practices that afforded him experiences in the interior spaces of the soul. The struggle between two powers, the dark foreboding mind of Night, and thepower of the Dawn which brings the new Light and the eventual triumph of a higher light that can transform even the mind of Night, is the underlying theme of the poem. "The Symbol Dawn", is an introduction to the whole epic, which is by itself a symbol. Savitri begins with a description of the symbol dawn which is also a reality present in some high transcendental realmof the spirit.

Keywords: Integral, supra mental, Magnum Opus revelation, mystic, transcendental, realm

The very first Canto of the First Book 'The Book of Beginnings' has been aptly titled "The Symbol Dawn". The first section describes the dawn, the beginning of a day but it is not a simple narrative account of a sunrise. All new life begins with the advent of Light. The first touch of this Light that awakens us out of the state of Ignorance is the Dawn. The approach of the new light is shown as the symbol of a psychological process. But the law of ignorance and darkness has a strong grip upon nature. Dull, soulless routine is preferred rather than making the needed effort to open ourselves to the New Light and undergo the needed transformation. But now the Divine Mother herself has come to change the scheme of things. She brings the New Dawn that would see the very end of Night, the death of Death. The second section introduces the heroine of the poem, Savitri, as she wakes up on this very special day – the day when, as she alone knows, and as readers

are told in the last line of the canto, her husband Satyavan must die.

The entire epic has unity of time, place, and action. The entire story takes place between one dawn and the following dawn. Everything described takes place within 24 hours. It takes place on the verge of the forest in which Satyavan and his father had their hermitage. And thereis the unity of action, there are no sub-stories but one simple story of Savitri meeting Satyavan and their finding love together, the God of Death snatching Satyavan away from Savitri, and Savitri claiming Satyavan back for herself and for the earth. Sri Aurobindo begins mid-way—notwith the birth of Savitri, not with the birth of Satyavan, not with the birth of Aswapati—but with the dawn of that day on which Satyavan was destined to die. He was interested in using this storyas a framework for the great message, for the great vision that he had to deliver. The story is in such a way that this multi-layered symbolism behind the story gradually opens up. And exactly the same technique he is using in describing the dawn.

The Symbol Dawn with which Savitri opens symbolizes both the obstacles and prospects in the effort to bring out a new manifestation. It is the story that tells how the divine opposites came into existence. The Supreme is there, the four Powers are there, and how they became opposites, they became their opposites in the fruitful long desirable involutionary sequel. This gives an idea of how consciousness became unconscious darkness, life became death, the truth became falsehood, and joy became pain and suffering.

The first canto is one of the greatest things Aurobindo ever did, and as an introduction to this epic he could not have written anything better. This is a very vivid picture of the full event, a story related to the beginning of this creation, a creation of course with a purpose. That is how Savitri begins, a beginning in which is present the entire sequel. The first line itself has given the entire thing, about this mortal world. The first few lines of *Savitri* set out what the problem of this mortal creation is, and how that problem could be tackled. The golden quintessence is present in this opening passage itself.

The poem begins:

”It was the hour before the Gods awake”.

The single line is so mysterious though the words are simple. He is pointing not to an event that happened once but to one that constantly and repeatedly happens. What Sri Aurobindo posits in this line is a religion-mythic concept that has been part of India’s temple life, the daily awakening of the Gods. The Gods are not yet awake and that the mind of Night is standing in the

way of the divine Event. The divine event is the manifestation of a new creation upon earth, a manifestation in the mortal world. If that is to happen then the mind of Night should be first dislodged from the path. It is only then that the transforming Gods will set themselves intoaction. The Event will proceed not with the waking of the Gods but with the removal of the mindof Night. In talking about the hour, Sri Aurobindo is talking about the time, not the hour as in onehour: this is the Brahmamuhurtam. Immediately the poet takes that moment, and then from that point on gradually the dawn begins to break. First there is pitch darkness, which reminds the inconscient. Gradually in this pitch darkness, there is a stir of aspiration. Aspiration is not associated with the dawn, it is associated with the dawn in human consciousness.

There is this slight movement, slight disturbance: from the inconscient people move to the subconscient, and from the subconscient they move to ignorance. That's where everyone is, the world of ignorance. And from ignorance people move to the world of the psychic being, fromthe psychic being to the spiritual being, from the spiritual being to the supramental being. This is the progress. The first section begins:

"It was the hour before the Gods awake. ||1.1||
Across the path of the divine Event
The huge foreboding mind of Night,
alone In her unlit temple of eternity,
Lay stretched immobile upon Silence' marge. ||1.2||"

The divine event is the coming of the dawn, the coming of the light. Next, "The huge foreboding mind of Night, alone". Even in the darkest of night there is the awareness that after the night will come the day. Even in the very heart of the inconscient there is this hope. Thenight doesn't want to end; the night doesn't want the light to come: that's why Sri Aurobindo uses the word 'foreboding. For the night, the coming of the dawn is foreboding. He is talking about multi-layered dawns: the dawn of consciousness in man, the dawn of spiritual illumination, basically anything that is symbolized by light breaking into darkness.

This second part is a beautiful description of Savitri on that day, and how she was also sleeping like everybody else, and she wakes up…

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"And Savitri too awoke among these tribes That
hastened to join the brilliant Summoner's chantAnd,
lured by the beauty of the apparent ways,
Acclaimed their portion of ephemeral joy.
Akin to the eternity whence she came,
No part she took in this small happiness;
A mighty stranger in the human field,
The embodied Guest within made no response.
The call that wakes the leap of human mind,
Its chequered eager motion of pursuit,
Its fluttering-hued illusion of desire,
Visited her heart like a sweet alien note.
Time's message of brief light was not for her".

Everybody wakes up, and all these people Sri Aurobindo calls 'tribes'. We are all like tribals, whereas Savitri is the only human being in that tribe, and he describes how she is different from other people. The whole problem of the earth's life becomes alive in her. She accepts the challenge and her soul arises to confront Time and Fate. The first canto evokes the symbol 'dawn'. First there is the Night: it is pitch-dark. The process is simultaneous-light coming and darkness retreating and vanishing. Thus Aurobindo demonstrates the emergence ofknowledge from ignorance. Savitri 's life and trial has been hinted at.

This canto is a wonderful overture, a wonderful introduction to a wonderful epic. Depending on the richness of inner life and imagination, several dawns can be created. And this is a part of the difficulty. Sri Aurobindo himself was aware of it and in one of his letters he has written:

"The whole of Savitri is, according to the title of the poem, a legend that is a symbol, and this opening canto is, it may be said, a key beginning and announcement…"

The poem opens on a crucial day 'the day when Satyavan must die', and it ends with the resolution of the crisis. Thus the material plane at the beginning and the spiritual plane at the end are brilliantly bridged. It is an arresting opening. It is not simply poetry, it is not purely spirituality, mysticism, or occultism; it is all that, and something more than that.

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A STUDY REPORT OF PRE-CRASH SENSING AND WARNING SYSTEM FOR LANDSLIDE DETECTION IN HILLY REGION

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Abstract

Landslide is a physical phenomenon in which large amount of rock debris break or slide down the slope leading to destruction of large natural as well as material losses along with lives of many people. Massive losses are caused by landslides in different parts of world. In India landslide is popular phenomena of Himalayan region and southern Nilgiri Mountains. Such losses could be avoided if proper intelligence system is present which could inform about the event in advance or at least give information about landslide trigger factors like water content in soil.

Sensors Provides real time measurement of various parameters such as level of moisture. This greatly prevents the heavy damages to the human lives. To avoid problems we design model that includes sensors and microcontroller and so on. The soil moisture sensors predict the level of moisture level and we can send it to microcontroller. To avoid accidents in hair bend these signal send to the pic microcontroller, which passes the signal to the RF transmitter with help of encoder. RF receiver on another side, receives the signal send to the decoder, which is used to decode the received signal and activate the driver circuits. If the soil moisture data is 1 means buzzer will be goes on, then gate is closed for alerting the people to quit the place immediately.

Key words: Landslide, debris flows, terrain, soil moisture sensor

1.Introduction

Landslides are more widespread than any other geological event and can occur anywhere in the world. Large mass of soil, rocks or debris move down a slope due to natural phenomenon or human activity cause landslide. Mud slides or debris flows are common type of fast-moving landslide. Landslides can accompany heavy rains or follow droughts, earthquakes or volcanic eruptions.

Areas most vulnerable to landslides include:

- steep terrain, including areas at the bottom of canyons;
- land previously burned by wildfires;

- lands modified due to human activity, such as deforestation or construction;
- channels along a stream or river;
- any area were surface runoff is directed or land is heavily saturated.

Climate change and rising temperatures trigger more landslides, especially in hilly areas with snow and ice. As permafrost melts, rocky slopes become unstable resulting in a landslide.

2. Impacts

Landslides can cause high mortality and injuries from rapidly flowing water and debris. The most common cause of death in a landslide is trauma or suffocation. Broken power, water, gas or sewage pipes can also result in injury or illness in the population affected.

Some of the deadliest landslides in world history

Rank	Event	Country	Year	Death toll
1	Haiyuan Landslides	China	1920	200,000
2	Vargas Tragedy	Venezuela	1999	30,000
3	Khait Lanslides	Tajikistan	1949	28,000
4	Armero Tragedy	Colombia	1985	20,000 - 23,000
5	Yungay Landslide	Peru	1970	22,000
6	Diexi Landslides	China	1933	9,300
7	North India Landslides	India	2013	5,700 - 6,054
8	Huaraz Debris Flow	Peru	1941	5000
9	Nevado Huascaran Debris Fall	Peru	1962	4,500
10	Vajont Dam Landslide	Italy	1963	2,500
11	Kelud Lahars	Indonesia	1919	200

Source: worldatlas.com

The NRSC/ISRO Landslide Atlas of India

The National Remote Sensing Centre (NRSC) of the Indian Space Research Organisation (ISRO) released a Landslide Atlas of India, which is freely available online. It provides maps of about 80,000 landslides that have been identified across India in the period between 1998 and 2022, with a particular emphasis on seasonal landslides triggered by the 2014 and 2017 monsoon seasons, as well as by the Sikkim earthquake. India faces 3,782 major landslides in past seven years.

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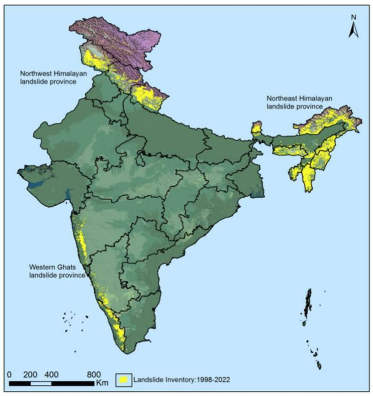
- The Atlas has been compiled using imagery collected from a range of sensors, including the Indian satellites IRS-1D PAN+LISS-III, Resourcesat-1, 2 & 2A LISS-IV Mx, Cartosat-1 and 2S; and international instruments such as Sentinel-1&2, Pleiades and World View; and through the use of aerial P. One of the key results is a single map showing all of the identified landslides in India:-



Source: NRSC/ISRO Landslide Atlas of India

- A map showing all of the identified landslides in India.
- This is fascinating map, highlighting the ways in which landslides are geographically concentrated, particularly in the northern (mountainous) areas and along the southwest margin of the country.
- The atlas also provides a very interesting assessment of macro-level socioeconomic risk exposure to landslides. Rudra prayag and Tehri Garhwal in Uttaranchal rank highest.
- This atlas is a really interesting initiative to highlight landslide risk in one of the most impacted countries globally. Intriguingly, the Economic Times has just published a separate article about landslide impacts in Himachal Pradesh, which is one of the high landslide impact states in the north of the country. The analysis has been undertaken by the Himachal Pradesh State Disaster Management Authority.
- The study has identified 17,120 landslide prone sites across Himachal Pradesh. Of these, 675 have been identified as posing higher levels of risk, and the report indicates an increasing trend with time. Perhaps most interestingly, the Economic Times reports that:
- *"High intensity rainfall coupled with cutting of hill slopes or rocks at the foothills are the main reason behind the significant number of landslides, experts say. Extensive cutting of hill slopes for construction and widening of roads, blasting for tunnels, hydro projects and mining are cited as reasons behind the increase in landslides, geological expert Prof Virender Singh Dhar said."*

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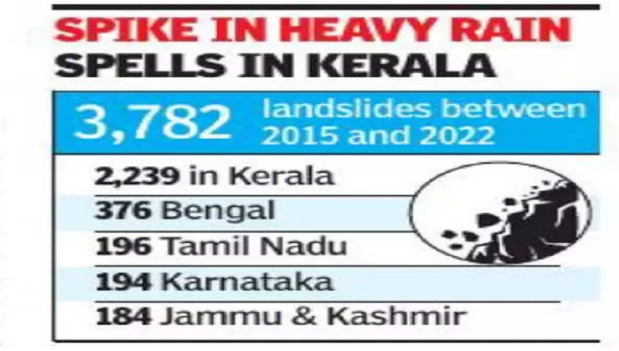
- The point that poor construction and land management practices are the key factors behind the increasing landslide impacts in India is well made.

Source: The Times of India, July 29,2022

New Delhi: Heavy rainfall events are showing an increasing trend over Kerala during the southwest (summer) monsoon season as per the past 20 years (2001-21) data and the state recorded the highest number of major landslides in the country in the past seven years. Analysis of heavy rainfall and landslides data of the southern state not only shows its growing vulnerability to extreme weather events but also calls for saving the ecological fragile. Western Ghats where in discriminate human activities may make the situation worse in coming years. Out of a total 3,782 landslides between 2015 and 2022 in India, the highest 2,239 were reported in Kerala followed by West Bengal (376), Tamil Nadu (196), Karnataka (194) and Jammu & Kashmir (184).



Source: The Times of India, July 29,2022

The ministry also informed that the Geological Survey of India (GSI) has carried out the National Landslide Susceptibility Mapping (NLSM) of the total area of 4.3 lakh sq. km (around 13% of India's total geographical area) in different landslide prone states/UTs where the largest 71,228 sq. km of vulnerable areas fall in Arunachal Pradesh followed by 42,108 sq. km in Himachal Pradesh, 40,065 sq. km in Ladakh (UT), 39,009 sq. km in Uttarakhand and 31,323 sq km in Karnataka. Other north-eastern states in the list of top 10 vulnerable states include Assam (24,144 sq. km), Manipur (23,250 sq. km) and Meghalaya (22,601 sq. km). The comparative

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analysis of the data from India State of Forest Report (ISFR) 2021 clearly shows correlation between green cover loss and landslide vulnerability of the hilly states. Arunachal Pradesh reported the largest forest cover loss (257 sq km) in 2021 followed by Manipur (249 sq km), Nagaland (235 sq km), Mizoram (186 km) and Meghalaya (73 sq km). Incidentally, Arunachal Pradesh, Manipur and Meghalaya figured in the list of top 10 states/UTs in terms of landslide vulnerable areas as per the NLSM. Referring to post disaster investigations of the landslides, the ministry attributed the major landslides to "unprecedented high rainfall". It, however, also said, "The other important geo-factors such as terrain character, slope forming material, geomorphology, land use/land-cover in different terrain etc. are the preparatory factors for initiation of landslides. Anthropogenic causes such as unprotected slope cuts, blocking of drainages etc. are also reported in many of the slides."

Source: The Times of India

Indian Space Research Organisation (ISRO) and the Wadia Institute of Himalayan Geology claimed in one of its visits that the artificial lake at the spot may have dissolved.

Source: India TV news

"Landslides have happened in nearly 140 places" in Nilgiris,

The Nilgiris, besides Coimbatore, had been severely affected by the torrential downpour, which triggered landslides in the high ranges of the hilly district, with Avalanchi receiving as much as 91 cm rainfall.

3.Proposed System

To overcome landslide a new technology is implemented in this paper. Different types of sensors like soil measurement sensor for detection of landslide [1-4], RF module and different types of controller for processing are used in this system. Real-time monitoring of environmental disasters is one of the prime necessities of the world. Different technologies have been developed for this purpose. Wireless sensor networks (WSN) [5-7], are one of the major technologies that can be used for real-time monitoring. WSN has the capability of large scale deployment, low maintenance, scalability, adaptability for different scenarios etc. WSN [8-9] has its own limitation such as low memory, power, bandwidth etc., but its capability to be deployed in hostile environment, and low maintenance requirement made it one of the best suited technologies for real-time monitoring. Due to progressive development of urban areas and infrastructure, more and more people settle in the environments such as hilly sides that have become dangerous due to different types of natural hazards. The occurrence of landslides is a huge loss for human life and economic property and such events are fast. For such rapid events the wireless sensor techniques are best suitable as it can respond quickly to rapid changes like unfortunate weather conditions of data and send the sensed data wirelessly to the receiver station.

Sensor connected to ADC of PIC acts as input form. The information collected from a sensor is in analog form hence it is converted into digital form by ADC. Sensors output values are display on LCD continuously. When the encoder transmit the data to decoder through the UART. If output value goes above threshold value the buzzer will ring and the motor turn on.

3.1 Soil moisture sensor: Soil moisture sensor is mainly used to detect the moisture content in the soil. The control board get the moisture value or threshold in the soil via analog or digital pins. To get output of soil moisture sensor we have to dip probes in soil continuously. Hence we get physical parameter to convert it into digital form we are using inbuilt ADC.

3.2 Encoder: Encoder is used to generate the digital data which need to be transmitted. The encoder integrated circuit has 8-address lines and 4-data lines. The encoder used in the project is HT12E.

3.3 Decoder: Decoder is used to decode the required data from the received data. The decoder integrated circuit has 8-address lines and 4-data lines.

3.4 Power Supply

Power supply is a reference to a source of electrical power. A device or system that supplies electrical or other types of energy to an output load or group of loads is called a

power supply unit or PSU. The term is most commonly applied to electrical energy supplies, less often to mechanical ones, and rarely to others.

3.5 LCD Display

Liquid crystal displays (LCDs) are used in similar applications where LEDs are used. They display numeric and alphanumeric characters in dot matrix and segmental displays.

3.6 Encoder

The HT12E encoder is a CMOS IC built especially for remote control system applications. It is capable of encoding 8 bits of address (A0-A7) and 4bits of data (AD8-AD11) information. Each address/data input can be set to one of the two logic states, 0 or 1. Grounding the pins is taken as a 0 while a high can be given by giving +5V or leaving the pins open (no connection). Upon reception of transmit enable (TE-active low), the programmed address/data are transmitted together with the header bits via an RF medium.

3.7 HT12E

The encoder starts a 4 word transmission cycle upon reception of a transmit enable (TE active low). This cycle repeats itself as long as TE is held low. Once the TE goes high, the encoder completes its final cycle and stops.

3.8 Decoder

A **decoder** is a device which does the reverse of an encoder, undoing the encoding so that the original information can be retrieved. The same method used to encode is usually just reversed in order to decode. In digital electronics this would mean that a decoder is a multiple-input, multiple-output logic circuit that converts coded inputs into coded outputs. Enable inputs must be on for the decoder to function, otherwise its outputs assume a single "disabled" output code word. Decoding is necessary in applications such as data multiplexing, 7 segment display and memory address decoding.

3.9 HT12D

The HT12D is a decoder IC made especially to pair with the HT12E encoder. It is a CMOS IC made for remote control system application. The decoder is capable of decoding 8 bits of address (A0-A7) and 4 bits of data (AD8-AD11) information. For proper operation, a pair of encoder/decoder with the same number addresses and data format should be chosen. The decoders receive serial addresses and data from programmed encoders that are transmitted by a carrier using an RF or an IR transmission medium. They compare the serial input data three times continuously with their local addresses. If no error or unmatched codes are found, the input data codes are decoded and then transferred to the output pins. The VT

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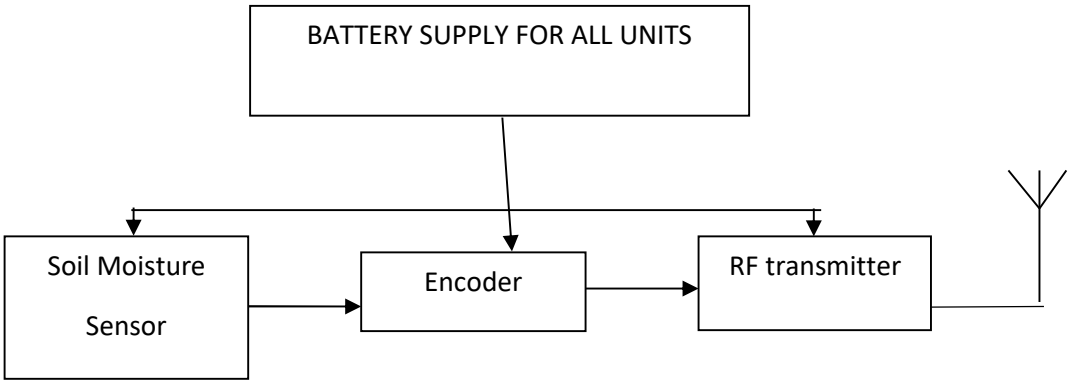
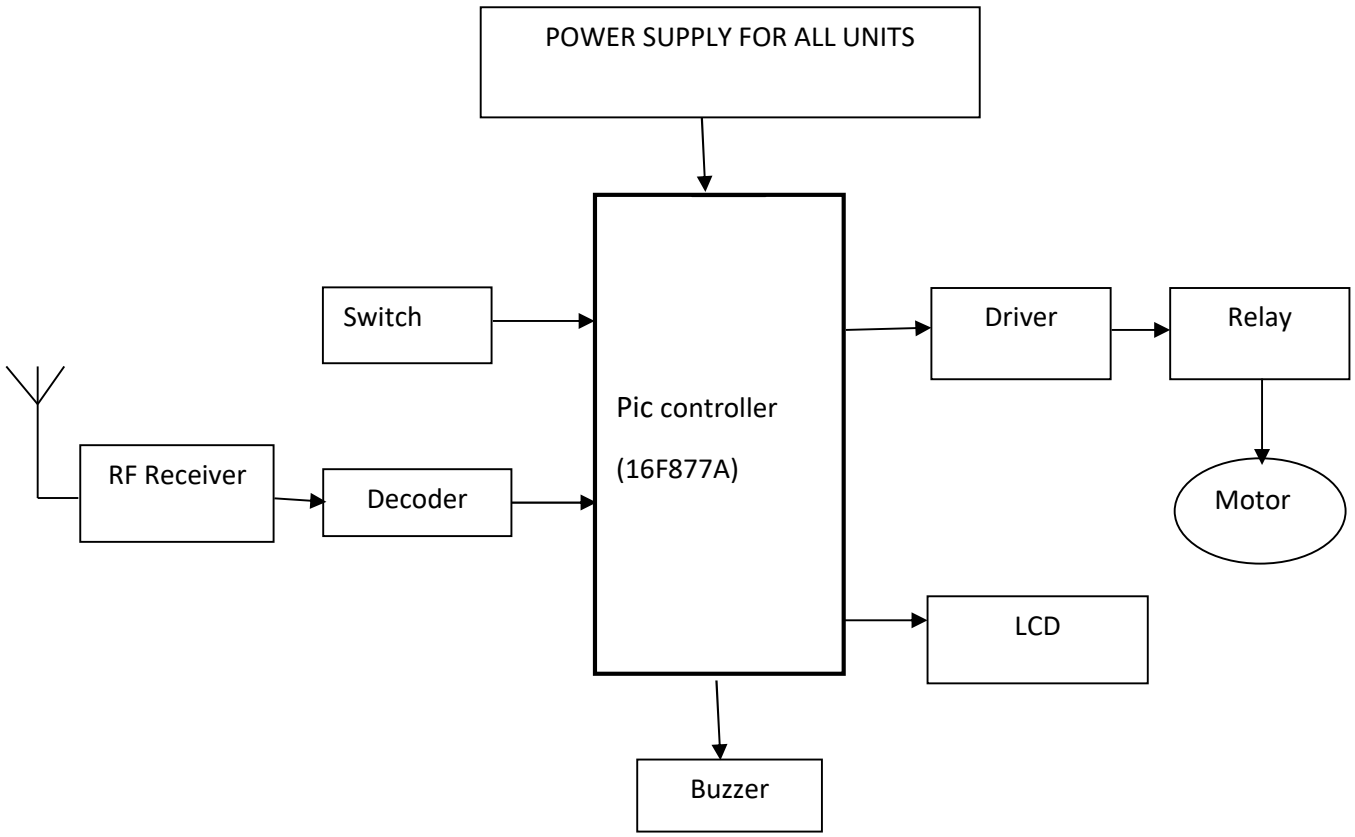
pin also goes high to indicate a valid transmission. The decoders are capable of decoding information that consists of N bits of address and 12_N bits of data. Of this series, the HT12D is arranged to provide 8 address bits and 4 data bits, and HT12F is used to decode 12 bits of address information.

Transmitter Unit



Receiver unit:



3.10 MPLAB IDE SOFTWARE

MPLAB is a free ware integrated development environment for the development of embedded applications on PICs and is developed by Microchip Technology. MPLAB support project management, code editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PICs. MPLAB 8.X is the last version of the legacy MPLAB IDE technology.

MPLAB supports the following compilers:

- MPLAB MP ASM Assembler
- MPLAB ASM 30 Assembler
- MPLAB C Compiler for PIC 18, PIC 24, PIC 32

MPLAB X of the MPLAB IDE built by Microchip Technology and is based on the open-source Net Beans platform. MPLAB X supports editing, debugging and programming of Microchip 8-bit, 16-bit and 32-bit PIC microcontrollers. MPLAB X is the first version of the IDE to include cross-platform support for Mac OS X and Linux operating systems.

MPLAB X supports the following compilers:

- MPLAB X C8/C16—C compiler for 8-bit/16-bit PIC devices
- MPLAB X C32 —C/C++ compiler for 32-bit PIC devices
- SDCC—open-source Compiler

Conclusion

Landslides have become very serious problem at hill and mountain areas. Because of landslide disaster many people lost their lives and also property. Hence landslide detection system alert before landslide by using sensor values. So it will help to conserve losses which are due to landslide. In future Rasberry Pi can be used instead of PIC microcontroller for further enhancement of the proposed paper.

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A STUDY ON JOB SATISFACTION AMONG THE NURSES AT PRABHU DIABETIC MULTI SPECIALITY CENTER, TRICHY

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Abstract

Job satisfaction is the important predictor stability reduce labour turnover and employee motivation. Nurses are the persons who understand and recognize the need of the sick. Now a days in the pandemic situation satisfaction among the nurses will improve the quality of patient care and it's wellbeing, dissatisfaction leads to absenteeism that affects the patient care.

Keywords: Nurses, Job satisfaction, Wellbeing

Introduction

Job satisfaction is defined as the level of comfort that employees feel with their job. It is the combination of psychological, physiological, and environmental circumstances that cause a person to truthfully say that they are satisfied with a job. Nurses are the licensed health-care professional who practices independently or is supervised by a physician or surgeon and who is skilled in promoting and maintaining health seek licensed practical nurse, licensed vocational nurse and registered nurse. Poor job conditions and limited resources are reducing job satisfaction and motivation among nurses which may affect the quality of services and attrition rates.

Objectives of the Study

- To know the factors responsible for job satisfaction
- To ascertain the level of job satisfaction

Significance of the Study

Hospital is a concern of health-care delivery system. The purpose of the health-care is to provide the best possible patient care. The reputation of the hospital and the success of patient care are dependent on the efficiency of the nursing staff, which includes tender loving care that is given to the patient. Nurses have a vital role in the healthcare system. One of the basic steps to increase their happiness is to recognize factors such as job satisfaction and quality

of working life. Dissatisfaction of nursing care leads to poor quality, inefficient patient care. Whereas there is a relation between nursing satisfaction, patient satisfaction, and the treatment outcome.

Research Methodology

Research is defined as the creation of new knowledge and the use of existing knowledge in a new and creative way so as to generate new concepts, methodologies and understandings. It includes scribe, explain, predict, and control the observed phenomenon. Primary data were collected through a well-structured questionnaire from 50 nurses of Prabhu Diebetic Multi Speciality Center**,** Trichy. The secondary data was gathered from books, magazines, and business websites.

Review of Literature

Sharma, Ajay, et al. (2020) "Assessment of job satisfaction among nursing officers working at a tertiary care hospital in Northern India". The study's purpose was to learn more about nurse officers' job satisfaction. In terms of economics, humanitarianism, and nursing practice, the study's goal is to determine whether job happiness is relevant. Using the short form of the Minnesota Satisfaction Questionnaire, a cross-sectional questionnaire-based study was carried out. In several locations, this study was carried out. Nursing staff satisfaction was significantly impacted by age, location of posting, and educational background. Additionally, it was shown that the length of employment had no appreciable impact on the degree of staff satisfaction among the nurses. According to this study, the majority of nurses were happy with their careers, despite a few factors that were regularly associated with discontent.

Lu, H., Zhao, et al. (2019) "Job satisfaction among hospital nurses: A literature review". The aim of a study is to gain a deeper understanding of the elements that influence the job satisfaction of certified general nurses working in acute care hospitals. Numerous research studies that produced ambiguous results have identified the relationship between job satisfaction and the likelihood of absenteeism and turnover as well as the factors that influence job satisfaction, including working shift and leadership, job performance, organisational commitment, effort, and reward style. The work environment, structural empowerment, organisational commitment, professional commitment, job stress, patient satisfaction, patient-nurse ratios, social capital, evidence-based practice, and ethnic background all have a strong correlation with hospital nurses' job satisfaction.

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Data Analysis and Interpretation

Table 1: Demographic profile of the Respondents

S.No	Particulars	Opinion	% of Respondents
1.	**Age**	Below 25 years	**52**
		25-30 years	**24**
		41-50 years	**24**
		Total	**100**
2	**Department**	Clinical	**88**
		Non- Clinical	**12**
		Total	**100**

Source: Primary Data

The above table shows that 52% of the respondents lies in the age group of below 25 years, 88% of the respondents belong to clinical department.

Table 2 shows that 90% of the respondents are satisfied with the Organizational Rules and Regulations; 70% of the respondents are satisfied with the Communication System followed in the organization ; 82% of the respondents are satisfied with the Priority given to the employee while taking decision; 86% of the respondents are satisfied with the Monetary Benefits provided by the organization ; 72% of the respondents are satisfied with the Training and Development programmes offered by the organization ; 72% of the respondents are satisfied with the Cleanliness of the work place; 82% of the respondents are satisfied with the Interpersonal Relationship between the employees ; 66% of the respondents are satisfied with the Job Security; 82% of the respondents are satisfied with the Career Goal and Aspiration.

Table 2: Factors Influencing Job Satisfaction

S.No	Particulars	% of Respondents				Total
		HS	S	DS	HDS	
1	Organizational Rules and Regulations	10	90	-	-	100
2	Organization Communication System	28	70	2	-	100
3	Priority when taking decision	14	82	4	-	100
4	Monetary Benefits	12	86	2	-	100
5	Training and Development	26	72	2	-	100
6	Cleanliness	24	72	4	-	100
7	Physical Facilities	26	72	2	-	100
8	Interpersonal Relationship	18	82	-	-	100
9	Job Security	26	66	6	2	100
10	Career Goal and Aspiration	14	82	4	-	100

Source: Primary Data

***HS-** Highly Satisfied **S-** Satisfied **DS-** Dissatisfied **HSD-** Highly Dissatisfied

Suggestions

To the Nurses

- Nurses can upgrade their knowledge on current trends and technology.
- Nurses can practice meditation and yoga to reduce stress.
- Nurses can maintain good relationship with the superiors and co-workers.

To the Hospital

- Workload causes stress among the nurses; it can be reduced by appointing new staffs.
- Compensation leave can be given to the nurses while doing over time.
- Management can organize counselling programmes to address nurse's problems.
- Management can provide seminars and workshops about work according to this training the nurses it can improve their knowledge and skills.

- Welfare programmes can be given to the nurses to increase their job satisfaction.
- Physical environment includes ventilation, water supplies, canteen, cleanliness in washroom, parking area can be improved.

Conclusion

Nurses are a vital human resource of the hospital. Satisfaction of the nurses is directly related to treatment outcome and patient satisfaction. There was no significant association found between occupational stress, job satisfaction and age, sex, professional education, year of experience. Specific measures to reduce stress of nurse associated with frequently occurring causes and measures to improve job satisfaction associated with compensation and in –dependence will be helpful to improve performance of the nurses. From this study we found that the nurses in the hospital are highly satisfied with their job.

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τ_g *$-\alpha\hat{}\, g-$ Closed Sets in Topological Spaces

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Abstract

The aim of this paper is to introduce a new class of sets called τ_g *$-\alpha\hat{}\, g-$closed sets in topological spaces and study some of their properties.

Key words: $\alpha\hat{}\, gcl-$operator, τ_g *$-$topology, τ_g *$-\alpha\hat{}\, g-$closed sets and τ_g *$-\alpha\hat{}\, g-$open sets.

1. Introduction

The concept of the closed sets in topological spaces has been generalized to generalized closed sets by Levine [1]. Using generalized closed sets, Dunham [2] introduced the concept of the closure operator cl^* and a topology τ^* and studied some of their properties. In 1990, S.P. Arya and T. M. Nour [3] define generalized semi-open sets, generalized semi-closed sets. In 1993 Maki H, Devi R and Balachandran K [4] generalized alpha closed ($g\alpha-$closed) sets. In 2000, A. Pushpalatha [5] introduced a new class of closed sets called weakly closed(w-closed) sets.

In 2009, Vishwanathan A and Ramasamy K [6] introduced the concept of generalized closed sets and weakly closed sets in topological spaces. Throughout this paper X denote the toplogical space (X,τ_g^*) on which no separation axioms are assumed.

2. Preliminaries

Definition 2.1

A subset A of a topological space (X,τ) is called

(i) Generalized closed(briefly $g-$closed)[1] if $cl(A)\subseteq G$ whenever $A\subseteq G$ and G is open in X.

(ii) Semi-generalized closed(briefly $sg-$closed)[7] if $scl(A)\subseteq G$ whenever $A\subseteq G$ and G is semi-open in X.

(iii) Generalized semi closed(briefly $gs-$closed)[2] if $scl(A)\subseteq G$ whenever $A\subseteq G$ and G is open in X.

(iv) Strongly generalized closed(briefly g^*-closed)[8] if $cl(A)\subseteq G$ whenever $A\subseteq G$ and G is $g-$open in X.

(v) αg - closed [9] if $\alpha cl(A)\subseteq G$ whenever $A\subseteq G$ and G is open in X.

(vi) $g\alpha$ - closed [4] if $\alpha cl(A)\subseteq G$ whenever $A\subseteq G$ and G is $\alpha-$open in X.

(vii) Weakly closed(briefly $w-$closed)[5] if $cl(A)\subseteq G$ whenever $A\subseteq G$ and G is semi-open in X.

(viii) $g^{\wedge}-$closed [10] if $cl(A) \subseteq G$ whenever $A \subseteq G$ and G is semi-open in X.

(ix) $\alpha g^{\wedge}$ - closed [11] if $\alpha cl(A) \subseteq G$ whenever $A \subseteq G$ and G is $g^{\wedge}-$open in X.

(x) αg^{*}- closed [12] if $\alpha cl(A) \subseteq G$ whenever $A \subseteq G$ and G is $\alpha-$open in X.

(xi) $g\alpha^{*}$- closed [12] if $cl(A) \subseteq G$ whenever $A \subseteq G$ and G is $\alpha-$open in X.

(xii) $wg\alpha$ - closed [6] if $\alpha cl(\text{int}(A)) \subseteq G$ whenever $A \subseteq G$ and G is $\alpha-$open in X.

(xiii) $w\alpha g$ - closed [6] if $\alpha cl(\text{int}(A)) \subseteq G$ whenever $A \subseteq G$ and G is open in X.

(xiv) $\psi-$closed [13] if $scl(A) \subseteq G$ whenever $A \subseteq G$ and G is $sg-$open in X.

(xv) $\alpha\psi-$closed [14] if $\psi cl(A) \subseteq G$ whenever $A \subseteq G$ and G is $\alpha-$open in X.

3. $\tau_g{}^{*}-\alpha^{\wedge} g-$ Closed Sets in Topological Spaces

Definition 3.1

For the subset A of a topological space X, the $\alpha^{\wedge}$-generalized closure operator $\alpha^{\wedge} gcl(A)$ is defined by the intersection of all $\alpha^{\wedge} g-$closed sets containing A.

Definition 3.2

For a topological space X, the topology $\tau_g{}^{*}$ is defined by

$\tau_g{}^{*} = \{G : \alpha^{\wedge} gcl(G^c) = G^c\}$.

Example 3.1

Let $X = \{a,b,c\}$ and $\tau = \{X, \phi, \{a\}\}$. Then the collection of subsets $\{X, \phi, \{a\}, \{b\}, \{c\}, \{a,b\}, \{b,c\}, \{a,c\}\}$ is a topology on X.

Definition 3.3

A subset A of a topological space X is called $\tau_g{}^{*}-\alpha^{\wedge} g-$closed if $\alpha^{\wedge} gcl(A) \subseteq G$ whenever $A \subseteq G$ and G is $\tau_g{}^{*}-\alpha-open.$

The complement of $\tau_g{}^{*}-\alpha^{\wedge} g-$Closed set is called the $\tau_g{}^{*}-\alpha^{\wedge} g-$open set

(briefly $\tau_g{}^{*}-\alpha^{\wedge} g-$open).

Example 3.2

Let $X = \{a,b,c\}$ and $\tau = \{X, \phi, \{a\}\}$. Then the sets $\{X, \phi, \{a\}, \{b\}, \{c\}, \{a,b\}, \{b,c\}, \{a,c\}\}$ are $\tau_g{}^{*}-\alpha^{\wedge} g-$Closed sets in X.

Theorem 3.1

Every closed set in X is $\tau_g{}^{*}-\alpha^{\wedge} g-$closed.

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Proof:

Let A be a closed set. Let $A \subseteq G$, since A is closed, $cl(A) = A \subseteq G$, where G is $\tau_g^{*} - \alpha - open.$. But $\alpha^{\wedge} gcl(A) \subseteq cl(A) \subseteq G.$

$\therefore \alpha^{\wedge} gcl(A) \subseteq G$, whenever $A \subseteq G$ and G is $\tau_g^{*} - \alpha - open.$

Hence A is $\tau_g{}^{*} - \alpha^{\wedge} g -$closed.

Theorem 3.2

Every $\tau_g^{*} -$closed set in X is $\tau_g{}^{*} - \alpha^{\wedge} g -$closed.

Proof:

Let A be a $\tau_g^{*} -$closed set. Let $A \subseteq G$, where G is $\tau_g^{*} - \alpha - open.$

Since A is $\tau_g^{*} -$closed, $\alpha^{\wedge} gcl(A) = A \subseteq G.$

$\therefore \alpha^{\wedge} gcl(A) \subseteq G.$ Hence A is $\tau_g{}^{*} - \alpha^{\wedge} g -$closed.

Theorem 3.3

Every $g -$closed set in X is $\tau_g{}^{*} - \alpha^{\wedge} g -$closed.

Proof :

Let A be a $g -$closed set. Let $A \subseteq G$, where G is $\tau_g^{*} - \alpha - open.$

Since A is $g -$closed, $cl(A) \subseteq G.$ But $\alpha^{\wedge} gcl(A) \subseteq cl(A) \subseteq G.$

$\therefore \alpha^{\wedge} gcl(A) \subseteq G$, whenever $A \subseteq G$ and G is $\tau_g^{*} - \alpha - open.$

Hence A is $\tau_g{}^{*} - \alpha^{\wedge} g -$closed.

Theorem 3.4

Every $g^{*} -$closed set in X is $\tau_g{}^{*} - \alpha^{\wedge} g -$closed.

Proof:

Let A be a $g^{*} -$closed set. Let $A \subseteq G$, where G is $\tau_g^{*} - \alpha - open.$ Since A is $g^{*} -$closed, $cl(A) \subseteq G.$

Every closed set is g-closed, then

$\alpha^{\wedge} gcl(A) \subseteq gcl(A) \subseteq cl(A) \subseteq G.$

This implies $\alpha^{\wedge} gcl(A) \subseteq G$, whenever $A \subseteq G$ and G is $\tau_g^{*} - \alpha - open.$

Hence A is $\tau_g{}^{*} - \alpha^{\wedge} g -$closed.

Theorem 3.5

Every $\alpha g^{*} -$closed set in X is $\tau_g{}^{*} - \alpha^{\wedge} g -$closed.

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Proof:

Let A be a αg^*-closed set. Let $A \subseteq G$, where G is $\tau_g^* - \alpha - open.$

Since A is αg^*-closed, $cl(A) \subseteq G$ and G is $\alpha-$open in X .Since every $\alpha-$open set is $g-$ open, but every closed set is g-closed, then $gcl(A) \subseteq cl(A) \subseteq G.$ $\alpha^{\wedge} gcl(A) \subseteq gcl(A) \subseteq cl(A) \subseteq G.$

This implies $\alpha^{\wedge} gcl(A) \subseteq G$, whenever $A \subseteq G$ and G is $\tau_g^* - \alpha - open.$

Hence A is $\tau_g^* - \alpha^{\wedge} g-$closed.

Theorem 3.6

Every $\tau_g^* - \alpha^{\wedge} g-$closed set is αg -closed.

Proof :

Let A be $\tau_g^* - \alpha^{\wedge} g-$closed. Let $A \subseteq G$ and G be open. Since every open set is α - open set and A is $\tau_g^* - \alpha^{\wedge} g-$closed. Then $\alpha cl(A) \subseteq G$. Hence A is αg -closed.

Remark 3.1

The converse of the above theorem need not be true as seen in the following example.

Example 3.3

Let $X = \{a,b,c\}$, $\tau = \{X, \phi, \{a\}, \{a,b\}\}$. Let $A = \{b\}$, then A is αg -closed set but it is not a $\tau_g^* - \alpha^{\wedge} g-$closed set.

Remark 3.2

$\tau_g^* - \alpha^{\wedge} g-$closed sets and $\alpha\psi$ - closed sets are independent of each other as seen from the following example.

Example 3.4

Let $X = \{a,b,c\}$, $\tau = \{X, \phi, \{a\}, \{a,b\}\}$. Let $A = \{b\}$, then A is $\alpha\psi$ -closed set but it is not a $\tau_g^* - \alpha^{\wedge} g-$closed set and $\{a,c\}$ is $\tau_g^* - \alpha^{\wedge} g-$closed set but not $\alpha\psi$ -closed.

Remark 3.3

$\tau_g^* - \alpha^{\wedge} g-$closed sets and sg- closed sets are independent of each other as seen from the following example.

Example 3.5

Let $X = \{a,b,c\}$, $\tau = \{X, \phi, \{a\}, \{a,b\}\}$. Let $A = \{b\}$, then A is sg-closed set but it is not an $\tau_g^* - \alpha^{\wedge} g-$closed set and $\{a,c\}$ is $\tau_g^* - \alpha^{\wedge} g-$closed set but not sg -closed.

Remark 3.4

$\tau_g^* - \alpha\hat{}\, g -$ closed sets and $wg\alpha$ - closed sets are independent of each other as seen from the following example.

Example 3.6

Let $X = \{a,b,c\}$, $\tau = \{X, \phi, \{a\}, \{a,b\}\}$. Let $A = \{b\}$, then A is $wg\alpha$ -closed set but it is not an $\tau_g^* - \alpha\hat{}\, g -$ closed set and $\{a,c\}$ is $\tau_g^* - \alpha\hat{}\, g -$ closed set but not $wg\alpha$ - closed.

Theorem 3.7

A subset A of X is $\tau_g^* - \alpha\hat{}\, g -$ closed set if and only if $\alpha\hat{}\, gcl(A) - A$ contains no non-empty $\tau_g^* - \alpha -$ closed set in X.

Proof:

Let A be a $\tau_g^* - \alpha\hat{}\, g -$ closed set. Suppose that F is a non-empty $\tau_g^* - \alpha -$ closed set subset of $\alpha\hat{}\, gcl(A) - A$.

Now, $F \subseteq \alpha\hat{}\, gcl(A) - A.$

Then $F \subseteq \alpha\hat{}\, gcl(A) \bigcap A^C$.

Since $\alpha\hat{}\, gcl(A) - A = \alpha\hat{}\, gcl(A) \bigcap A^C$, $F \subseteq \alpha\hat{}\, gcl(A)$ and $F \subseteq A^C$. This implies $A \subseteq F^C$.

Since F^C is a $\tau_g^* - \alpha -$ open set and A is $\tau_g^* - \alpha\hat{}\, g -$ closed set. $\alpha\hat{}\, gcl(A) \subseteq F^C$.

(i.e.,) $F \subseteq \alpha\hat{}\, gcl(A) \bigcap [\alpha\hat{}\, gcl(A)]^C = \phi.$

(i.e.,) $F = \phi$ which is a contradiction.

Hence $\alpha\hat{}\, gcl(A) - A$ contains no non-empty $\tau_g^* - \alpha -$ closed set in X.

Conversely, assume that $\alpha\hat{}\, gcl(A) - A$ contains no non-empty $\tau_g^* - \alpha -$ closed set in X. Suppose that $\alpha\hat{}\, gcl(A)$ is not contained in G then $\alpha\hat{}\, gcl(A) \bigcap G^C$ is a non-empty $\tau_g^* - \alpha -$ closed set of $\alpha\hat{}\, gcl(A) - A$, which is a contradiction. $\alpha\hat{}\, gcl(A) \subseteq G$, whenever $A \subseteq G$ and G is $\tau_g^* - \alpha - open.$ Hence A is $\tau_g^* - \alpha\hat{}\, g -$ closed.

Corollary 3.1:

A subset A of X is $\tau_g^* - \alpha\hat{}\, g -$ closed set if and only if $\alpha\hat{}\, gcl(A) - A$

contains no non-empty closed set.

Proof:

The proof follows from the above theorem and the fact that every closed set is $\tau_g^* - \alpha\hat{}\, g -$ closed set in X.

Theorem 3.8 : If a subset A of X is $\tau_g^* - \alpha\hat{}\, g -$ closed set and $A \subseteq B \subseteq \alpha\hat{}\, gcl(A)$

then B is $\tau_g^* - \alpha\hat{}\, g -$ closed set in X.

Proof : Let A be $\tau_g^* - \alpha^\wedge g -$ closed set such that $B \subseteq G$. Since A is $\tau_g^* - \alpha^\wedge g -$ closed, we have $\alpha^\wedge gcl(A) \subseteq G$, whenever $A \subseteq G$ and G is $\tau_g^{*} - \alpha - open.$

Now, $\alpha^\wedge gcl(A) \subseteq \alpha^\wedge gcl(B) \subseteq \alpha^\wedge gcl[\alpha^\wedge gcl(A)] = \alpha^\wedge gcl(A) \subseteq G.$

$\therefore \alpha^\wedge gcl(B) \subseteq G$, whenever $B \subseteq G$ and G is $\tau_g^{*} - \alpha - open.$

Hence B is $\tau_g^* - \alpha^\wedge g -$ closed.

Remark 3.5

(i) The finite Union of two $\tau_g^* - \alpha^\wedge g -$ closed sets are $\tau_g^* - \alpha^\wedge g -$ closed.

(ii) The intersection of two $\tau_g^* - \alpha^\wedge g -$ closed sets are $\tau_g^* - \alpha^\wedge g -$ closed.

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முனைவர் இரா. இளங்குமரனார் - தமிழ்ப்பணி

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தமிழ்த்துறை, சீதாலட்சுமி இராமசுவாமி கல்லூரி, திருச்சிராப்பள்ளி.

ஆய்வுச்சுருக்கம்

பள்ளிப் படிப்பை முழுமையாக தொடரவில்லை என்றாலும் தன் தந்தையாலும் அனுபவத்தாலும் தமிழ் மீதுபற்றுக் கொண்டு தனித்தேர்வராக அமர்ந்து புலவர் பட்டம் பெற்றார். பல அரிய தமிழ்ப் பணிகளைப் புரிந்துள்ளார். வள்ளுவர் தவச் சாலையை நிறுவி தமிழ் நூல்களைச் சேகரித்து ஆய்வு மாணாக்கர்க்கு வழிகாட்டியாக அமைந்துள்ளார். சொற்பொழிவாளர் கட்டுரையாளர் ஆகியோருக்கு கையில் கிடைத்த கருவூலமாக திகழ்கின்றார். இன்றைய ஆய்வாளர்களின் ஆய்வு போக்கிற்கு உறுதுணையாகத் திகழும் இளங்குமரனார் அவர்களின் தமிழ்ப்பணியை ஆய்வு செய்கின்றது இக்கட்டுரை.

திறவுச்சொற்கள்: இளங்குமரனார் தமிழ்ப் பணி, விருது, பதிப்பு ஆசிரியர், ஆய்வு வழிக்காட்டி, தமிழ்க்கருவூலம்

Abstract

Although he did not complete his schooling, his father and his experience instilled him with a passion for Tamil and he sat as a separate candidate and obtained his graduate degree. He has understood many rare Tamil works. Valluvar founded the penance road, collected Tamil texts and became a guide to the student of study. He is a treasure in the hands of the orator and essayist. This article examines the Tamil work of Ira.Ilangumaranar, which is a contribution to the research trend of today's researchers.

Keywords: Undergraduate Tamil Work, Award, Editor, Study Guide, Tamil Archive

முன்னுரை:

தமிழ் இலக்கியங்களில் காணப்படும் உயர் பண்புகளை தனக்கே உரிய நடையில் உலகப்பொதுமைகளை தம் நூலில் பதிவுசெய்தவர். இருபதாம் நூற்றாண்டில் தோன்றிய தமிழ் அறிஞர் பெருமக்களுள் தமிழ்க்கடல் இரா. இளங்குமரனார் குறிப்பிடத்தகுந்தவர். தமிழ் இலக்கண இலக்கியங்களில் ஆழ்ந்த பயிற்சியுடைய இரா.இளங்குமரனார் பள்ளி ஆசிரியராக விளங்கியவர். பின்னர் நூலாசிரியர், பாவலர், பதிப்பாசிரியர், உரையாசிரியர், தொகுப்பாசிரியர், இதழாசிரியர், உரையாளர் எனப் பலமுகங்களைப் பெற்றுத் தமிழுக்கு ஆக்கமான

பலபணிகளைச் செய்துள்ளார். இவர் எழுதிய நூல்கள் பல நூறாக விரியினும் இலக்கண வரலாறு, தமிழிசை இயக்கம், தனித்தமிழ் இயக்கம், பாவாணர் வரலாறு, குண்டலகேசி, யாப்பருங்கலம், புறத்திரட்டு, திருக்குறள் தமிழ் மரபுரை, காக்கைபாடினியம், தேவநேயம் உள்ளிட்ட நூல்கள் இவர்தம் தமிழ்ப்பணிக்கு என்றும் நின்று அரண் சேர்க்கும் வகையில் அமைந்துள்ளன. திருக்குறள் வழியில் வாழ்க்கையை அமைத்துக் கொண்ட திரு. இளங்குமரனார் வாழும் வள்ளுவராகவே விளங்குபவர்.

இலக்கியச்செம்மல் இரா.இளங்குமரனார் தமிழ் வாழ்க்கை: (1930 – 2021)

இரா.இளங்குமரானார் அவர்கள் திருநெல்வேலி மாவட்டம் வாழவந்தாள்புரம் என்னும் சிற்றூரில் 1930 ஆம் ஆண்டு சனவரித் திங்கள் முப்பதாம் நாள் பிறந்தவர். தந்தையார் படிக்கராமர், தாய் வாழவந்தம்மையார். தந்தையாரிடம் இருந்த தமிழறிவு கணக்கு அறிவு மகனாரிடத்து நின்று நிலவியது. தொடக்கப்பள்ளி ஆசிரியராகத் தம்மை ஆயத்தம் செய்து கொண்டு தம் பச்சிளம் பருவத்திலேயே 08.04.1946 இல் ஆசிரியர் பணிமேற்கொண்டார். பின்னர் தனியே தமிழ் கற்றுச் சென்னைப் பல்கலைக்கழகத்தின் வழியாகப் புலவர் தேர்வில் முதல் வகுப்பில் வெற்றிபெற்றார் (1951) பள்ளிப் பருவத்தில் சொற்பொழிவாற்றும் திறன் பெற்றிருந்த இரா.இளங்குமரனார் தம் பதினான்காம் அகவை முதல் பாடலியற்றும் திறன்பெற்றிருந்தார். இப்பயிற்சி பின்னாளில் குண்டலகேசி என்னும் காவியம் உருவாக வழிவகுத்தது. இக்காவியம் 1958 ஆம் ஆண்டு மதுரை அங்கயற்கண்ணி ஆலயத்தில் அரங்கேற்றப்பட்டது. மதுரை பாரதிபுத்தக நிலையத்தின் வாயிலாகப் பல நூல்கள் வெளிவரத் தொடங்கின. புல ஆண்டுகளாகத் தமிழாசிரியர் பணிபுரிந்தாலும் இவர் விரும்பிச் செய்வது நூலாக்கப் பணிகளேயாகும். பல்வேறு அமைப்புகளில் இணைந்தும் பணிபுரிந்துள்ளார். தமிழ்க்காப்புக் கழகச்செயலாளர், மதுரை மாவட்டத் தமிழாசிரியர் கழகச் செயலாளர், தேர்வுக்குழு அமைப்பாளர் உள்ளிட்ட பல பொறுப்புகளை வகித்துத் திறம்படப் பணிபுரிந்தார். முதுரை காமராசர் பல்கலைக்கழகத்தில் சிலகாலம் அறிஞர் தமிழண்ணல் முயற்சியால் விருந்து பேராசிரியராகப் பணிபுரிந்தார். அயல்நாடுகள் பல சென்று தமிழ்ப்பொழிவு ஆற்றிய பெருமைக்கு உரியவர். தமிழக அரசு இவர்தம் தமிழ்ப்பணியை மதித்துப் பலசிறப்புப் பரிசில்கள், விருதுகளை வழங்கியுள்ளது. இலக்கியச் செம்மல், செந்தமிழ் அந்தணர், முதுமுனைவர், வடஅமெரிக்கத் தமிழ்ச் சங்கக் கூட்டமைப்பு வாழ்நாள் சாதனையாளர், கனடா இலக்கியத் தோட்டவிருது என்று விருதுகள் பலபெற்றுள்ளார்.

முனைவர் மு.தமிழ்க்குடிமகன், முனைவர் கா.காளிமுத்து உள்ளிட்ட அரசியல் சார்புற்ற தமிழ் அறிஞர்கள் இரா.இளங்குமரனாரைப் போற்றி மதித்தவர்கள். தமிழ் வழிக் கல்விக்காகவும் குறளியக் கருத்துக்காகவும் தொடர்ந்து குரல் கொடுத்தவர்.[1] – (இரா.இளங்குமரன்-தமிழ் விக்கிப்பீடியா) தமிழ்க் கடல் இரா.இளங்குமரனார் 25.06.2021 இயற்கை எய்தினார்.

பதிப்பு நூல்கள்

தமிழரின் வாழ்க்கை நடைமுறைகளை விளக்கும் 'தமிழக ஒழுகு' என்னும் அரிய நூலை இவரைப் பதிப்பிக்கச் செய்து வெளியிட்டுள்ளது பாரதிதாசன் பல்கலைக்கழகம். அந்த நூலை எழுதிய விருதை சிவஞானயோகி 19.11.1908-ல் தொடங்கிய திராவிடர் கழகமே முதல் தனித்தமிழ் அமைப்பு என இளங்குமரனார் வெளிப்படுத்திய போது வியந்தது தமிழுலகம். 'தனித்தமிழ் இயக்கம்' (1991), 'தேவநேயப் பாவாணரின் சொல்லாய்வுகள்' (1985), 'இலக்கணவரலாறு' (1990) 'தமிழர் வாழ்வியல் இலக்கணம்'(2019) 'உவமை வழி அறநெறிவிளக்கம்'(2013) போன்ற நூல்களால் ஆய்வுச் செழுமைக்கு வலிமையூட்டியுள்ளார் இளங்குமரனார்.

சுவடிகள் அச்சேறிய அரிய வரலாற்றை விளக்கும் 'சுவடிக்கலை' (1984), 'சுவடிப்பதிப்பு வரலாறு' (1990) போன்ற அரிய நூல்கள் இவருடைய உழைப்பில் பிறந்தவை என்பதை அறிந்தோர் சிலரே. பழைய நூல்களைத் தேடிப் பதிப்பிப்பதில் நம் கால உ.வே.சா.வாகத் திகழ்ந்தார் இளங்குமரனார்![2] (தமிழ்க்கடல் புலவர் இரா.இளங்குமரனார் - Oneindia Tamil)

வள்ளுவத்தை வாழ்வியலாகவும் தமிழியத்தை தம் உயிர் மூச்சாகவும் கொண்டு வாழ்ந்தவர். தொழத்தகும் பெரியார் பாவாணாரை தம் முன்னோடியாகவும் வழிக்காட்டியாகவும் கொண்டு வாழ்ந்தவர். தமிழர்களின் அகவாழ்வு, புறவாழ்வு, உயர்ந்தஉள்ளம், உயரியவாழ்வுக் கொள்கைகளை உள்ளடக்கி தொன்மை வாய்ந்த தமிழினத்தின் பண்பு நலன்களைப் படம் பிடித்துக் காட்டுகிறார். சைவ சித்தாந்த நூற்பதிப்புக் கழகம், மணிவாசகர் பதிப்பகம், ஈரோடு குறளாயம், திருவள்ளுவர் தவச்சாலை, தமிழ்மண் பதிப்பகம் வழி 420 க்குமேல் நூல்களை எழுதியுள்ளார்.

ஆய்வுப்பணி:

தமிழர் வாழ்வியல் இலக்கணம் எனும் நூலின் முன்னுரையில் 'தமிழ்த் தொண்டன்' என்று தன்னைக் குறிப்பிட்டுள்ளார்.[3] (தமிழர் வாழ்வியல் இலக்கணம் - இரா.இளங்குமரனார் ப-6) இந்நூலில் தொல்காப்பியத்தின் விழுப்பத்தினை

எழுத்துசொல் பொருள் என்று மூன்று அதிகாரங்களையும் உரையாசிரியர்களின் வரலாறுகளையும் எளிய முறையில் ஆய்ந்து வெளியிட்டுள்ளார்.

இந்நூலின் கண் தொல்காப்பியத்தின் தோற்றம் வளர்ச்சி நிலையில் ஆய்வுகள் செய்துள்ளார். 'அறம் முதலாகிய மும்முதற் பொருள்', என்பது தொல்காப்பியம். அது வகுத்தவாறு அறம் பொருள் வழக்காறுகள் திருக்குறளில் இடம்பெற்றதுடன் இன்பத்துப் பாலோ புணர்தல், பிரிதல், இருத்தல், இரங்கல், ஊடல் எனத் தொல்காப்பியம் குறிப்பிடும் உரிப்பொருள் ஐந்தும் முறையே ஐந்தைந்து அதிகாரங்களாக 25 அதிகாரங்கள் கொண்டு முற்றாகத் தொல்காப்பிய வழியில் விளங்க நூல் யாத்துள்ளார். வள்ளுவர் என கால அடிப்படையில் திருக்குறள் காலத்தை வைத்து தொல்காப்பியக் காலத்தைக் கணித்திருக்கின்றார்.[4] (தமிழர் வாழ்வியல் இலக்கணம் - இரா.இளங்குமரனார் ப - 54) எனவே பன்னூற்றாண்டு முற்ப்பட்ட பழமையுடையது தொல்காப்பியம் என்பதை வலியுறுத்துகிறார்.

தொல்காப்பியம் கட்டொழுங்கமைந்த நூல் என்பது மேலோட்டமாகப் பார்ப்பவர்க்கு நன்கு விளங்கும். இன்னபொருள் இத்தட்டில் என்று வைக்கப்பட்ட ஐந்தறைப் பெட்டியில் இருந்து வேண்டும் பொருளை எடுத்துக் கொள்வது போல எடுத்துக்கொள்ள வாய்ந்தது தொல்காப்பியம். அத்தகு சிறப்பு அமைந்த தொல்காப்பியத்தின்; மூலத்தை சிதைக்காத தன்மையை ஆய்வு நூலில் காணலாம்.

ஈராண்டுகள் கொண்ட முயற்சியில் ஏறத்தாழ எண்ணாயிரம் உவமைகளைத் தொகுத்தார் அவற்றுள் தொல்காப்பியம் வரையறுக்கும் உவமைகளை மட்டும் எடுத்துக் கொண்டு ' உவமை வழி அறநெறிவிளக்கம்' – நீதிநூல் என்ற தலைப்பில் தொகுதிகளாக எழுதி வெளியிட்டுள்ளார். களவழி நாற்பது பாடலில்,

"ஓஒஉவமன் உறழ்வின்றி ஒத்ததே

குhவிரி நாடன் கழுமலம் கொண்டநாள்

மாவுதைப்ப மாற்றார் குடையெலாம் கீழ்மேலா

ஆவுதை காளாம்பி போன்ற புனல்நாடன்

மேவாரை அட்ட களத்து." [5] - (உவமை வழி அறநெறிவிளக்கம் - இரா.இளங்குமரனார் ப - 4)

என்ற பொய்கைப் புலவர் கண்டகாட்சியை மற்ற இலக்கியபாடல் சான்றுகளோடு விளக்குகிறார். சங்கப் புலவர் முதல் இக்கால புலவர் வரை படைத்த

படைப்புகளில் உள்ள அறம் கூறும் உவமைகளை மட்டும் எடுத்து உவமை வழி அறநெறிவிளக்கம் என்ற இந்நூலை ஆய்ந்து எழுதியுள்ளார்.

அறிஞர் பெருமக்களின் கருத்து:

"இளங்குமரனார் எந்த ஒன்றையும் நுணுகி நோக்குவதும் அகப் புறச் சான்றுகளால் அறுதியிடுவதும் இவர்தம் புலமை இயல்புகள். உழைத்து உழைத்து பல அறிய நூல்களை வெளியிட்ட இவர்தம் எழுத்துக்கள் பெருமையும் புகழும் பெற்றவை."–குறளியம் வேலா.[6] (உவமை வழி அறநெறிவிளக்கம் - இரா.இளங்குமரனார் ப - 14)

"புலவர் இளங்குமரனார் ஆழ்ந்த பலத்துறைப் புலமையோடு தமிழ்ச் சொற்களின் வேர்களையும் வேரொப்புமைகளையும் கூர்ந்து ஆராயும் நுண்மதி பெற்றவர்: சிதறிக் கிடந்த நூற்பாக்களைத் தேடித் திரட்டிக் காக்கைப்பாடினியம் என்ற நூலை உருப்பிடியாக்கி> விரிந்த உரையும் வரைத்த இலக்கணப் பணியாளர்." - தமிழ்ச் செம்மல் வ.சுப. மாணிக்கம்[7] (உவமை வழி அறநெறிவிளக்கம் - இரா.இளங்குமரனார் ப - 16)

இளங்குமரனார் போல் அகரமுதலிப் பணியாற்றுவார் எவருமில்லை. ஆங்கிலப் பெரும் பட்டம் பெற்ற பண்டாரகளுள்ளும், இவர் போல் இலக்கணம் கற்றாரும். ஆய்ந்தாரும் ஒருவருமில்லை'– மொழிஞாயிறு பாவாணர்.

சொற்பொழிவாளர், கட்டுரையாளர் ஆகியோர்க்குக் கையில் வாய்த்த கருவூலம், ஒப்பீட்டு ஆய்வாளர்க்கு அருந்துணை, வாழ்வியல் வளம் காண விழைவோர்க்கு வாய்த்த விருந்து, தமிழர் தம் ஊன்றிய பார்வையை உணர்த்தும் உயிர்ப்பிடம், இக்காட்சிதானே, அக்காட்சி, அக்காட்சியை அவர் பொது வர்க்கம், செய்தது போல நாமும் ஏன் செய்யக் கூடாது? எனப் படைப்பாளியையும் சிந்தனையாளர்களையும் தூண்டும் தூண்டாமணி விளக்கு, என இளங்குமரனாரும் இவர்தம் படைப்புகளும் திகழ்கின்றன என்பதில் ஐயமில்லை.

முடிவுரை:

ஒரு படைப்பைப் படைத்து அதனை தானே துய்த்துவிட்டு விடுவதைவிட அப்படைப்பை மூலம் மாறாமல் சந்ததியினருக்குக் கொண்டு செல்லும் தனித்திறனைப் பெற்ற தமிழ் ஆர்வலர் இளங்குமரனார் என்பதை அவர்தம் படைப்புகள் வழி அறியலாம்.

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5. உவமை வழி அறநெறிவிளக்கம் - இரா.இளங்குமரனார் ப - 4
6. உவமை வழி அறநெறிவிளக்கம் - இரா.இளங்குமரனார் ப - 14
7. உவமை வழி அறநெறிவிளக்கம் - இரா.இளங்குமரனார் ப - 16

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2. https://tamil.oneindia.com

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தமிழுக்குத் தொண்டாற்றிய உன்னத உரையாளர்கள்

கா. காமாட்சி
தமிழ்த்துறை, சீதாலட்சுமி இராமசுவாமி கல்லூரி, திருச்சிராப்பள்ளி.

ஆய்வுச்சுருக்கம்

கி.பி. ஒன்பதாம் நூற்றாண்டின் பிற்பகுதிக்கும் 12ஆம் நூற்றாண்டின் முற்பகுதிக்கும் இடைப்பட்ட காலமே உரையாசிரியர்களின் காலமாகும். இந்த முந்நூறு ஆண்டுக்காலத்தில் குறிப்பிடத்தக்க அரிய இலக்கியப் படைப்போ, புதிய இலக்கண நூலோ எதுவும் தோன்றவில்லை. இக்காலத்தில் தோன்றியவையெல்லாம் உரைகளேயாகும். தொல்காப்பியம், சங்க இலக்கியம், திருக்குறள், சிலப்பதிகாரம், திருவாய்மொழி ஆகியவற்றிற்குக் குறிப்புரை எழுதினர் சிலர். பொழிப்புரை எழுதினர் சிலர். விளக்கவுரை எழுதினர் சிலர். பேருரை கண்டனர் சிலர். இதனால் பழமை புதுமை பெற்றது: மறைந்த பழந்தமிழ் மீட்சி பெற்றது. உரையாசிரியர்கள், தமிழ்மொழிக்குச் செய்துள்ள தொண்டு மாணப் பெரிதாகும். தமிழ் மொழியின் காலம் கடந்த வாழ்விற்கும், வெற்றிக்கும் காரணமாய் இருப்பவர்கள் உரையாசிரியர்கள். இலக்கணக் கொள்கைகளை விளக்கி மொழியை வரம்பு கட்டிக் காத்தும், இலக்கியக் கருத்துக்களை விளக்கிக் காலந்தோறும் பண்பாட்டை வளர்த்தும் தமிழுக்கும், தமிழினத்திற்கும் தொண்டு செய்த பெருமை உரையாசிரியர்களேயாவார். தமிழுக்குத் தொண்டாற்றிய உரையாசிரியர்கள் குறித்து இக்கட்டுரை எடுத்துரைக்கிறது.

திறவுச்சொற்கள்: சங்க இலக்கியம், அழனென்பது பிணம், மூங்கா என்பது கீரி, நவ்வி என்பது புள்ளிமான், கராகமென்பது கரடி

Abstract

AD The period between the late ninth and early 12th centuries is the period of the textualists. During this period of three hundred years no notable rare literary work or new grammar book appeared. All that appeared in this period were texts. Some wrote notes on Tolkappiyam, Sangha literature, Thirukkural, Silappathikaram, Thiruvaimozhi. Some wrote a commentary. Some people wrote explanations. Few saw the bus. Thus the old became new: the lost Palantami was revived. The contribution of the speechwriters to the Tamil language will be magnified. Speech writers are responsible for the survival and success of the Tamil language in the past. Speech writers are the people who are proud of giving charity to Tamil

and Tamil people who explain the principles of grammar and keep the language bounded, explain the literary ideas and develop the culture from time to time. This article discusses about the speech writers who contributed to Tamil.

Keywords: Sangha literature, Alan is Pinam: Mangoa is Keeri: Navvi is Spotted Deer: Karakam is Bear

உரையாசிரியர்கள்

சங்ககாலம் தொடங்கி தற்காலம் வரை இலக்கண, இலக்கிய உரையாசிரியர்கள், திருக்குறள் உரையாசிரியர்கள், காப்பிய உரையாசிரியர்கள், சமய நூலுரையாசிரியர்கள் என பலவாறாக உரையாசிரியர்கள் உருவாகியுள்ளனர். களவியலுரையாசிரியர், இளம்பூரணர், சேனாவரையர், பேராசிரியர், பரிமேலழகர் ஆகிய உரையாசிரியர்கள் தனித்தனியாக ஒரு பரம்பரையை உண்டாக்கியவர்கள். நாலாயிரத்திவ்வியப் பிரபந்தம், சைவசித்தாந்த சாத்திரங்கள், திருக்குறள், சிலப்பதிகாரம் போன்றவற்றிற்கு உரையெழுதிய உரையாளாகளுக்குள்ளும் பரம்பரைத் தொடர்பினைக் காணமுடிகிறது. இதுபோல யாப்புநூல், பாட்டியல்நூல் போன்றவற்றிற்கும் பரம்பரைத் தொடர்புண்டு. அவ்வகையில் உரையாசிரியர் பரம்பரை இன்றளவும் தொடர்ந்து கொண்டே வருகின்றது.

களவியல் உரைகாரர்

உரைகளில் மிகத் தொன்மையானது களவியலுரையே. இவ்வுரை பல ஆண்டுகள் வாய்மொழியாக வழங்கிவந்து பின், பல தலைமுறைகளுக்குப் பின்னர், எழுத்து வடிவம் பெற்ற முதல் உரையாகும். பாயிரக் கருத்துரைத்தல், சொற்பொருள் விரித்தல், தமிழ்மரபு பேணுதல், இலக்கணக் குறிப்பு தருதல், பழைய பாடல்களை மேற்கோள் காட்டுதல், வினாவிடை முறையில் பொருளை விளக்குதல், செய்யுள் நடையில் உரைநடை எழுதுதல், எந்தக் கருத்தையும் தெள்ளத் தெளிவாக கூறுதல் போன்ற பல வழிகளில் பிற்கால உரையாளர்களுக்குக் களவியலுரை வழிகாட்டியாக அமைந்தது.

இளம்பூரணர்

இளம்பூரணர், களவியலுரையைச் சில வகையில் பின்பற்றினாலும், தொல்காப்பியத்திற்கு முதன்முதலில் உரையியற்றித் தனக்கெனத் தனிச் சிறப்பும் தலைமையும் பெற்று விளங்குகிறார். தொல்காப்பிய உரையாசிரியர்களுக்கும்,

பிற்கால இலக்கண உரையாசிரியர்களுக்கும் இளம்பூரணரே முதன்மையராகத் திகழ்கிறார். 'அறிதற்கரிதாகிய தொல்காப்பியக் கடலைத் தம்மத வலி கொண்டு கடைந்து, முதன்முதலில் இலக்கண அமுதம் அளித்த பெரியார்' என்று புலவர் போற்றும் புகழுக்குரிய சான்றோர் இவர். இளமையிலேயே முழுதறிவு பெற்றுச் சிறந்தமை கண்ட சான்றோர் இவரைச் சிறப்புப் பெயரிட்டு அழைத்தனர். மயிலைநாதர் தன்னுரையில், எச்சங்களின் வகையை எடுத்துக்காட்டுமிடத்து, "இஃது ஒல்காப் புலமைத் தொல்காப்பியத்துள் உளங்கூர் கேள்வி இளம்பூரணரென்னும் ஏதமில் மாதவர் ஓதியவுரையென்றுணர்க" என்று உரைப்பதினின்று இளம்பூரணரின் பெருமை அறியமுடிகிறது. ஆழமான தெளிந்த நீரோடை போன்றதான இவருரையில், ஆரவாரமும் பகட்டும் காண்பதரிதாகும். மிகச் சுருக்கமாகத் தெளிந்த கருத்தைக் கூறி விளங்க வைக்கிறார். பிறர் கருத்தை மதித்தலும், புலமை முதிர்ச்சியும், நடுநிலைமையும் இவரது உரையில் காணமுடிகிறது. பிற மொழிப் பயிற்சியில்லாத இவர் தமிழ்மரபு நன்கறிந்த சான்றோராவார். வேண்டுமிடங்களிலெல்லாம், அருஞ்சொல்லுக்குப் பொருள் உரைக்கின்றார். சான்றாக, குயின் என்பது மேகம்; மின் என்பது ஓர் தொழிலும் உண்டு, பொருளுமுண்டு: அழனென்பது பிணம்: மூங்கா என்பது கீரி: நவ்வி என்பது புள்ளிமான்: கராகமென்பது கரடி என்றுரைக்கின்றார். மேலும், வழக்காறுகள், அளவுப் பெயர்கள், நிறைப் பெயர்கள், பல்துறைப் புலமை ஆகியன வெளிப்படுகின்றன. "சாத்தன் கையெழுதுமாறு வல்லன்: அதனால் தன் ஆசிரியன் உவக்கும்" என்றவுரையில் கையெழுத்தினழகை விரும்பிய தன்மையும், "மனைவியைக் காதலிக்கும்: தாயை உவக்கும்" என்றவுரையின் வாயிலாக வாழ்வியலின் நுணுக்கத்தைத் தேர்ந்திருந்த விதமும் புலப்படுகிறது.

நச்சினார்க்கினியர்

இலக்கணம், இலக்கியம் என இருவகை நூல்களுக்கும் உரையெழுதிய சான்றோர். தமிழெனும் பெருங்கடற்பரப்பில் ஒரு கலஞ்செலுத்தி உலாக் கொண்டு, உயர்மணித் தொகுதிகளையெல்லாம் தொகுத்துப் பின்னவர்க்குக் கருவூலமென வைத்துச் சென்றவர் இவர். பல நூறாயிரம் பாடல்களை மனப்பாடமாகக் கொண்ட திறனும், பிறழாத நினைவாற்றலும், கலைச்சுவையுடனும், அழகிய உரைநடையெழுதும் வன்மையும் உடையவர். இவர் நீண்டநாள் வாழ்வாங்கு வாழ்ந்து, வாழ்நாளின் பெரும்பகுதியைச் சிறந்த நூல்களைக் கற்பதிலும், உரையெழுதுவதிலுமே கழித்துள்ளார். தாம் உரையெழுத எடுத்துக்கொண்ட நூல்களையும், உரைகளையும் பலமுறை பயின்று தெளிவுற்று புலமை பெற்ற பிறகே உரையியற்றத் தொடங்குவார். மக்களின் வாழ்க்கை முறைகளை நன்கு

ஆராய்ந்து உலகியலறிவு பெற்றவர். வரலாற்றுச் செய்திகளை கூறுமிடத்து, தமிழகத்துச் செய்தியாம் இவையன்றி, அக்காலத்தில் தமிழில் வழங்கிய இராமாயண, பாரதப் பழநூல்களிலிருந்து மேற்கோளும், செய்திக் குறிப்பும் காட்டுகின்றார். தாம் உரை எழுத எண்ணிய நூல் பிற சமயத்தைச் சார்ந்தது எனினும் அச்சமயத்தினையும், நூலாசிரியர் கொள்கையையும் நன்கு அறிந்தே உரையெழுதுகின்றார் என்பதற்குச் சிந்தாமணி உரையே தக்கச் சான்றாகும். மிகுதியாக எழுதி ஆரவாரம் செய்யாமல்

சுருங்கச் சொல்லி விளங்க வைப்பார். இவருரையில் அமைந்துள்ள சில நூற்பாக்களின் பொருட்போக்கே நாவலர் பாரதியாரைத் தொல்காப்பியப் புத்துரை காணத் தூண்டிற்று. இவையும் நச்சினார்கினியரின் கொடையேயாகும்.

சேனாவரையர்

சேனாவரையர் என்பது பட்டப்பெயர். எட்டி, காவிதி என்னும் பட்டங்கள் போல் படைத்தலைவர்களுக்கு அரசால் வழங்கப்பட்ட பட்டப்பெயர் இது. அதனால் சேனாவரையரின் முன்னோருள் ஒருவர் அப்பெயர் பெற்று விளங்கி, அது குடிப்பெயராக பின்னர் விளங்கியிருக்கவேண்டும். சொல்லதிகாரத்திற்கு உரை கண்ட புலவர் பெருமக்கள் ஐவருள் ஒருவர் சேனாவரையர். புலவர் உலகம் போற்றும் பெருமைக்குரிய விதத்தில் விரிவான உரையெழுதி தமிழுக்குத் தொண்டு செய்தவர். இவரது உரை வாயிலாக சமயத்தினை அறிய இயலவில்லை. சேனாவரையர் தமிழ் இலக்கணத்தில் தேர்ச்சி பெற்றிருப்பதைப் போலவே வடமொழி இலக்கணத்திலும் தேர்ச்சி பெற்றவர். கிளவியாக்கம், இரட்டைக்கிளவி, முக்காலம், இடைச்சொல் ஆகிய இலக்கணத் தொடர்களையும், கொள்கைகளையும் நுணுகித் திறம்பட விளக்குகின்றார். சில சொற்றொடர்களின் வரலாறு, வழக்கு, வடிவம், பொருள் ஆகியனவற்றை நன்கு சிந்தித்து நல்ல முடிவுகளைத் தருகின்றார். தக்க இடங்களில் ‘அதிகாரம், ஞாபகம், அநுவாதம், யோக விபாகம், உத்தரம், நேயம், காரகம் கரும கருத்தன், தாது ஆகிய வடமொழிச்சொற்களை எடுத்தாளுகின்றார். சேனாவரையர் ஆசிரியப்பணி பூண்டு வாழ்ந்தவர் என்பதைக் கல்வெட்டால் மட்டுமன்றி உரையாலும் அறியமுடிகிறது. பலகாலும் மாணாக்கர்க்குப் பாடம் சொல்லும்போது மாணவர் எழுப்பும் வினாவும் ஆசிரியர் கூறும் விடையும் அமையுமாறு எழுதிச் செல்கிறார். நன்னூலார் கருத்துக்களைத் தம் உரைகளில் சுட்டிச் செல்கிறார். தம் காலத்து மக்கள் பேசிய முறையை உலகியலோடு பல இடங்களில் குறிப்பிடுவதிலிருந்து உலகத்தோடு ஒட்ட ஒழுகியவர் என்பதனை அறியமுடிகிறது.

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தெய்வச்சிலையார்

தெய்வச்சிலையார் தொல்காப்பியச் சொல்லதிகாரத்திற்கு உரை கண்டாருள் ஒருவர். இவரது உரை முழுமையும் கிடைத்துள்ளது. "மன்னாப் பொருளும் அன்ன இயற்றே" எனும் நூற்பாவுரையில், வேதாகமத் துணிவு ஒருவர்க்கு உணர்த்துமிடத்து, உலகும், உயிரும், பரமும் அனாதி : பதியும், பாசமும் அனாதி என வரும். உலகும் உயிரும், பரமும், பசுவும் பொருந்தும் பொருள் ஆனவாறும் பதியும், பாசமும் இவற்றோடு பொருந்தாத பொருள் ஆனவாறும் காண்க எனும் விளக்கத்தால் இவர் வைதிகம் சார்ந்த சைவ சமயத்தவர் என்பது புலப்படுகிறது. இவர் தொல்காப்பியரை வைதிக முனிவரென்று கொண்டதால் வைதிகக் கொள்கைக்கேற்ப உரை செய்யுள்ளார். உலகம் என வரும் நூற்பாவில், சொல் என்பது எழுத்தினான் இயன்று பொருள் உணர்வது. அச்சொல்லினான் இயன்ற மந்திரம், விடம் முதலாயின தீர்த்தலின் தெய்வம் ஆயிற்று. இந்நூல் செய்தான் வைதிகமுனிவராதலின் சொல்லென்பது 'வேதம்' என்று கொள்ளப்படும் எனும் வரிகளால் அறியப்படுகிறது.

உரைகளின் ஊடே சிலவிடங்களில், தரும் விளக்கமும், எடுத்துக்காட்டும் நினைதோறும் இன்பம் பயக்கிறது. முன்னவர் உரைகளைத் தழுவியும், சார்ந்தும் பின்னவர் உரை காண்பதும் காட்டுவதும் வழக்கெனினும், அப்பின்னவர் உரைகளால் முன்னவர் விளக்காத பகுதிகள் விளக்கம் பெறுவதும், சிக்கல்கள் அவிழ்க்கப்படுவதுமான இவரது உரை தனிச் சிறப்புக்குரியதாகும். செந்தமிழ் நாட்டு எல்லை குறித்து கூறுகின்ற கருத்து பிறரினும் தெளிவும், திருத்தமுடையதாகவும் அமைகின்றது. சோழநாடே செந்தமிழ்நாடு என பிறர் கூற, சிலையாரோ வடவேங்கடம் தென்குமரி ஆயிடை தமிழ் கூறும் நல்லுலகமே செந்தமிழ்நாடு என்றுரைக்கின்றார். மேலும், உண்டு என்பது உண்ணல், கறித்தல் குடித்தல், சுவைத்தல் முதலிய பலவற்றுக்கும் வரும் பொதுவினையாதலை விளக்குகின்றார்.

கல்லாடர்

தொல்காப்பியச் சொல்லதிகாரத்திற்கு உரை கண்டவர். இவர் ஒல்காப் புலமைத் தொல்காப்பியத்திற்கு உரையிடையிட்ட விரகர் கல்லாடர் எனப் பாராட்டப்படுகிறார். ஆவர் சிவநெறிச் சார்பினர். முன்னவர் உரைகளை உள்வாங்கி உரை எழுதுகிறார். எடுத்த பொருளை நன்கு விளக்கிக் கூறுதலில் இவர் பெரிதும் கருத்துச் செலுத்துகின்றமையால் இவருரை விருத்தியுரை என்றழைக்கப்படுகிறது. முன்னவர் உரையை உள்வாங்கி எழுதும் தன்மையர். இயல்களின் முறை

வைப்பை ஆராய்ந்து இலக்கண நுட்பத்தோடு கூறுகின்றார். தயக்கத்தோடும், ஐயத்தோடும் பலவிடங்களில் உரை கண்டுள்ளார்.

பேராசிரியர்

பேராசிரியர் தொல்காப்பியப் பொருளதிகாரம் முழுமைக்கும் உரை கண்டவராவார். சிறப்புப் பெயர் இயற்பெயருக்கு முன்னம் வருதல் வேண்டும் என இலக்கணம் கண்ட தொல்காப்பியத்தில் பின் நான்கு இயல்களுக்குப் பேராசிரியர் உரை அமைந்துள்ளது. பாலாசிரியர், இளம்பாலாசிரியர், ஆசிரியர், கணக்காயனார் என்னும் சிறப்புப் பெயர்களை அடுத்துள்ள இயற்பெயர்கள் பல, சங்கச் சான்றோர் பெயர் வரிசையில் பேராசிரியரும் இடம்பெற்றிருப்பது சிறப்புக்குரியதாகும்.

இவர் சிவ வழிபாட்டினர் என்பது அறியமுடிகின்றது. 'வாழ்த்தியல் வகையே' என்னும் செய்யுளியல் நூற்பாவில், வாழ்த்தப்படும் பொருளாவன, என கடவுளும், முனிவரும், பசுவும், பார்ப்பனரும், அரசரும், மழையும், நாடும் என்பனவற்றை எடுத்துக்காட்டி, இவற்றுள் கடவுளை வாழ்த்தும் செய்யுள் கடவுள் வாழ்த்தெனப்படும் என்று உரைக்கின்றார். இவ்வாழ்த்துதல் என்பது பழந்தமிழர் வழிவழிக் கொண்டொழுகிய வழிபாட்டியல்பினராகிய பேராசிரியர் தமிழ் நெறிவழிபாட்டாளர் என்பதனை அறிய முடிகிறது. இவர் ஓரியலுக்கும் அடுத்துவரும் இயலுக்கும் உள்ள தொடர்பை விளக்குகிறார். ஒரு நூற்பாவிற்கும் அடுத்த நூற்பாவிற்கும் உள்ள தொடர்பைச் சுட்டுகிறார். ஒரே நூற்பாவில் வரும் செய்திகளின் முறைவைப்பையும் கவனமாக எண்ணி எழுதுகின்றார். இவர் உரையெழுத மேற்கொண்ட நெறிகள் பலவாகும். வகைப்படுத்திக் கூறுதல், வறையறைப்படுத்துதல், நூற்பா அமைதிக் காட்டல், பாடம் கூறுதல், வேற்றுமை கூறுதல், மறுப்புறை வழங்கல், பிறருரை கூறதல், சொற்பொருள் கூறல் ஆகியனவாம். சான்றாக, " நகையென்பது சிரிப்பு: அது முறுவலித்து நகுதலும், அளவே சிரித்தலும், பெருகச் சிரித்தலுமென மூன்றென்ப" என மெய்ப்பாட்டியலில் கூறுகின்றார். மேலும் பரந்த புலமையுடையவராகவும், உலகியலறிவுடையவராகவும், இலக்கிய வன்மையுடையவராகவும் திகழ்கின்றார்.

இவ்வாறு தமிழ் நுல்களுக்கு அவ்வப்போது ஏற்பட்டு வந்துள்ள தடை, எதிர்ப்பு, புறக்கணிப்பு ஆகியவற்றை அகற்றி அந்த நூல்களுக்கு வாழ்வு தந்து போற்றவும், அவை இழந்த செல்வாக்கை மீட்டுத் தரவும், அவற்றிற்குரிய இடங்களில் அவற்றை மீண்டும் அமர்த்த உரையாசிரியர்கள் அரும்பாடுபட்டுள்ளனர். உரையாசிரியர்களைப் போற்றுவோம்: மதிப்போம்: வணங்குவோம்.

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