

# ASPIRING RESEARCHER

( JOURNAL FOR SHAPING THE  
RESEARCH LANDSCAPE OF  
STUDENTS )

**VOLUME - 1**



**2024  
EDITION**

Editors

Dr. C. RAJESH, PRINCIPAL

Dr. M.C. RANJINI

Dr. K.P. SREENIVASAN

Dr. T.P. SIVADASAN



MES KALLADI COLLEGE, MANNARKKAD

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## **Preface**

It is with immense pleasure that we present this collection of research projects by the postgraduate students of MES Kalladi College, compiled and published under the auspices of the Research Promotion Council. This initiative represents a significant milestone in our academic journey, as it brings to light the scholarly endeavors of our students and provides a platform for their innovative contributions to various fields of study.

The publication of this volume, bearing an ISBN, marks a new chapter in our commitment to fostering a culture of research and intellectual pursuit. It is a testament to the hard work, creativity, and dedication of our students, guided by the encouragement and expertise of their mentors and faculty members. Each project included in this book has been carefully selected based on its originality, relevance, and potential impact, reflecting the high standards of academic excellence upheld by our institution.

This compilation aims to inspire future researchers, not just within our college but beyond, showcasing the importance of inquiry, critical thinking, and the relentless pursuit of knowledge. We believe this book will serve as a valuable resource for scholars and a stepping stone for our students as they advance in their academic and professional journeys.

We extend our heartfelt gratitude to all contributors, including the authors, faculty members, and the editorial team, for their unwavering efforts in bringing this initiative to fruition. We also thank the management and administration of MES Kalladi College for their constant support in promoting research and academic excellence.

May this book be a source of inspiration and motivation for all those who strive to make a difference through research and innovation.

**Research Promotion Council**

**MES Kalladi College**



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### **Detection of synthetic colours in sweet confectioneries by UV-Visible spectroscopy**

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#### **Abstract**

Food adulteration, particularly through the addition of synthetic colours or any other harmful substances, causes significant health risks globally. Synthetic colours, used to enhance the visual appearance of food products, can be potentially harmful if consumed above permissible limits. This study investigates the prevalence of synthetic colours in sweet confectioneries through UV-visible spectroscopy. Samples collected from rural areas were analyzed to detect both permitted and non-permitted colours including tartrazine, amaranth, malachite green, orange G, and rhodamine B. Results revealed that out of 30 samples tested, 7 contained synthetic colours, with 5 samples showing non-permitted colours and two samples were permitted colours. The study underscores the importance of rigorous monitoring and regulation by authorities such as the Food Safety and Standards Authority of India (FSSAI) to safeguard public health against the adverse effects of food adulteration. Understanding the composition of synthetic colours in confectioneries is crucial for ensuring food safety and consumer protection.

**Key words:** Sweet confectioneries, UV-Visible spectroscopy, Tartrazine, Amaranth, Rhodamine B, FSSAI

#### **1.Introduction**

Food additive are the substances which are added to the food by the manufactures to improve appearance, texture, flavour and keeping quality. Food adulteration is defined as addition of undesirable

substances. Which may be added naturally, accidentally or deliberately for the removal of certain constituents. Over time, various food additives have been created for the demands of large-scale food production. These additives are crucial for ensuring the safety and freshness of processed food as it travels from factories to consumers [1]. Even if the adulterant is not harmful, it reduces the nutritional value of food. Some of the adulterants are also identified as carcinogenic or lethal when exposed to them for a longer period.

A dye is pigment or a substance which is added to food to get colour. Also, we can call it a colour additive. The colours that are added to the food can be natural colours or synthetic colours (permitted and non-permitted). Natural food colours come from sources such as vegetables and fruits. These colours are permitted, and they do not impart any toxic effects to the body. Synthetic food colours are regulated and authorized for use in food additives in many countries. Permitted colours are defined as colours that are permitted under The Prevention of Food Adulteration Act. And the permitted colours, according to FSSAI, are tartrazine, sunset yellow FCF, brilliant blue colours such as metanil yellow, rhodamine B, orange green, amaranth, malachite green, and orange II, And the maximum amount of permitted synthetic colours doesn't exceed 100 parts per million, according to FSSAI regulation [2]. The Food Safety and Standards Authority of India (FSSAI) was established in 2006 to consolidate various food safety acts and create standards for food articles. Its primary goal is to ensure the availability of safe food for human consumption through regulations on manufacture, storage, distribution, sale, and import [3].

Recently some states on India to ban the use of certain colouring agents in cotton candy and even in Gopi Manchurian. The ban is on the state like Goa, Tamil Nadu and Karnataka. Recently Himachal Pradesh has instituted one year ban for the production, sale of cotton candy after the detection of Rhodamine B. The survey by the Public Health Department that showed the presence harmful chemicals in food samples, which is unsafe for consumption and may lead to acute toxicity. And it is carcinogenic in nature. Exposure to this chemical causes damage to the dye and cause irritation in respiratory tract. Rhodamine B is the chemical that present in popular street items such as cotton candy& Gopi

Manchurian. FSSAI specially banned the Rhodamine B in food products, any use of this chemical in the processing, preparation and distribution is punishable. Penalties include the cancellation of commercial licence and fine not less than ₹ 10 lakh and minimum 7 years jail term, extending jail imprisonment. The negative effects include attention deficit hyperactivity disorder, along with potential carcinogenic properties, immune-related issues, respiratory problems, and gastrointestinal disturbances [4].

## **2. Materials And Methods**

### **2.1 Reagents And Chemicals**

- Distilled water
- Acetone And 5 standard synthetic colours
- Tartrazine(85% Pure), Amaranth(85% Pure), Malachite green(90%Pure),OrangeG(88% Pure), Rhodamine B (80% Pure), have been purchased from Vidya Lab equipment and Chemicals, Kozhikode.

### **2.2 Laboratory Equipments**

- Beaker
- Glass rod

### **2.3 Instrumentation**

Uv-visible spectrophotometer is used for the detection of synthetic colours. A uv-visible spectrophotometer uses Beer-Lambert's law to measure the absorption of UV light by a sample, allowing for the determination of concentration and the identification of substances based on their distinctive absorption patterns. Here, it compares the sample with a blank sample to measure the

### **2.4 Sample Collection**

In this present study, all 30 samples (consisting candies, cotton candy, chalk candy and pudding candies) were collected from the different shops including both rural and urban area. Collection of samples were chosen from different locations, to check the adulteration in sweet confectioneries by synthetic colours, mainly focusing on non-permitted colours.

And standard was also used and test were performed for comparison. The standard colours collected are, Rhodamine B, Amaranth, Malachite green, Orange G and Tartrazine. The study mainly focused on the coloured ones suspected on synthetic colours.

## **2.5 Method**

First step is the dilution of the sample. A small portion of the candy is dissolved in 25 ml of distilled water within a beaker. This dilution process ensures that the candy's components are dispersed evenly in the solution, facilitating uniform absorption measurements later on. Stirring the mixture using glass rod, until a consistent colour appears in the solution ensures that the sample is adequately prepared for spectroscopic analysis. Also, take a pinch of each colour, such as, tartrazine, rhodamine B, amaranth, malachite green and orange G. And makeup to 100 ml in a distilled water.

After sample solution prepared, attention turns to the UV-visible spectrophotometer, a sophisticated instrument designed to measure how substances absorb light in the UV and visible spectra. The setup process begins with powering on the spectrophotometer and allowing it to initialize, indicated by a reassuring green tick mark. Next, the wavelength of light used for analysis is meticulously chosen using the instrument's monochromator, typically within the range of 200 to 800 nm. This selection is crucial as different substances absorb light at specific wavelengths, allowing researchers to target and quantify particular components present in the candy. To ensure accuracy in measurement, baseline measurements are conducted using cuvettes filled with distilled water. This initial measurement establishes a reference point against which subsequent samples are compared. Once the baseline is confirmed, a cuvette containing the candy sample solution is inserted into the spectrophotometer's sample compartment. Initiating the measurement captures the absorbance spectrum of the candy sample, recording how much light is absorbed at the chosen wavelength. This data is critical for understanding the concentration of substances present in the candy.

After completing the measurement, the spectrophotometer's software generates a calibration curve, between absorbance and wave

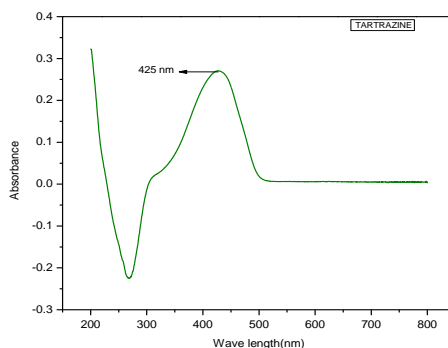
length. The data, typically exported in spreadsheet format (export > file location > file name >. Xls format > save). And clean the cuvette with acetone, for the preparation of next samples.

### 3. Results And Discussion

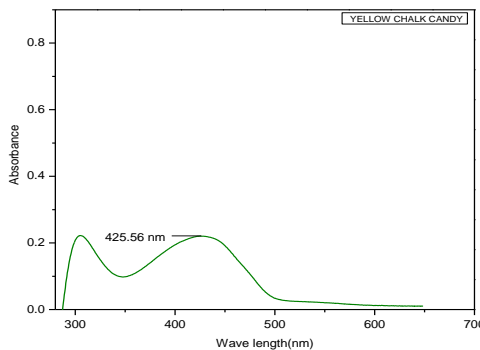
Out of the 30 samples analysed, 6 contained synthetic colours, one contained permitted colour and the remaining 5 containing non-permitted colours.

#### **Tartrazine**

Only one sample was found to contain tartrazine when tested using a UV-visible spectrophotometer.



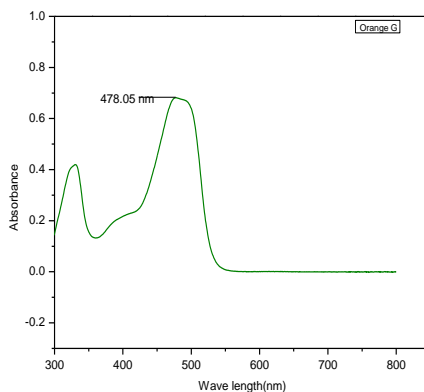
Tartrazine standard



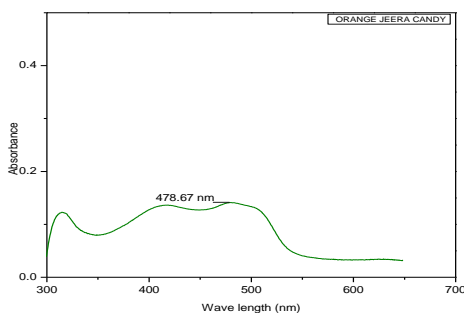
Yellow chalk candy

## **Orange G**

5 samples which containing orange colour are collected. Some are branded while others are local products with no labelling. Out of which only one sample showed the presence of synthetic colour.



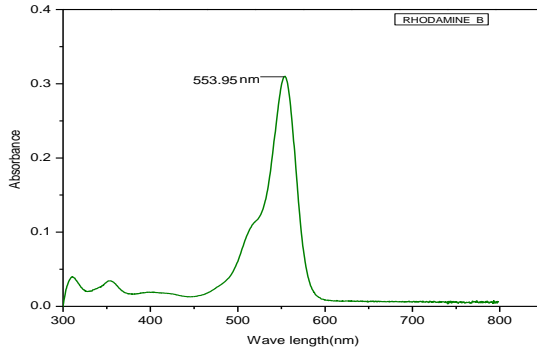
Orange G standard



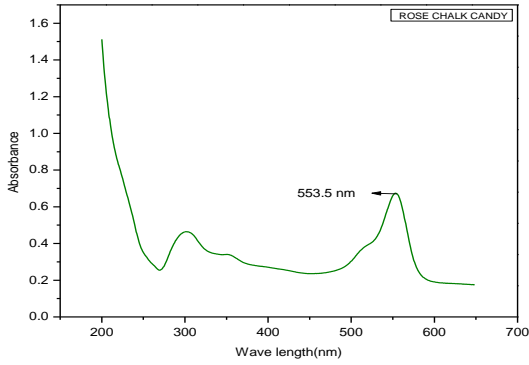
Orange jeera candy

## **Rhodamine B**

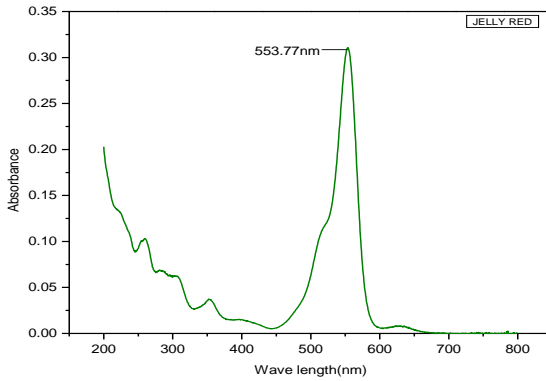
11 samples, which have the combinations of red, rose, and purple colours, were suspected to contain rhodamine B. Out of which, only 2 samples were detected to have its presence when run on the UV-visible spectrophotometer.



Rhodamine B standard



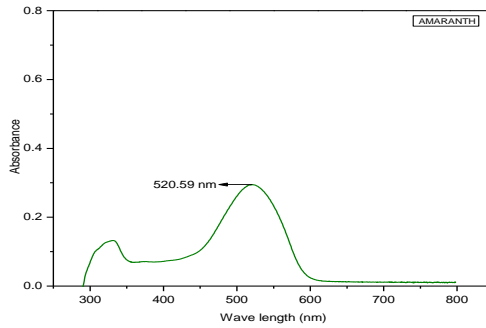
Rose chalk candy



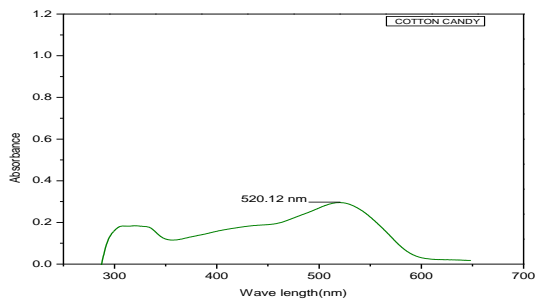
Jelly red

## Amaranth

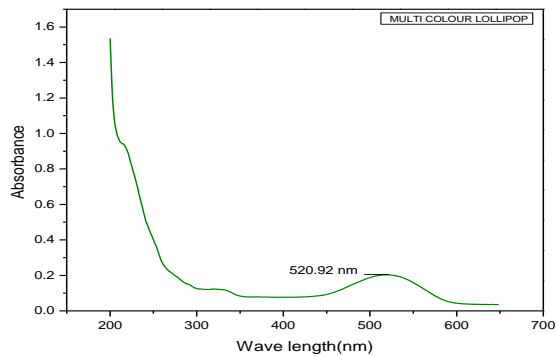
11 samples, which have combinations of red, rose, and purple colours, were suspected to contain amaranth. Only 2 samples were detected the presence of amaranth.



Amaranth standard



Cotton candy



Multicolour lollipop

The study was focused on a simple method of detecting the synthetic colours only by dissolving the sample using distilled water as the solvent. And the prepared solution is run on a UV-visible spectrophotometer. All standard colours are run on a UV-visible spectrophotometer, and get a calibration curve. Save the data after measurement. Different peaks are identified in each sample. The standard peaks are,

- Tartrazine - 425 nm
- Orange B - 478.05 nm
- Rhodamine B- 553.95 nm
- Amaranth - 520.59 nm

Synthetic colours were found in 6 samples. Out of which 5 contained non-permitted colours and the remaining one detected the presence of permitted colours. It was noted that tartrazine is a permitted colour, could have adverse effects on the body with repeated use. Interestingly, non-permitted colours were mostly found in non-branded samples, some of which lacked proper labelling. Orange G was detected on jeera candy and amaranth was detected in a multi colour candy, and it doesn't contain any label on outside of the sample. Recently, the sale and manufacturing of rose chalk candy was banned in Kerala. Chalk candy is one of the traditional candies in south India. Mainly, the sale of this chalk candy was found during the traditional festivals. This rose-coloured candy was detected the presence of rhodamine B. Rhodamine was also detected in non-branded jelly sample. The yellow chalk candy was also found to contain tartrazine.

For instance, a branded cotton candy was found to contain the non-permitted colour amaranth without any mention on the label, despite listing only sugar and flavour extract as ingredients. Although labelled as allergen-free, amaranth can be carcinogenic and trigger allergic responses. Experiment, focused on samples primarily from rural areas rather than urban areas. The range of areas from which samples were collected was limited. Therefore, collecting samples from a wider range of areas, including both rural and urban, would provide more insight into the presence of synthetic colours, particularly non-permitted colours.

#### **4. Conclusion**

Numerous artificial food colours are utilized in processed foods. These synthetic colours are preferred over natural ones due to their consistency and suitability for a wide range of processed foods. This study was an attempt to identify the presence of synthetic colours, mainly non-permitted colours by using a simple method. The samples are diluted in distilled water and run on a UV-visible spectrophotometer. The summary of the above analysis shows that, overall, 30 samples were analysed. The outcome showed that 6 samples indicated the presence of artificial colours, out of which only one sample contained permitted colour and the remaining are non-permitted colours. So, it is essential to systematically monitor the presence of harmful and unauthorized colours within the country. While also being cautious of potential adulteration in locally sourced foods that could pose serious health risks, which include irritation, allergies, and carcinogenic properties. Implementing and enforcing strict regulations is crucial to mitigating the risks associated with the use of unauthorized colours and exceeding permissible levels of approved colours.

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### **Adsorption and Photocatalytic Degradation Studies of Methylene Blue on Sol –Gel Derived CdS -Ti MCM-41**

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#### **Abstract**

We suggested a simple method for the synthesis of CdS modified Ti MCM-41 catalyst materials by sol- gel method and studied the calcined materials were well characterized by Powder X-ray Diffraction, Ultraviolet-Visible diffuse reflectance spectroscopic analysis, ATR FT-IR Spectroscopy, N<sub>2</sub> Sorption analysis and transmission Electron Microscopy. The powder X -ray diffraction data showed the presence of hexagonal phase CdS and variation in crystallinity of the material as we changed the composition of the materials. Upon increasing the amount of CdS concentration, the intensity of the spectra in the visible region also increased. From transmission electron microscopy analysis, noticed the presence of CdS nanoparticle along with TiO<sub>2</sub>. The textural properties of CdS modified Ti MCM 41 was found to be lower than that of the parent Ti MCM41. Up on studying the photocatalytic activity of the material, CdS modified Ti MCM 41 showed lower photocatalytic activity under direct sunlight irradiation. This might be attributed to lower surface area, crystallinity, and visible light sensitivity of the CdS modified Ti MCM 41.

**Keywords:** Sol- gel method, mesoporous material, TM -41, CdS modification, Photodegradation, methylene blue

## **1. Introduction**

Meso structured silica, like MCM-41, has small pore size distributions, high surface areas, and organised frameworks, making it the most suitable support [1-3]. However, the visible light supported photocatalytic performance of mesoporous silica-TiO<sub>2</sub> is very poor. Therefore, structural and surface modification of TiO<sub>2</sub> is necessary for improving visible light absorption capacity and thereby enhancing the efficiency of photocatalyst. An efficient photocatalyst consisting of Cd chalcogenide nanoparticle dispersed mesoporous silica-titania mixed oxide materials are efficient photocatalyst for discolouration of textile effluent [4]. Material scientists are always trying to find out the most efficient photocatalysts that is visible light activated, chemically or photochemically stable and low cost[5]. Cadmium sulfide has garnered significant attention as a promising visible light-driven photocatalyst due to its narrow band gap (2.4 eV), high absorption coefficient and suitable conduction and valence band positions [6,7]. The sol-gel method was employed for the preparation of TM-41-CdS nanocomposite. Here we are trying to explore the applications of this kind of material by studying photocatalytic degradation of methylene blue.

## **2. Experimental**

### **2.1 Chemicals required**

Cetyl trimethyl ammonium bromide (CTAB) (Labochemie), Titanium isopropoxide (Aldrich 98 %), Tetra ethyl ortho silicate (TEOS) (Aldrich), aqueous ammonia, Isopropyl alcohol, Cadmium acetate and sodium sulphide (Nice chemicals), Distilled water.

### **2.2 Preparation of Ti MCM 41**

About 0.75g of CTAB was added to 15 ml of deionised water under vigorous stirring in a 250 ml beaker. After CTAB was completely dispersed in water, 17.5 ml of aqueous NH<sub>3</sub> was poured into the clear solution. About 23 ml isopropyl alcohol was added to the surfactant solution under vigorous stirring. After stirring for 30 minutes, 3 ml TEOS was added and stirred continuously for further 30 minutes. Then 2.2 ml titanium isopropoxide was added slowly to the solution during stirring. The resultant gel was kept for drying at room temperature. Calcination

was done at 550°C in a static air environment. The obtained sample was labelled as TM 41.

### **2.3. Preparation of CdS modified Ti MCM 41**

For the preparation of the CdS -modified Ti MCM 41, 0.5g of previously prepared TM 41 was added to 10 ml of water. After stirring for 30 minutes add 80 mg of cadmium acetate into it. After stirring for 15 minutes, 0.02 g of sodium sulphide in 10 ml of water was added to in it. The resultant mixture was keep drying for 5 days and then washed with 500 ml water. The samples obtained were dried in static atmosphere. The sample was labeled as TM 41- CdS- 80. The same procedure was repeated with 160 mg, 40 mg of cadmium acetate and 20 mg of sodium sulphide respectively to obtain TM 41- CdS-160, TM 41-CdS-40 respectively.

### **2.4 Characterization**

The XRD measurements were performed at room temperature using a Rigaku Ultima IV X-ray diffractometer with Cu K $\alpha$  radiation. The diffractometer was operated at 40 kV, and 44 mA, scanned with a step size of 0.02°, and a count time of 1°/min in the range of 2 $\theta$  angle 10 to 80. The FT-IR analysis were carried out using a Bruker ALPHA instrument with ATR Pt diamond holder and the spectra were acquired in the range 4000 cm<sup>-1</sup> to 500 cm<sup>-1</sup> with a resolution of 4cm<sup>-1</sup> The TEM images were recorded on a HRTEM Jeol/JEM 2100 instrument operating at 200 kV. Prior to TEM analysis, the sample was dispersed in ethanol and the suspension was sonicated for 1h. For each material, one drop of suspension was placed on a copper grid coated with carbon film, and allowed to dry overnight. The textural properties, such as surface area and pore size distribution of TM 41 and as TM 41-CdS 160 materials were analyzed by using N<sub>2</sub> physisorption measurements. After the samples are dried overnight at 70 °C and degas at 200 °C for at least 1 h, N<sub>2</sub> isotherms are obtained at -196 °C using a BELSORP-max surface area and pore size analyzer. The surface areas of the synthesized materials were calculated by using the Brunauer-Emmett-Teller (BET) equation within a relative pressure range (P/P<sub>0</sub>) of 0.05–0.30. The pore volume was determined from the amount of N<sub>2</sub> adsorbed at the highest relative pressure of P/P<sub>0</sub>

$\approx 0.99$ . The pore diameter and pore size distribution plots are defined by applying the Barrett-Joyner-Halenda (BJH) model to the desorption isotherm. The UV-Vis diffuse spectra were recorded by a JascoV-550 UV-Visible spectrophotometer with Jasco model ISV 469 reflection accessory.

### 3. Results and discussion

#### 3.1 Powder XRD Analysis

The powder XRD patterns of the materials TM 41, TM 41- CdS- 40, TM 41- CdS- 80, and TM 41- CdS- 160, were shown in Fig.1. All the mesoporous materials showed a fairly broad peak between  $2\theta$  values of 20 and 30. This is typical of amorphous silica support. The broad peaks due to  $\text{TiO}_2$  and CdS indicated that both of these species were highly dispersed on the mesoporous silica support. This suggested that the  $\text{TiO}_2$  and the CdS were amorphous in nature. Upon modification of TM 41 with CdS nanoparticle a new peak at 17 appeared. Peaks due to  $d_{100}$ ,  $d_{002}$ ,  $d_{101}$ ,  $d_{110}$ ,  $d_{103}$ , and  $d_{112}$ , at 25.6, 26.4, 30.1, 43.7, 48.2 (overlapping with  $\text{TiO}_2$ ), and 52.0, indicated that the hexagonal phase of CdS [8].

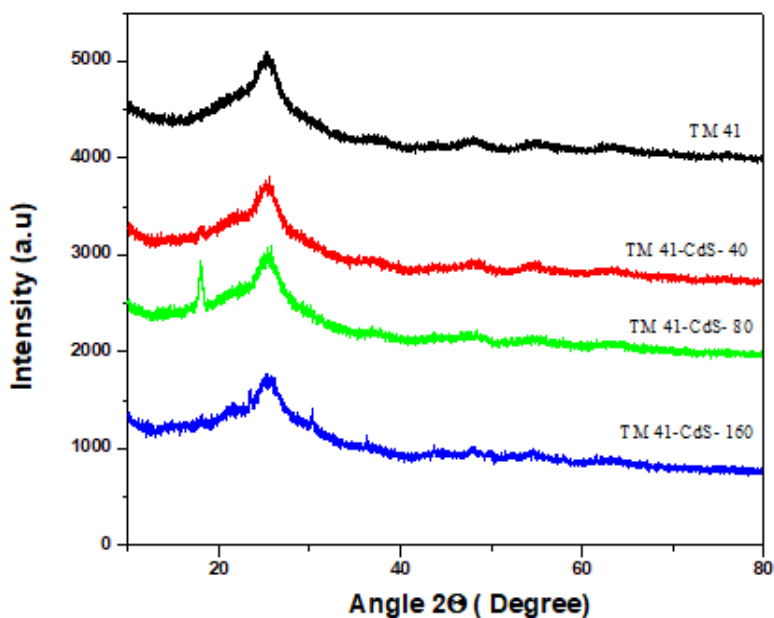
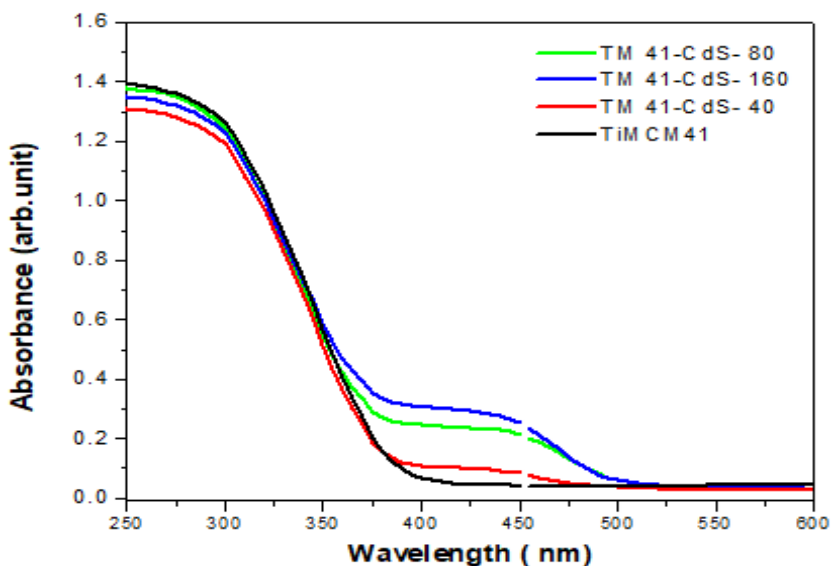


Fig .1 XRD patterns of TM41, TM 41-CdS-40, TM41-CdS- 80, Tm 41-CdS-160 respectively

### 3.2 UV-Visible DRS Analysis

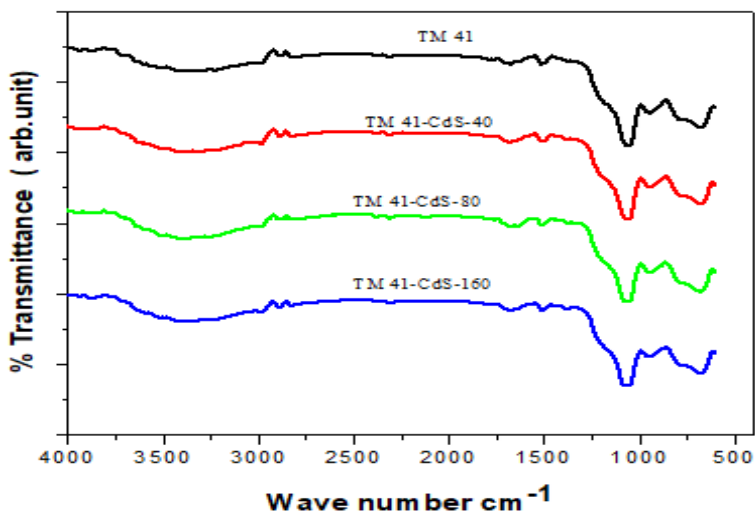
UV-Visible diffuse reflectance spectroscopic analysis was carried out to knowing the optical properties of the materials. The UV-Vis spectra of TM41, TM41-CdS-80, TM41-CdS-160, and TM41-CdS-40 were shown in Fig. 2. All the CdS modified samples showed a broad bands between 400 and 500 nm corresponding to band gap absorption of CdS [9, 10]. Intensity of the band increased with concentration of CdS precursor. Two types of absorption onsets, one in the UV and another in the visible region were seen. These distinct absorption bands were due to the presence of CdS and TiO<sub>2</sub> species, respectively.



**Fig. 2 UV-Vis spectra of TM41, TM 41-CdS-40, TM41-CdS- 80, Tm 41-CdS-160 respectively**

### 3.3 ATR-FT-IR Spectroscopy

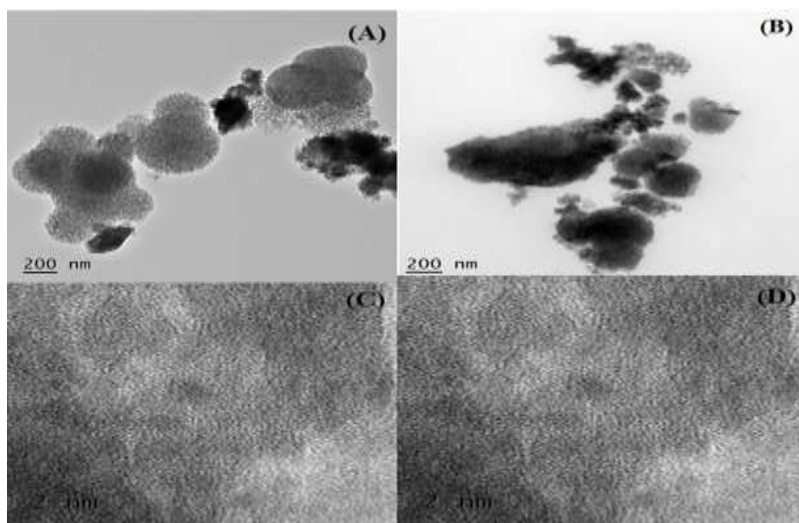
In order to acquire information about the different functional groups, the materials were further characterized by using FT-IR analysis. The spectrum was shown in Fig.3. All the samples showed typical IR spectra of TM 41 as reported earlier. It was reported that the characteristic broad peak for Si-O-Si observed in between 900-1200 cm<sup>-1</sup>, while the peak observed at 870 cm<sup>-1</sup> was due to Si-O-Si symmetric stretching. The broad peak observed at 1600 cm<sup>-1</sup> was due to OH bending vibrations and is attributed to chemisorbed water molecules [11].



**Fig.3. ATR FT-IR spectra of TM 41, TM 41-CdS-40, TM41-CdS- 80, Tm 41-CdS-160 respectively**

### 3.4 TEM Analysis

TEM images of TM 41 and representative material TM 41 -CdS-160 were shown in Fig. 4. From the TEM images of TM 41 and representative material, TM 41-CdS-160, the TiO<sub>2</sub> particles were randomly distributed with a particle size of 10-15 nm. The TEM image of TM 41 CdS-160 showed lattice fringes due to CdS nanoparticle [10].



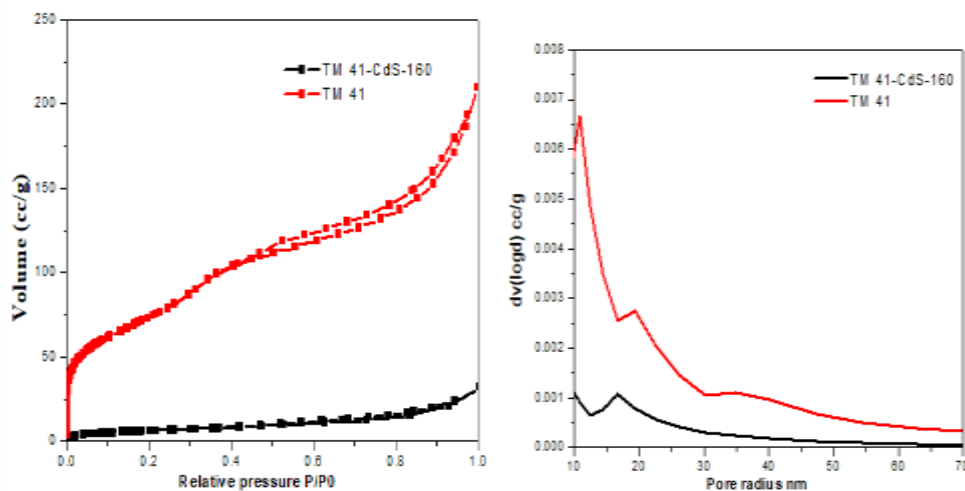
**Fig. 4. TEM images of TM41 (A, C) and TM 41-CdS-160 (B, D)**

### 3.5 Nitrogen physisorption studies

The N<sub>2</sub> isotherms and pore size distribution curve of TM41-CdS-160, TM 41 prepared in these studies were shown in Fig. 3.5. The N<sub>2</sub> isotherms of TM41 and TM41-CdS-160 indicated that, the materials exhibited type IV isotherms typical of mesoporous materials. The hysteresis loops featured in the isotherms were reflection of porosity of these materials. The initial part of type IV isotherm was due to monolayer adsorption at low relative pressures. As the relative pressure increases, multilayer adsorption occurs followed by capillary condensation. The material TM41-CdS-160 and TM41 suggested a set of pores with a BJH pore diameters of 8.2 nm and 3.65 nm respectively. The textural property details of these materials were also shown in Table 1.

**Table 1. Textural properties of TM41 and TM41-CdS-160**

Materials	Specific surface area m <sup>2</sup> /g	Pore diameter(nm)	Pore volume
TM41-CdS-160	22.55	8.2	0.04
Ti MCM41 (TM 41)	385	3.65	0.35



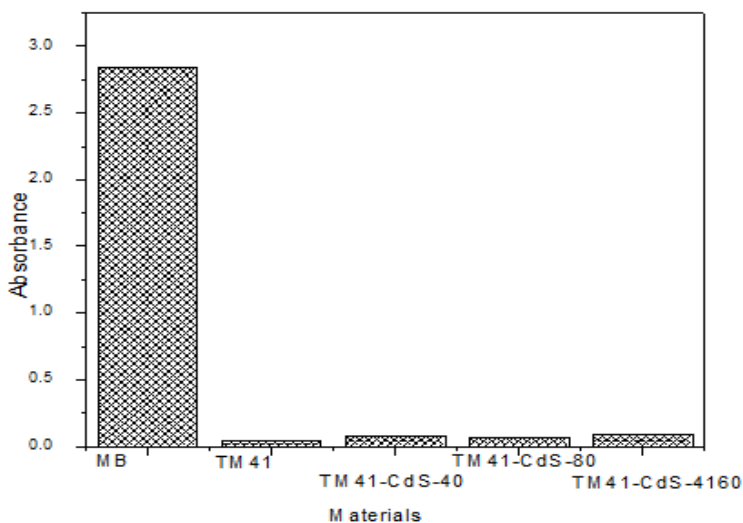
**Fig.5. N<sub>2</sub> isotherms and pore size distribution curve of TM 41 and TM41-CdS-160**

The TM-41 having the surface area 385 cm<sup>-1</sup> showing type IV behaviour with H3 type hysteresis loop have an average pore diameter of 3.65 nm and pore volume 0.35cm<sup>3</sup>g<sup>-1</sup> which was shown in Fig. 5 and in

Table 1. This study indicated that upon modification with the CdS nanoparticle the surface area of the TM -41 has been reduced and is more prominent.

### 3.6 Adsorption studies of dye molecule.

Absorbance corresponding to methylene blue and methylene blue unadsorbed on catalyst materials at same interval of time were shown in Fig.6. The plot corresponding to the absorbance of methylene blue using TM 41 was lower compared to TM41-CdS-40, TM41-CdS 80, TM41-CdS-160) materials. Which, indicated that maximum amount of dye species were adsorbed on TM 41 surface. Upon modification with CdS nanoparticle absorbance of methylene blue was slightly higher compared to TM 41 sample [13].

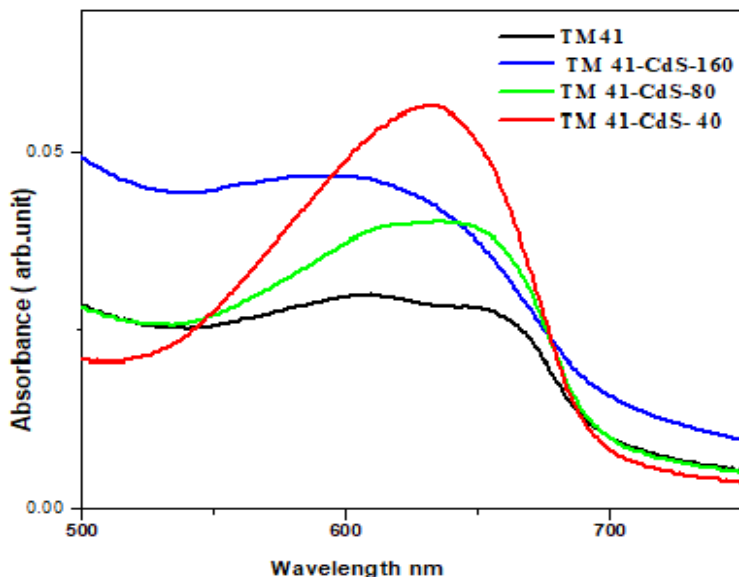


**Fig. 6. Adsorption properties of methylene blue over TM41, TM41-CdS-40, TM41-CdS 80, TM41-CdS-160 respectively**

### 3.7 Photocatalytic degradation studies

UV/ Visible Absorbance spectra corresponding to methylene blue degraded on catalyst materials at same interval of time were shown in Fig. 6. The absorbance of methylene blue corresponding to the  $\lambda_{max}$  was lowered in presence of TM 41 compared to TM41-CdS-40, TM41-CdS 80, TM41-CdS-160 materials which indicated that maximum amount of dye species were degraded by TM41 material by photocatalytic reaction.

Upon treatment with CdS modified materials TM41-CdS-40, TM41-CdS 80, TM41-CdS-160 the absorbance of methylene blue was slightly higher compared to TM41, which also indicated the controlled modification cause degradation of dye molecule on catalyst surface [14].



**Fig.7. Photocatalytic degradation of methylene blue over TM41, TM41-CdS-40, TM41-CdS 80, TM41-CdS-160 respectively**

#### 4. Conclusion

The TM 41 nanomaterial with CdS modification was successfully done by sol-gel process. X ray diffraction analysis indicated that the synthesised material consists of anatase phase  $\text{TiO}_2$ . The UV-Vis DRS spectra of the synthesized material indicated band width intensity increased with increasing concentration of the CdS. From the TEM images, we observed that the  $\text{TiO}_2$  particles are randomly distributed with a particle size of 10-15 nm. From photocatalytic studies it was proved that upon modification with CdS nanoparticle absorbance of methylene blue was slightly higher compared to TM 41. Through the surface area studies we could identify that the textural properties of the material was lowered upon modification with CdS. This work provided an insight to explore various method and their effects on the physico-chemical properties of mesoporous materials.

## **Acknowledgement:**

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**A study on the consumers perception and satisfaction  
towards e-banking facilities with special reference to  
Cherpulassery Municipality**

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**Abstract**

This study investigates consumer perceptions of e-banking services within Cherpulassery Municipality, focusing on satisfaction drivers and user challenges. E-banking, recognized for its flexibility and convenience, allows users to perform transactions and manage accounts anywhere and anytime, eliminating the need for physical branch visits. By analyzing data collected from 60 respondents through a structured questionnaire, this research identifies motivational factors—such as ease of use, security, and institutional trust—that influence e-banking adoption. It also considers demographic variables like age and income, which shape consumer preferences and perceptions of e-banking. Findings highlight critical insights for banks and policymakers looking to improve user experiences and address concerns within this specific locality. Through statistical analysis, including correlation tests, the study identifies relationships among key variables, providing a clearer understanding of customer needs and expectations. These insights are essential for developing strategies that increase user satisfaction, enhance trust, and optimize digital banking services, ultimately benefiting both consumers and financial institutions in the municipality.

## **1. Introduction**

This study highlights how to analyse the perception of consumers using E-Banking. The implementation of financial services, reducing cost and increase in benefit for the consumer to access the transactions based on the samples collected from Cherpulassery Municipality. In order to understand customer perception towards e-banking services, Motivational factors, and also identify the problems faced by customer. For this purpose, a structured questionnaire was developed and a sample of 60 respondents was taken. The customer can take the services of bank 24 hours by seats at home or in office. Then the customer is satisfied with the e-banking services. E-banking, also known as online banking or internet banking, is a service provided by banks that allows customers to access their accounts, conduct transactions, and manage their finances online. With e-banking, Check account balances and transaction history, Pay bills and transfer funds, Deposit checks remotely, Pay credit card bills, Apply for loans and credit cards, Manage investments and accounts, Receive statements and notifications. E-banking offers convenience, flexibility, and time-saving benefits. You can access your accounts from anywhere, at any time, using a computer, tablet, or mobile device with an internet connection. Some common e-banking services include Online banking websites, Mobile banking apps, SMS banking, Internet banking platforms, Digital wallets. E-banking is secure, with banks using advanced security measures like encryption, firewalls, and two-factor authentication to protect your accounts and personal information. E-banking encompasses a wide range of electronic services offered by financial institutions, including but not limited to online banking portals, mobile banking applications, electronic fund transfers, and digital payment platforms. These platforms provide customers with the flexibility to manage their finances anytime, anywhere, without the constraints of traditional banking hours or physical branch locations. 3 E-Banking in simple terms, it does not involve any physical exchange of money, but its all done electronically, from one account to another, using the internet. Electronic banking is latest in the series of technology in the recent times, involving use of internet for delivery of products and services. In India , E-banking services carried out in effective way to satisfy the consumers of

respective banks. In a modern society waiting in a queue and spending time is difficult to the consumers, hence they don't want to waste their time for consumption. The E banking facilities replaced conventional banking system the bank as evolved from cash economy to plastic card economy. The E-Banking facility provide various electronic channels for using banking services such as internet banking, mobile banking, ATM, Electronic Fund Transfer, Credit Card, Debit card etc. E-banking is not a technology but merge of technologies, which plays a vital role in economic development of nation. In the fast-evolving landscape of finance, electronic banking, or e-banking, has emerged as a pivotal aspect of modern banking services. As traditional brick-and-mortar institutions integrate digital platforms into their operations, understanding consumer perception towards these e-banking facilities becomes paramount. This study delves into the intricate dynamics of consumer attitudes, preferences, and behaviours concerning e-banking services. Despite the rapid adoption of e-banking solutions, there exists a spectrum of consumer perceptions that influence their acceptance and utilization. Factors such as perceived ease of use, security concerns, perceived usefulness, and trust in the banking institution play pivotal roles in shaping consumer attitudes towards e-banking facilities. Furthermore, demographic variables such as age, income level, and technological proficiency also contribute significantly to varying consumer perception.

## **2. Significance of The Study:**

This study explores consumer awareness and satisfaction with e-banking services, emphasizing the importance of customer knowledge about available products and services for optimal use. By analyzing perceptions within a specific demographic area, this research provides valuable insights into how consumers engage with digital banking. Findings offer practical implications for banks, policymakers, and researchers in tailoring services to better meet customer needs and expectations. By understanding the factors that influence customer perceptions and satisfaction, stakeholders can make informed decisions to enhance service delivery, drive customer loyalty, and support the growth of e-banking in this region.

### **3. Objectives:**

1. To examine consumer satisfaction relating to e- banking facilities
2. To identify about the problems faced by the customer in using e- banking facilities.

### **4. Methodology:**

The methodological frame work of this study comprised both primary data and secondary data. The primary data contains a field survey with a pre- determined questionnaire. The data collected by taking 60 households from the study area, and the questions are in the line with the objectives of the study. The study also makes use of secondary data. These data has been collected from various sources like Journals and Websites etc. The collected data are analysed and depicted through various statistical tools like tables, diagrams, percentage, and appropriate testing methods. For testing the hypothesis here using correlation. The variables selected for testing hypothesis is scale and categorical variables therefore here using correlation. The collected data are analysed through the statistical package SPSS (version 25)

### **5. Review of Literature**

- **Nalini and Ancly Simi (2019):** This study analyzes customer perceptions and satisfaction with e-banking services, focusing on factors influencing customer decisions to use e-banking. It highlights the importance of customer satisfaction and identifies critical variables like ease of use, accessibility, and security that shape consumer choices.
- **Aravind Sueya R. (2020):** This research examines consumer awareness, perception, and challenges in e-banking services, finding that accessibility and ease of use are primary factors driving adoption. It suggests that banks promote e-banking by addressing networking issues, enhancing accessibility, and creating user-friendly platforms to increase customer satisfaction.

- **Vignaneswari B et al. (2020):** This paper examines client perceptions of e-banking, focusing on the importance of online and mobile banking. The authors suggest that increased awareness among business communities could drive higher acceptance of e-banking and mobile payment options.
- **Prema C. (2013):** This study investigates factors influencing the adoption of internet banking in India, emphasizing the role of marketing in promoting the benefits of e-banking and raising awareness to attract users. Key findings suggest that awareness and perceived usefulness significantly impact adoption rates.
- **Aoreen Akad Mchoma (2018):** Investigating e-banking's impact on customer satisfaction in Tanzania, this study highlights accessibility, convenience, and security as key factors driving customer satisfaction. It suggests that banks invest in technological infrastructure to meet consumer demands and improve financial performance.

## **6. Results and Discussion**

This study aims to examine consumer satisfaction and perceptions regarding e-banking services. E-banking offers convenient, round-the-clock access to a variety of banking functions, allowing customers to manage their finances remotely. By understanding how customers perceive and interact with these digital services, banks can better address consumer needs and enhance service quality. The findings will provide insights into key factors that influence customer satisfaction and inform strategies for improving e-banking experiences.

### **I. To Examine Consumer Satisfaction and Perception Relating To E-Banking Facilities**

H0: There is no significant relation between Benefits and Satisfaction of e-banking for testing this hypothesis here using the correlation analysis

**Table 1**

<b>Correlations</b>			
<b>Satisfaction</b>		<b>Rate the overall satisfaction with e-banking?</b>	<b>Which of the following benefits accrue to you while using e-banking service?</b>
Rate the overall satisfaction with e-banking?	Pearson Correlation	1	.796**
	Sig. (2-tailed)		.000
	N	60	60
Which of the following benefits accrue to you while using e-banking service?	Pearson Correlation	.796**	1
	Sig. (2-tailed)	.000	
	N	60	60
**. Correlation is significant at the 0.01 level (2-tailed).			

**Source:** Computed from primary data

The Pearson correlation analysis reveals a strong positive relationship ( $r = 0.796$ ,  $p < 0.01$ ) between overall satisfaction with e-banking and the perceived benefits of using e-banking services. This significant correlation suggests that as customer satisfaction with e-banking services rises, so does the perceived utility of these services, and vice versa.

This finding has practical implications for e-banking providers, indicating that by enhancing customer satisfaction, they can likely boost the perceived benefits of their services, leading to increased user satisfaction and loyalty. Additionally, to examine the hypothesis that "there is no significant relationship between awareness and convenience of e-banking," correlation analysis will be used.

**Table 2**

<b>Correlations</b>			
<b>Satisfaction</b>		<b>Do you think e-banking would make banking more convenient to you?</b>	<b>Which of the following e-banking services are you aware of?</b>
Do you think e-banking would make banking more convenient to you?	Pearson Correlation	1	.275*
	Sig. (2-tailed)		.033
	N	60	60
Which of the following e-banking services are you aware of?	Pearson Correlation	.275*	1
	Sig. (2-tailed)	.033	
	N	60	60
*. Correlation is significant at the 0.05 level (2-tailed).			

**Source:** Computed from primary data

A positive correlation ( $r = 0.275$ ,  $p = 0.033$ ) exists between awareness of e-banking services and the perception that e-banking enhances convenience. This statistically significant relationship ( $p < 0.05$ ) suggests that as awareness of e-banking grows, so does the perception of its convenience. Financial institutions can leverage this finding by focusing on awareness initiatives to improve convenience perceptions, potentially driving greater adoption of e-banking services. By promoting specific e-banking options that align with convenience, banks can better meet customer expectations and enhance satisfaction.

## **II. To Identify About the Problems Faced by The Customer in Using E-Banking Facilities**

This research aims to identify the challenges that customers encounter when using e-banking services. Despite the convenience and

accessibility offered by digital banking, users may face issues that impact their overall experience and satisfaction. By understanding these specific problems, banks and financial institutions can develop targeted solutions to enhance user experience and address concerns. This research seeks to provide insights into common obstacles in e-banking, helping to shape more user-friendly and reliable digital banking services.

**Table 3**

<b>Problems of E-banking</b>	<b>Frequency</b>	<b>Percent</b>
Hacking	19	31.7
More time taking in fund transfer	3	5.0
Not easy for non educated person	12	20.0
Often transaction Errors	5	8.3
Security risk	16	26.7
Weak password	5	8.3
Total	60	100.0

Source: Computed from primary data

The table outlines the various problems users encounter with e-banking services, highlighting key concerns reported by respondents. Hacking is identified as the most significant issue, affecting 31.7% of users and reflecting widespread anxiety regarding the security of online transactions and personal data. This concern underscores the potential for financial losses and privacy breaches, making it a critical focus for both consumers and financial institutions. Additionally, 26.7% of respondents noted general security risks associated with e-banking, which may include threats like phishing and malware, emphasizing the need for strong security measures and user awareness.

The perceived complexity of e-banking platforms presents a barrier for 20% of respondents, particularly for those less technologically savvy, potentially limiting access to these services. Transaction errors and weak passwords were each identified by 8.3% of

users, raising concerns about the reliability and security of online banking. Finally, 5% of respondents reported issues with longer processing times for fund transfers. Overall, these findings indicate that while e-banking provides convenience, addressing security, usability, reliability, and efficiency challenges is essential to foster greater user trust and adoption.

### **Findings:**

- Consumer perception and satisfaction with e-banking present a complex landscape influenced by factors such as convenience, security concerns, and service quality.
- E-banking is predominantly viewed as highly convenient, allowing users to manage their finances flexibly from anywhere, at any time.
- However, security remains a critical concern, with many consumers worried about the safety of their personal and financial information online.
- Trust in banking institutions is essential, shaped by perceptions of reliability and transparency in addressing security challenges.
- Customer satisfaction is affected by various factors, including the user experience—particularly ease of navigation, responsiveness of customer support, and the cost-effectiveness of services offered.
- Additionally, personalization and innovation in e-banking services are vital satisfaction drivers, as consumers increasingly seek tailored solutions and advanced technology.
- Banks that focus on enhancing security, improving user experience, and fostering continuous innovation are more likely to achieve higher levels of satisfaction and trust among e-banking users in today's digital-centric environment.

### **Conclusion:**

The primary focus of this study is on consumer perception of e-banking facilities within Cherpulassery Municipality. The findings reveal that a significant number of customers actively use e-banking services and express satisfaction with the offerings provided by their banks. Most customers are aware of the various e-banking services available to them. The study highlights that factors such as convenience, speed of

operations, and accessibility positively influence the adoption of ATMs, while security risks negatively impact this adoption. A major concern identified in the survey is the fear of hacking and security breaches, which continues to hinder customer confidence.

The study concludes that while consumers generally view e-banking positively due to its convenience and time-saving benefits, significant concerns about security, service reliability, and technological challenges persist. Recommendations include enhancing security measures, improving user education, and advancing technology to foster greater consumer trust and encourage e-banking adoption.

Furthermore, the analysis underscores the importance of addressing customer pain points, offering organizations valuable insights into improving security protocols, user interface design, and service efficiency to better align with customer needs and expectations.

In summary, the correlation analysis indicates a statistically significant positive relationship between awareness of e-banking services and the belief that these services enhance convenience. The correlation coefficient of 0.275 suggests a moderate relationship, emphasizing the need to increase customer awareness of e-banking options and utilize these services to enhance perceptions of convenience in the digital banking landscape

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### **Participation of Mappila women of Malabar in Anti-Colonial struggles**

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#### **Abstract**

This study examines the socio-political role of Mappila Muslim women in Malabar under British colonial rule, focusing on their historically marginalized yet active contributions to the Indian national movement. Despite early historiography largely overlooking Muslim women's involvement, evidence indicates their engagement in anti-colonial struggles and socio-political activities, challenging prevailing gender norms. Women's studies in Kerala's late twentieth-century academic landscape have highlighted the importance of recognizing women as integral historical participants rather than passive subjects. Over 150 years of colonial rule (1792–1947) reshaped local socio-economic structures, often amplifying patriarchal constraints and limiting women's agency. This research traces the complex interactions between Mappila women and Malabar's agrarian society, revealing how colonialism sparked a nascent political consciousness among them. It reconstructs the neglected history of Mappila women and provides a nuanced perspective on their motivations for participating in nationalist movements and the challenges they faced. By addressing their societal roles and modes of participation, this inquiry contributes to a more inclusive historical narrative, showcasing the bravery and resilience of women in shaping resistance against colonial powers.

**Keywords:** Mappila women, British colonial rule, Malabar region, Socio-political engagement, Anti-colonial struggles

## **Introduction**

Colonialism, characterized by one nation's domination over another, profoundly reshaped India, particularly under British rule. The imposition of Western education, the English language, and new legal frameworks transformed the social, economic, and political landscape. Although some infrastructural and administrative advancements occurred, they were largely overshadowed by exploitation and repression, fostering economic hardships and a racial hierarchy that marginalized many groups, especially women. Despite the introduction of social reforms, such as the abolition of Sati and the promotion of female education, these measures reinforced existing patriarchal structures, deepening women's economic dependency and social constraints.

In Kerala, Mappila Muslim women experienced a distinct socio-cultural environment compared to other Indian Muslim communities. Notable figures like Sir Arthur Lawley and Qadir Husain Khan, commented on the relative freedoms Mappila women enjoyed, including their independence in areas like dressing, divorce and remarriage etc. However, Mappila women's experiences varied based on socio-economic status and education, with social norms limiting their mobility and confining them to domestic roles.

This paper explores the socio-political roles of Mappila women under British rule, highlighting their resilience and agency within the broader independence struggle. By examining their contributions and interactions with colonial structures, the study aims to shed light on the complexities of their legacy during this tumultuous period.

## **The Context of Resistance**

The twentieth century in Malabar witnessed fierce resistance against both British imperialism and the oppressive feudal system, with notable contributions from Muslim women that often remain underrepresented in historical accounts. While men are frequently highlighted in the narrative of anti-colonial uprisings, women played crucial, though indirect, roles in supporting these movements. The Mappila Muslim communities, especially in Eranadu and Valluvanad, saw extensive tenant exploitation under colonial policies, resulting in around eighty recorded peasant uprisings from 1836 to 1900.

Although primarily seen as supportive figures, women were instrumental in sustaining the resistance, providing food, shelter, and moral support to activists and their families, rooted in their familial roles. The courage displayed by figures like Kummath Chirmammu, who defended her home against soldiers, exemplifies women's defiant spirit during this period. Inspired by leaders such as Mahatma Gandhi and Annie Besant, many women became active in political movements, including the 1930 Salt Satyagraha, during which over 500 women were arrested.

The involvement of women, especially Mappila women like Malu Hajjumma and Chakki Paramban Kunjaisha Hajjumma, demonstrates their resilience and commitment to the fight for independence. Recognizing their contributions deepens our understanding of Malabar's anti-colonial struggles, creating a more inclusive and comprehensive historical narrative. Their legacy underscores the necessity of acknowledging women's integral role in the resistance, shaping future generations of social and political activism in Malabar. Let's discuss about some profiles of brave ladies of Malabar.

### **Malu Hajjumma**

Malu Hajjumma, also known as Malu Fatima, was born on July 20, 1873, into a family involved in local resistance, her upbringing in Eranaduthur East was influenced by her father, Paravetti Koyamu Haji. Unlike many women of her time, she received formal education up to the fifth grade, which laid the groundwork for her active participation in socio-political movements. Malu exhibited remarkable courage from an early age, developing a keen interest in horsemanship. Her personal life included several marriages, notably to Kunjahammed Haji, a revolutionary leader. As his partner, she not only supported him personally but also actively participated in the Malabar Rebellion of 1921. Malu was instrumental in organizing Khilafat meetings, galvanizing women from Pantallur and nearby rural areas to join the anti-colonial struggle. Her impassioned speeches inspired resilience and encouraged women to engage in logistical support, even risking their lives for their community.

Beyond her symbolic support, Malu actively participated in the armed struggle, joining her husband in the forests and sustaining injuries during confrontations with colonial forces. After Kunjahammed Haji's execution by the British in 1922, her grief transformed into a commitment to empowering her community through education. She revitalized the Kannath School established by her father, ensuring that children received food and resources, which established her as a respected leader. Malu Hajjumma's contributions included donating land for educational and religious institutions and managing her legal affairs independently, which was exceptional for women of her time. By the time of her death in 1961 at age 88, she was regarded as a "renaissance heroine" among the Mappilas of Malabar. Her legacy continues to inspire, highlighting the often-overlooked roles women played in India's socio-political movements. Her home remains a poignant reminder of her contributions, with ongoing calls for its preservation as a historical site.

### **Chakkiparamban Kunjaayisha Hajjumma**

Born to Paravetti Unni Mammad Haji in Tuvvur, she married Chakkiparamban Moiteenkutty Haji, a key leader in the fight against British colonial rule. Unni Mammad Haji was a prosperous farmer and trader with extensive agricultural land. Her life transformed after marrying Moiteenkutty, who led the Mannarkkad struggle against colonial forces. Despite the constant threat from British soldiers, Kunjaisha supported his activism, even joining him on the pilgrimage to Mecca. Her husband's prominence made her a target for British harassment, enduring brutal interrogations that highlighted her resilience.

Kunjaisha and Moiteenkutty dedicated much of their wealth to supporting revolutionary fighters, sacrificing their resources for the cause. She raised her children with tales of Malabar's resistance, instilling in them bravery and patriotism. Despite facing societal ostracism and constant army harassment, she managed the family and provided refuge for those in need, regardless of caste or religion. Following Moiteenkutty's capture and subsequent death in exile, Kunjaisha continued her commitment to the resistance, donating her land inheritance to support the cause. She passed away in 1926, believed

to be buried at the Karuwarakund Mosque, leaving behind a legacy of courage, sacrifice, and patriotism in the Malabar Rebellion.

### **Mamburam Beevi**

Mamburam Beevi, also known as Mambrath Beevi, was a key figure connected to the resistance against British rule, particularly in the aftermath of the deportation of Mamburam Syed Fadl Poo Koya to Mecca on charges of inciting riots against British exploitation in Ernad and Valluvanad. Syed Fadl Poo Koya's forced departure sparked outrage among the Mappilas, leading to the assassination of the Malabar Collector, Connolly, who orchestrated the exile. This act of retaliation resulted in the arrest of 164 people, including 14 women, some of whom were pregnant and gave birth during their trials. Beevi, the guardian of Mamburam's sacred tomb, played an influential role in the planning of Connolly's assassination. She provided support to the revolutionaries, an action that led to her imprisonment and subsequent deportation to Nellore Jail, where she gave birth while in confinement.

British magistrate Walter Elliot described Beevi as "a person of violent and fanatical disposition" who willingly aided the assassins, reflecting the British officials' animosity toward her. As a result, Beevi received no leniency, unlike the other imprisoned women, and was the only woman to be deported from Malabar due to her involvement in the Connolly case. Despite her reputed family background and societal status as the female head of the Mamburam tomb, Beevi faced severe punishment, marking her as a powerful symbol of resistance and a reminder of the significant role women played in the Malabar resistance.

### **Areepuram Parakkal Kadiyamu**

Areepuram Parakkal Kadiyamu's story is another testament to the courage of Malabar's women. She was a young woman who lost her life in the Malappuram Adhikarathodi massacre while trying to protect her father and husband. Kadiyamu had come to Melmuri with her husband to care for her ailing father, Kunheen Haji, when the British army attacked. Despite repeated attacks with bayonets and being offered chances to escape, Kadiyamu chose to stay and defend her father, who was bedridden. When the soldiers attempted to drag him away,

Kadiyamu shielded her father, clinging to him to prevent the British from taking him. In a brutal display, the soldiers shot and killed Kadiyamu, her father, and her husband. Her courage and sacrifice resonate as a powerful memory among the people of Melmuri, symbolizing the fierce resistance spirit of Mappila women.

These accounts reveal the intensity of anti-imperial sentiment among Mappila women in Malabar. Figures like Mamburam Beevi and Areepuram Parakkal Kadiyamu led by example, inspiring future generations and shaping a legacy of resilience and patriotism among Malabar's people. Their stories underscore the active role of women in the region's resistance history, highlighting the often-overlooked contributions of women who stood unwaveringly against colonial oppression.

### **Ummacha**

Ummacha became a symbol of resistance and sacrifice when she was martyred on her wedding day. The incident took place in Poothupadam village in Cherukav, near Kondoti, where Ummacha had just married Konnakodan Karangat Kuttihassan. Shortly after the Nikah, British forces arrived, searching for a revolutionary named Variyam Kunath. The soldiers surrounded the couple's home, and Kuttihassan bravely stepped outside to confront them. Ummacha followed her husband, but he pushed her back, hoping to protect her. Tragically, Kuttihassan was shot and killed instantly. Seeing this, Ummacha fearlessly charged toward the soldiers. Despite being shot in the leg, she stood up defiantly, challenging them with the words, "Shoot!" She was fatally shot, ending her life on her wedding day. Though they were denied the chance to begin their life together, their legacy endures as a testament to their courage and unyielding spirit in the face of colonial oppression.

### **Koorimannil Parappurath Pathummakutty**

Pathummakutty was another extraordinary figure who provided unwavering support to the resistance movement, risking her life to aid fighters in hiding. The daughter of Valiya Cheko Haji, she offered food and shelter to Variam Kunnath Kunjahammed Haji and approximately 80 freedom fighters despite the severe risks involved. In February 1919,

after a clash at Nenmini where several revolutionaries were killed, Pathummakutty's role became increasingly critical. She welcomed the fighters into her forest-side home in Koorimannil, an act considered treason under British rule, as the authorities patrolled the area heavily.

On December 28, 1921, Kunjahammed Haji and his group reached her home after a secret journey through dense forests, defying British surveillance in the region. Even under the threat of harsh penalties, Pathummakutty, along with her father's close friend Sultan of Nilambur, provided them with food, lodging, and moral support. British officer Hitchcock's descriptions of Pathummakutty's forested homestead highlight its remote location and challenging environment, which she navigated with courage. Pathummakutty raised five children, passing down her bravery and resilience, a legacy now upheld by her descendants. The home she sheltered the fighters in stands as a symbol of her extraordinary defiance and her pivotal role in the resistance.

The bravery displayed by Ummacha and Pathummakutty reflects the spirit of the Mappila women, whose strength and commitment were instrumental in Malabar's anti-colonial struggles. These stories serve as powerful reminders of the role women played in the resistance, shaping a legacy of valor that inspired future generations.

### **Kollaramban Biyathumma Hajjuma**

Kollaramban Biyathumma Hajjuma's encounter with Kunjahammad Haji during his 1899 stay in Makkah highlights her commitment to aiding fellow revolutionaries despite the risks. After Kunjahammad Haji was robbed during his journey from Makkah to Madinah, Biyathumma Hajjuma, who was also in Makkah for Hajj, came forward with financial and moral support to help him continue his journey. Her dedication didn't wane even as the resistance in Malabar intensified. Biyathumma Hajjuma's courage was apparent when she later offered support to Kunjahammad Haji, despite her son being a British officer—a conflict of interests that did not stop her from upholding her values and supporting the cause of freedom.

### **Kottakuth Mathayi Kadeeja**

Mathayi Kadeeja stands out as an inspiring figure of patriotism and resilience. Her unwavering support for the freedom struggle is seen

in her willingness to send her 16-year-old son, Unnikoya, to fight alongside Kunjahammad Haji. When Kunjahammad Haji questioned Unnikoya's young age, Mathayi Kadeeja replied with courage, asserting that age was no barrier in the quest for freedom. She prepared a hearty meal for Unnikoya, understanding that this journey would likely lead to martyrdom. She found solace in her belief that dying for one's native land was a path to divine blessings.

Unnikoya became a loyal bodyguard to Kunjahammad Haji but ultimately sacrificed his life in the struggle, keeping his promise to his mother to serve and protect his people. Mathayi Kadeeja's bravery, as well as her profound faith, left a legacy of patriotism and maternal strength that underscored the crucial role women played in fostering resistance and encouraging the next generation to fight for freedom.

These stories of Biyathumma Hajjamma and Mathayi Kadeeja reflect the resilience and contributions of women in the Malabar resistance, showcasing the dedication with which they supported and inspired revolutionary efforts against British colonial rule.

### **Paravetty Aminakutty**

Aminakutty, the wife of Koyamu Haji, served as a pillar of support and inspiration for her husband, who was a key commander under Chakkiparamban Moiteenkutty Haji, an Eranadan Caliph. She was proud of Koyamu's commitment to liberate their land and protect tenant rights against British rule. Before each journey, she prepared food and provisions, imparting her strength to him with words of encouragement. Aminakutty even expressed her desire to raise future generations of freedom fighters by saying, "I am giving you a Chakara Kutty as a gift to take with you when you go to war," reflecting her vision of passing on the revolutionary spirit to their unborn children. Aminakutty's legacy is underscored by her children, including figures like Malu Hajjamma and Manu Haji, who grew up embodying her fierce patriotism and resistance.

### **Melmuri Keedakaatt Fathima**

Keedakaatt Fathima's story is one of youthful courage and tragedy. On October 25, 1921, at the age of eleven, she faced the British Dorset Regiment's brutality in Malappuram. Despite having the chance

to flee, Fathima chose to remain with her father, Keedakat Moitin, a freedom fighter, when soldiers arrived. When her father was forced outside to be shot, Fathima clung to his leg in defiance, enduring beating and bayonet stabs as she shielded him. Ultimately, she was shot in the chest, her life ending alongside her father's in an act of profound bravery. Both were laid to rest in Adhikarthodi, symbolizing the enduring strength of even the youngest in the resistance.

### **Variyan Kunnath Unnipathu**

Unnipathu, the wife of Moiteenkutty Haji and mother of young Kunjathumma, also faced the harsh consequences of her husband's revolutionary activities. After Moiteenkutty was captured and sentenced to life imprisonment in January 1922, he suffered fatal torture in Kannur Jail. Unnipathu was left to care for their daughter, enduring not only the grief of his death but also repeated harassment and violence from British forces. Her experience underscores the silent sacrifices and enduring struggles faced by the wives of freedom fighters, who bore both the emotional toll and the physical dangers of resistance.

### **Variyankunnath Kadooran Ummuhani**

Ummuhani was a woman of immense resilience and strength, married to the revolutionary leader Variyankunnath Kunjahammad Haji, who led significant resistance against British rule. As the daughter of Katuran Unnimammad, a respected civic leader and businessman from Morayur Pothuvettipara in Malappuram district, Ummuhani came from a background familiar with leadership and resistance.

Her marriage to Kunjahammad Haji subjected her to constant harassment and violence from the British, as she endured interrogations and beatings. Despite her husband's frequent absences due to exile, imprisonment, or his revolutionary commitments, Ummuhani maintained her courage and took care of their four children—Mahmood (Moiteenkutty), Fatimakutty, Aishakutty, and Beerankutty (Biravunni). The stress and hardships, compounded by the tragic loss of her daughter Fatimakutty, eventually took a toll on Ummuhani's health, making her chronically ill. She passed away in 1917, before the peak of the Malabar Rebellion. The strength and sacrifice she displayed continue to serve as an inspiration.

## **Variyankunnath Kadeeja's Daughter, Kunjamina, and Biravunni**

Biravunni, Ummuhani's youngest son, faced brutal persecution from the British due to his association with his father's revolutionary legacy. When Biravunni was only twelve years old, he was imprisoned in Bellary Jail and later transferred to Palayamkota Children's Jail. Though sentenced to death as part of the British policy to eliminate all male members of Kunjahammad Haji's family, he was spared due to his young age and the intervention of a sympathetic British officer.

Biravunni spent most of his youth confined within the jail walls but eventually secured a job there as a warden, thanks to the support of an officer who had witnessed his plight. He married Kunjamina from Shornur and chose to settle in Palayamkot as he built a new life, far from the turmoil of his earlier years. Biravunni's unwavering resilience and perseverance embodied the enduring spirit of his family. As he recounted stories of his father, Kunjamina, often moved to tears, remembered his promise, "Later you will know who I was," a testament to his hope for posthumous recognition.

The prophecy finally found its fulfillment in 2020, when the story of his family's sacrifices came to light, allowing a new generation to honor the legacy of Variyankunnath Kunjahammad Haji and his family's dedication to India's struggle for freedom.

## **Pookottur Women and Their Role in the Malabar Struggle**

The Pookottur Revolution marks a significant chapter in India's freedom struggle, showcasing the courage and sacrifices of the people of Malabar. Around 3,000 fighters, including approximately 400 who perished, bravely fought British forces on Pookottur soil. Remarkably, the role of women in this struggle was profound. Women encouraged their men, sent them off to battle with blessings, food, and even arms, and promised to meet again in the afterlife. They played an active part on the battlefield, and even after death, when bodies were buried, it was discovered that a Mappila woman had disguised herself as a man to fight. This heroism highlighted the commitment of Malabar's women to the cause.

Papatungal Thayumma, for instance, embodied bravery as she sent her two sons to war with food and her blessings, remarking, "We

will get the wages of Shaheed." Women from Melmuri and Pilakale villages faced heavy losses, but they remained unwavering, even burying the dead and caring for the wounded amidst the brutality of the British forces. These women did not bury their men with sadness but with the pride of knowing they were martyrs.

### **Resilience and Strategy and Legacy of Family in the Malabar Movement**

Beyond the battlefield, Malabar women served as key logistical supporters, procuring weapons, delivering food, and passing vital information to the freedom fighters. They sang war songs to inspire the men and were ready to defend their homes with hidden gun holes near entrances for protection against sudden British raids. Women like Chetali Biyumma courageously stood up to the British, even when two of their group were killed. Figures such as Aminakutty (wife of Paravetti Koyamu Haji), Ummhani, Papatur Thayumma, and the Parappuram Kadiumma exemplified the tenacity of women during the Malabar struggle. When British forces came to subdue Malu Hajjumma, it was said that it took an entire army to confront her, showcasing her symbolic and actual strength against the colonizers.

The oral histories collected by local historian PT Shukur provide further insight into the spirit of the Malabar women. He recounts the story of his great-grandmother, Iyyacha, who joyfully prepared a rare feast of chicken curry for her son Cheku before sending him off to fight, a last meal he never had the chance to eat as he rushed to join the battle. Similarly, Shukur's great-uncle Thodiil Marakar, a seasoned fighter, endured 12 years of imprisonment in Bellary Jail, sustained by food sent from his family.

The women of Malabar, while mourning their lost loved ones, remained steadfast in their mission to support the fight for freedom. This deep commitment and resilience extended beyond the battlefield, creating a legacy that still resonates in the collective memory of Malabar today.

### **Conclusion**

The transformative journey of Muslim women in Kerala, particularly in Malabar, has often been overshadowed in historical

narratives. A detailed examination of socio-religious reforms reveals a critical gap, with early writings frequently overlooking the significant roles played by Mappila women. Despite this, evidence of their active participation in socio-political movements is emerging, challenging the mainstream historiography that tends to reflect inherent biases.

The involvement of women in 19th-century rebellions illustrates their crucial role in the fight against colonialism. For instance, the case of Mambrath Beevi, who was arrested while pregnant for her participation in the plot against Colonel Conolly, highlights the bravery and agency of Mappila women. Her subsequent conviction and deportation emphasize the need to recognize women's contributions to resistance efforts.

This overlooked history necessitates further research into the roles of Mappila women, showcasing their activism and resilience. Acknowledging their participation enriches our understanding of Kerala's anti-colonial struggle and emphasizes the importance of including diverse narratives in the study of history. Ultimately, recognizing the agency of these women not only corrects historical oversights but also inspires a more inclusive perspective on the socio-political dynamics of the time.

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# **The impact of digital transformation on the performance of trading companies in the United Arab Emirates: A case study approach**

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### **Abstract**

To maintain a competitive advantage in today's digital landscape, businesses must prioritize digital transformation as a fundamental aspect of their operations. The integration of digital transformation with technologies like artificial intelligence, machine learning, Industry 4.0, social media, cloud computing, and big data analytics is crucial for enhancing customer relationships, improving business processes, generating revenue, and maximizing company value.. It is also seen that the introduction of disruptive technologies may cause threats to the existing strategies of business enterprise and encountered various challenges such as data security issues, lack of control, lack of interoperability in the existing technologies.

This paper aims at why the company undergoes digital transformation and how it affects their business operations. This paper also focuses on major challenges faced by the organization during the process of digital transformation. This study utilized a case study approach focused on Acquosoft Electronic Trading LLC, located in Saudi Arabia and the UAE. A structured questionnaire was employed to gather data from owners, managers, and employees. The analysis included mean, standard deviation, chi-square tests, and t-tests. The findings revealed that digital transformation has a direct impact on company performance across all areas. However, both respondents and the organization faced several challenges during the digital transformation process.

**Keywords:** Digital transformation, Acquosoft Electronical Trading LLC, cloud computing, business process

## **1. Introduction**

Digital transformation is always necessary for every firm to enhance operational efficiency, risk mitigation and achieve sustainability outcomes. Digital transformation is widely implemented across departments such as finance, sales, IT, and human resources. Digital transformation is about survival. It's about unlocking new value and efficiency to stay competitive in an increasingly digital world (Westerman et al., 2019). The main objective of the study is to find out why the organization undergo digital transformation and what are the challenges faced by the organization before implementing the digital transformation and during the process and what they gained after the implementation. Digital transformation is the process of adoption and implementation of digital technology in an organization to modify the existing products, services and operations by the means of translating business process in to a digital format. Digital transformation is a journey, is not a destination Battistoni, et al., 2023). The most successful companies are ones that view digital transformation as a cultural change, not just a technological one (Barrenchea M.J., 2015). Digitalization analysis is commonly called the analysis and interpretation of digital transformation implemented in the firm.

## **2. Review of literature**

Numerous studies have been conducted by researchers on the digital transformation of various industry sectors worldwide. Many of these studies focus on the impact of digital transformation on operational efficiency and the challenges companies face before, during, and after its implementation. Findings indicate that, among three organizational capabilities, only marketing mix capabilities had a direct positive effect on both new product quality and speed to market, while technological capabilities showed no significant direct impact on these aspects of new product competitive advantage (Akroush, M. N., 2012).

Another study found that environmental responsibility leads to financial improvements and enhanced relationships with employees and customers (Nejati et al., 2014). The success of companies mainly

depends on the digital capabilities integrated into all aspects of their operations. Business Process Management (BPM) suggests that enterprises can use an effective BPM as a foundation for digitalization, while developing the necessary digital capabilities over time (Imgrund et al., 2018). By adopting new technologies, firms can drive significant business improvements to remain competitive and cultivate new growth opportunities. The study emphasizes that digital transformation is a crucial undertaking for all organizations, as it has the potential to optimize and reshape established business activities, making it a vital strategy for business development (Stief et al, 2016).

Through a systematic literature review, one of the studies shown that the fundamental concepts in the domain of study are digital technologies, digital business strategy and digital transformation, digital leadership, business models, digital innovation, digital transparency, and digital maturity. There is a key relationship between business strategy and digital transformation strategy. A model is also developed which depicts the interrelationship of all these concepts (Brown, N., & Brown, I., 2019). It has seen that there is a moderate strong demand for digital transformation in the business development. Although the objectives of digital transformation are clear, organizations need to focus on heavily preconditions for successful implementations (Kó et al., 2019). But the traditional companies follow partial implementation of digital environment in the business operations. The study says that nature of digital transformation is only partially covered by conventional frameworks on organizational change (Hanelt et al., 2021).

To attain economies of scale, the companies can use various digital technologies and these digital transformation achieved through digital technologies such as mobile technologies, social media, cloud computing, interest of things, big analytics and artificial intelligence. Now digital transformation managerial actions that include organization-centric activities related to achieving economies of scale (Balakrishnan, R., & Das, S., 2020). The implementation of digital transformation directly is influenced on the firm internationalization and the literature shows that the digital transformation can positively and negatively impact firm internationalization at the individual, firm, and macro levels. Feliciano-Cestero et al., 2023).

According to Nadella. S., 2018 'Digital transformation is not just a technology; it's about reimagining your company. Digital transformation in an organization involves the comprehensive integration of digital technologies to optimize processes enhance customer experiences and drive innovation implementation begins with a strategic assessment of current systems and processes, identifying areas for improvement and innovation. This is followed by selection and deployment of technologies like cloud computing, artificial intelligence and data analytics. It requires a cultural change that embraces innovation and agility. Digital transformation is not about technology, it's about people (Tabrizi et al, 2019). Digital transformation is more about minds than a machine (Leodolter, W., 2017). Digital transformation is the integration of digital technology in to all areas of a business, fundamentally changing how you operate and deliver value to customers (Westerman et al., 2019). Digital transformation is not optional. It's a do-or-die proposition for most firms. It's about staying relevant and competitive in a fast-changing business environment (Day, G. S., & Schoemaker, P. J., 2016). Digital transformation is about using technology to drive business outcomes. It's not just about the technology itself, it's about how leverage it to create value and improve performance (Fenwick, N., & Strategy, R., 2015).

The competitive advancements in digital technologies have promoted the organizations to embrace digital transformations in order to enhance operational efficiency, gain a competitive advantage, and achieve sustainable objectives however the successful adoption of digital technologies necessitates the careful consideration of various factors, such as customer engagement, cost mitigation, sustainable goals, strategic decision making and implementation support. Implementation of digital transformation in an organization is essential for improving operational efficiency and productivity as well as adapting to technological advancements and staying competitive. Nowadays the organization including multinational companies focuses on sustainability and do their business process in an eco-friendly manner. The business landscape is undergoing a rapid and profound shift towards digitalization, compelling organizations to stay competitive and relevant. In this study the researcher tried to focus on the impact of the

digital transformation on the performance of Aqua soft Electrical Trading LLC. The study also made an attempt to find out the primary reasons to undergo digital transformation and the challenges that they faced before the implementation, during the implementation and what they gained after the implementation. To suggest how the firm can carry out it's activities with enhanced efficiency and sustainability the absence of the proper management of company survive in the world. The study will very much helpful to know the before and after effects of digital transformation and whether to know the company is successful or not after the implementation.

### **3. Objectives of the study**

1. To know the impact of digital transformation on the performance of the company with respect to the gender, age, department level of employees, owners and managers.
2. To identify the challenges faced by the departments like finance, sales, IT, HRA before, during and after the implementation process.
3. To examine the benefits gained by the departments like finance, sales, IT, HRA after the implementation of digital transformation.

### **4. Aqua soft Electrical Trading LLC**

Aqua Soft Electrical Trading LLC is a rapidly growing electrical trading company in the Middle East, specializing in high-quality water purification and filtration systems throughout the UAE. They cater to both residential and industrial needs, offering comprehensive services that include the installation and maintenance of RO water filters, RO purifiers, water softeners, custom RO plants, and a variety of electrical and plumbing accessories. The company has introduced digital transformation across all departments to enhance operational performance and has implemented the system effectively.

### **5. Research Methodology**

The study utilized a case study approach, focusing on a detailed analysis of the operational efficiency of Aqua Soft Electrical Trading LLC before and after the implementation of digital transformation. It also employed a descriptive cross-sectional design to illustrate the characteristics of the phenomenon of digital transformation. Primary

data was collected from the owners, managers, and other employees of Aqua Soft Electrical Trading LLC through a structured questionnaire, with 2 owners, 7 managers, and 41 employees participating as respondents.

## 6. Result analysis

**Table 1. Demographic variables of owners and managers**

<b>Variables</b>		<b>Frequency</b>	<b>Percent</b>
<b>Age</b>	Below 25	1	11.1
	25-35	5	55.6
	Above 35	3	33.3
	Total	9	100
	Male	5	55.6
<b>Gender</b>	Female	4	44.4
	Total	9	100
	Owner	2	22.2
<b>Designation</b>	Manager	7	77.8
	Total	9	100
	Finance	1	11.1
	Sales	4	44.4
<b>Department</b>	IT	2	22.2
	HRM	2	22.2
	Total	9	100

Source: Primary data

Table 1 clearly presents the demographic variables of the owners and managers. Among the respondents, 55.6% fall within the age group of 25-35, while 33.3% of respondents belongs to the age group of above 35. . In the case of Gender, 55.6% are male and 44.4% are female. The table also indicates that 77.8% of the respondents are managers, whereas 22.2% are owners. Regarding departmental affiliation, 44.4% of respondents work in the sales department, followed by 22.2% in both the IT and HRM departments.

**Table 2. Demographic variables of employees**

Variables		Frequency	Percent
Age	Below 25	9	22
	25-35	14	34.1
	Above 35	18	43.9
	Total	41	100
Gender	Male	21	51.2
	Female	20	48.8
	Total	41	100
Department	Finance	9	22
	Sales	10	24.4
	IT	16	39
	HRM	6	14.6
	Total	41	100

Source: Primary data

The above table 2 revealed that 43.9% employees belong to the category of above 35 and 34.1% of total employees belong to the age group of 25-35. Additionally, the table indicates a nearly equal distribution of male and female employees.

### 6.1 Impact of digital transformation initiatives on operational performance

**Table 3. Impact of digital transformation initiatives on operational performance**

Descriptive Statistics						
Effects	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Over all understanding of digital initiatives	41	3	5	4.1707	0.44173	0.195
Support of digital transformation initiatives to remote work arrangement	41	3	4	3.1463	0.35784	0.128
Access of HR related task	41	2	4	3.1463	0.61486	0.378

Source: Primary data

The table 3 indicates that the mean value for overall understanding of digital initiatives is 4.17, reflecting a good understanding about digital initiatives. In the case of support for digital transformation initiatives related to remote work arrangements, the mean value is 3.14, suggesting moderate support for remote work. Regarding HR-related tasks, the mean value is also 3.14, indicating that these tasks are fairly easy to access.

## 6.2 Association between gender and department of respondents

*H1: There is an association between gender and department of respondents.*

**Table 4. Chi square test for association between Gender and department**

Gender	Department				Total	Chi square value	p value
	Finance	Sales	IT	HRM			
Male	3	7	9	2	21	3.494	.321
	14.30%	33.30%	42.90%	9.50%	100.00%		
Female	6	3	7	4	20		
	30.00%	15.00%	35.00%	20.00%	100.00%		
<b>Total</b>	9	10	16	6	41		
	22.00%	24.40%	39.00%	14.60%	100.00%		

Source: Survey data, Figures in the parenthesis refer to Row Percentage

Table 4 indicates the Chi square and it evaluates the association between gender and department. With a p-value of 0.321 and 3 degrees of freedom, the result is not statistically significant at the 0.05 significance level. Therefore, the results do not provide strong evidence to reject the null hypothesis of no association between gender and department based on the Pearson analysis. There is a no correlation between the gender of respondents and their respective departments.

## 6.3 Differences in the impact of digital transformation on company performance with respect to the gender of owners and managers

*H2 : There is significant difference in the impact of digital transformation on the performance of the company with respect to the gender of owners and managers.*

**Table 6. Difference in the impact of digital transformation on the performance of the company with respect to the gender of owners and managers**

Effects of Digital transformation	t-test for Equality of Means			H1
	t	df	Sig. (2-tailed)	
Financial and operational benefits	1.619	7	0.150	Not supported
Align with mission and Vision	1.205	7	0.267	Not supported
Improvement in business area	1.29	7	0.238	Not supported
Challenges in workflows	0	7	1.000	Not supported
Awareness level of Employees	0.743	7	0.482	Not supported
Security and privacy concerns	0.14	7	0.893	Not supported
Challenges in leveraging data	1.742	7	0.125	Not supported
Improvement in HR department	1.064	7	0.323	Not supported

Source: Survey data

The table 6 indicates differences in the impact of digital transformation with respect to gender of owners and managers. Since the p-values for all impacts of digital transformation exceed 0.05, the null hypothesis is failed to reject at the 5% significance level for all variables related to these effects, hence H1 is not supported and indicates that there is significant no difference in the impact of digital transformation on the performance of the company with respect to the gender of owners and managers.

### 6.4 Difference in the impact of digital transformation on the performance of the company with respect to the gender of employees

*H3 : There is significant difference in the impact of digital transformation on the performance of the company with respect to the gender of employees.*

**Table 7. Difference in the impact of digital transformation on the performance of the company with respect to the gender of employees**

Effects of digital transformation	t-test for equality of Means			H1
	t	df	Sig. (2-tailed)	
Efficiency in work	2.109	39	0.048	Supported
Advantage after digital implementation	-1.681	39	0.101	Not supported
Change after digital implementation	0.871	39	0.389	Not supported
Effect on inter departmental communication	-1.224	39	0.228	Not supported

Source: Survey data

The table 7 indicates differences in the impact of digital transformation with respect to employee gender. For work efficiency, the T value is 2.109 and the p-value is 0.048, which is less than 0.05, leading to the rejection of the null hypothesis at the 5% significance level with respect to work efficiency. It means that there is no significant difference in how digital transformation affects the company's performance based on employee gender. However, for all other variables related to the effects of digital transformation, H1 is not supported.

## 6.5 Difference in impact of digital transformation on the performance of the company with respect to the department level of employees

*H4: Impact of digital transformation on the operations of company differ based on performance of department level of employees.*

**Table 8. ANOVA for significant difference in the impact of digital transformation on the operations of company with respect to performance of department level of employees**

<b>Effects of digital transformation</b>	<b>F</b>	<b>Sig.</b>	<b>H1</b>
Efficiency in work	0.753	0.527	Not supported
Advantage after digital implementation	1.249	0.306	Not supported
Change after digital implementation	1.275	0.297	Not supported
Effect on inter departmental communication	1.28	0.295	Not supported

Source: Survey data

The table 8 illustrates the differences in the impact of digital transformation with respect to employees' departmental levels. Since the p-values for all impact of digital transformation exceed 0.05, the null hypothesis is failed to reject at the 5% significance level for all variables related to these effects, indicating that H1 is not supported and indicates that The impact of digital transformation on a company's operations does not vary based on the performance levels of employees in different departments.

## 6.6 Difference in impact of digital transformation with respect to age of employees

*H5: Impact of digital transformation on the operations of company differ based on the age of employees.*

**Table 9. ANOVA for significant difference in impact of digital transformation on the operations of company with respect to the age of employees**

<b>Effects of digital transformation</b>	<b>F</b>	<b>Sig.</b>	<b>H1</b>
Efficiency in work	1.238	0.301	Not supported
Advantage after digital implementation	0.604	0.552	Not supported
Change after digital implementation	0.688	0.509	Not supported
Effect on inter departmental communication	1.385	0.263	Not supported
Efficiency in work	0.452	0.64	Not supported

Source: Survey data

From the table it explains the significant difference in impact of digital transformation with respect to age of employees. In the case of all effects of digital transformation, p values are more than 0.05, the null hypothesis is failed to reject at 5% level of significance with regard to all variable of effects of digital transformation, H1 is not supported. Hence, the impact of digital transformation on a company's operations is consistent regardless of the age of employees.

## 6.7 Difference in impact of digital transformation with respect to age of owners and managers

*H6: Impact of digital transformation on the operations of company differs based on the age of owners and managers.*

**Table 10. ANOVA for significant difference in impact of digital transformation on the operations of company with respect to the age of owners and managers**

<b>Effects of digital transformation</b>	<b>F</b>	<b>Sig.</b>	<b>H1</b>
Financial and Operational benefits	1.234	0.356	Not supported
Align with mission and Vision	0.37	0.705	Not supported
Improvement in business area	1.231	0.357	Not supported
Challenges in workflows	0.649	0.556	Not supported
Awareness level of Employees	1.855	0.236	Not supported
Security and privacy concerns	3.864	0.083	Not supported
Challenges in leveraging data	5.333	0.047	Supported
Improvement in HR department	0.108	0.899	Not supported

Source: Survey data

From the table it explains the significant difference in the impact of digital transformation with respect to age of owners and managers. In the case of challenges in leveraging data, the p value is (0.047) is less than 0.05 the null hypothesis is rejected at 5% level of significance with regard to challenges in leveraging data. The impact of digital transformation on a company's operations varies based on the age of owners and managers when it comes to challenges in leveraging data. In the case of all other variable of effects of digital transformation, H1 is not supported.

## 6.8 Difference in impact of digital transformation on the operations of company with respect to the department level of owners and managers

*H7: Impact of digital transformation on the operations of company differ based on the department level of owners and managers*

**Table 11. ANOVA for significant difference in impact of digital transformation on the operations of company with respect to the department level of owners and managers**

<b>Effects of digital transformation</b>	<b>F</b>	<b>Sig.</b>	<b>H1</b>
Financial and Operational benefits	0.694	0.594	Not supported
Align with mission and Vision	0.019	0.996	Not supported
Improvement in business area	0.144	0.929	Not supported
Challenges in workflows	0.385	0.769	Not supported
Awareness level of Employees	1.169	0.409	Not supported
Security and privacy concerns	3.551	0.103	Not supported
Challenges in leveraging data	4.259	0.076	Not supported
Improvement in HR department	0.605	0.64	Not supported

Source: Survey data

From the table 11, it explains the difference in the impact of digital transformation with respect to department level of owners and managers. In the case of all effects of digital transformation, p values are more than 0.05, the null hypothesis is failed to reject at 5% level of

significance with regard to all variable of effects of digital transformation, H1 is not supported and reveals that the impact of digital transformation on a company's operations do not varies depending on the department level of owners and managers.

## **7. Discussions and conclusion**

The purpose of this study is to analyze the impact of digital transformation on the operational performance of a trading company before and after implementation of digital transformation with special to Aquasoft Electrical Trading LLC, United Arab Emirates. The result shows that the firm gained enhanced efficiency, achieve sustainable goals, operational efficiency, financial benefits, risk mitigation after the implementation of the digital transformation. The result shows that firm faced a numerous challenges in the operations before the implementation of digital transformation like time consuming, data migration, paper based workflows, delay in works. These problems can be overcome by the implementation of digital transformation activities like of Quick books, Pay fort, Share point, Cyber security measures, web application fire walls, Oracle HCM Cloud, concord, Microsoft Dynamics in different departments.

To enhance efficiency, mitigate risks, and achieve sustainable goals, organizations should implement digital transformation initiatives. This requires increasing the adoption of digital technologies across various departments, including finance, sales, IT, and HR. Organizations committed to eco-friendly practices can leverage digital technologies to enhance their operations. For instance, firms can use QuickBooks in the finance department to manage financial transactions efficiently. Implementing Oracle HCM Cloud in HR can improve employment processes and self-service capabilities. Additionally, deploying web application firewalls in the sales department can help identify and mitigate security threats.

The firm can implement multi-factor authentication (MFA) in the IT department to provide multiple layers of identification before granting access to critical systems and data. Additionally, introducing

more technologies can strengthen the organization. To enhance operational efficiency and achieve sustainability, it's essential to adopt further digital initiatives. Improving efficiency will lead to higher sales and profitability, and the firm should develop better strategies to stay competitive by embracing new digital technologies.

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### Matroid Theory

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#### **Abstract**

A matroid is a structure that generalizes the properties of Independence. Matroid were introduced by Whitney in 1935 to provide a unifying abstract treatment of dependence in linear Algebra and graph theory. There are several ways to define a Matroid, each relate to the concept of independence. This project will focus on definitions of matroid in terms of Independent sets, circuits, bases and rank function and also discuss about transversal matroids and matroid optimization.

**Keywords:** Matroid, Independent Set, Bases, Rank, Transversals, Greedy Algorithm

#### **Introduction**

Matroid were introduced by Whitney in 1935 to provide a unifying abstract treatment of dependence in linear algebra and graph theory. There are several ways to define a matroid, each relate to the concept of independence. A characteristic of matroid is that they can be defined on many different but equivalent ways. The Theory of matroids originated in Linear Algebra and

Graph Theory and has deep connections with many other areas including Field theory, matching theory, submodular optimization, lie combinatorics and total positivity.

## Preliminaries

### Basic Graph Theory

By a graph  $G(V, E)$  we mean a finite set of vertices  $V$  and a set of edges  $E$ . An edge that joins a vertex to itself is called a loop. Edges that join the same pair of distinct vertices are called parallel edges. A graph with no loops and parallel edges are called simple. A graph  $H$  is a subgraph of a graph  $G$  if  $V(H)$  and  $E(H)$  are subsets of  $V(G)$  and  $E(G)$  respectively. A subgraph  $H$  of  $G$  is called proper if either  $V(H) \neq V(G)$  or  $E(H) \neq E(G)$ . A walk in a graph is a sequence  $v_0 e_1 v_1 e_2 \dots v_{k-1} e_k v_k$  of vertices and edges and each vertex or edge in the sequence, except  $v_k$ , is incident with its successor in the sequence. If the vertices and the edges in the walk are distinct, it is a path.

A graph is closed i.e.,  $v_0 = v_k$  then it is called a cycle. A graph which contains no cycles is called forest or acyclic. A graph is connected if for any  $v, w \in V(G)$  there exists a  $v - w$  path. A connected acyclic graph is a tree.

### Basic Linear Algebra

A non-empty set  $V$  is said to be a vector space over a scalar field  $F$  together with operations, addition and scalar multiplication, if it satisfy the following axioms:

1. If  $\alpha, \beta \in V$ , then  $\alpha + \beta \in V$
2.  $\alpha + \beta = \beta + \alpha$ , for every  $\alpha, \beta \in V$  (commutativity)
3.  $(\alpha + \beta) + \gamma = \alpha + (\beta + \gamma)$  for every  $\alpha, \beta, \gamma \in V$  (associativity)
4. There exists  $0 \in V$  such that  $\alpha + 0 = \alpha$  for every  $\alpha \in V$  (Zero vector)
5. For every  $\alpha \in V$  there exists  $-\alpha \in V$  such that  $\alpha + -\alpha = 0$  (additive identity)
6. If  $c \in F$  and  $\alpha \in V$ , then  $c\alpha \in V$
7.  $c(\alpha + \beta) = c\alpha + c\beta$  for every  $c \in F$  and every  $\alpha, \beta \in V$
8.  $(c_1 + c_2)\alpha = c_1\alpha + c_2\alpha$  for every  $c_1, c_2 \in F$  and every  $\alpha \in V$
9.  $c_1(c_2\alpha) = (c_1c_2)\alpha$  for every  $c_1, c_2 \in F$  and every  $\alpha \in V$
10.  $1\alpha = \alpha$  for every  $\alpha \in V$

Let  $V$  be a vector space over  $F$ , then a linear combination of vectors  $\alpha_1, \alpha_2, \dots, \alpha_n$  in  $V$  is a vector  $\beta = c_1\alpha_1 + c_2\alpha_2 + \dots + c_n\alpha_n$  for some scalars  $c_1, c_2, \dots, c_n$  in  $F$ . The vectors  $\alpha_1, \alpha_2, \dots, \alpha_n$  are said to be linearly independent if  $c_1\alpha_1 + c_2\alpha_2 + \dots + c_n\alpha_n = 0 \Rightarrow c_i = 0 \forall i$ . Otherwise the vectors are said to be linearly dependent. Let  $V$  be a vector space over  $F$ , then the subset  $S = \{\alpha_1, \alpha_2, \dots, \alpha_n\}$  of  $V$  is said to be a spanning set of  $V$  if for any  $\alpha \in V$ ,  $\alpha = c_1\alpha_1 + c_2\alpha_2 + \dots + c_n\alpha_n$  for some scalars  $c_1, c_2, \dots, c_n$  in  $F$ . Let  $V$  be a vector space over  $F$ ,  $S = \{\alpha_1, \alpha_2, \dots, \alpha_n\}$  be a subset of  $V$ , then the Linear span  $L(S)$  of  $S$  is given by  $L(S) = \{\alpha \in V, \alpha = c_1\alpha_1 + c_2\alpha_2 + \dots + c_n\alpha_n, c_i \in F\}$ . A subset  $S$  of a vector space  $V$  over  $F$ , is a basis for  $V$  if it is linearly independent and spans  $V$ .

### Basic Transversal Theory

Let  $E$  be a finite set and  $S = (S_1, S_2, \dots, S_m)$  be a family of non-empty subsets of  $E$ . A transversal of  $S$  is a set of  $m$  distinct elements of  $E$ , one chosen from each of subsets  $S_i$  such that a partial transversal of  $S$  is a Transversal of some subfamily of  $S$ . An equivalent way of graphically representing transversals is through bipartite graph. So the edges of the bipartite graph represent the membership of the elements in  $E$  to the subsets in  $S$ . A matching  $M \subseteq E(G)$  in a graph  $G$  is a set of non-adjacent edges, while we say that  $M$  is a matching of some  $U \subseteq V(G)$  if every vertex in  $U$  is an end-vertex of an edge in  $M$ . We can see that any matching in a bipartite graph of a set system corresponds to a partial transversal, and any matching of  $S$  corresponds to a transversal.

### Independent Sets And Circuits

#### Independent Sets

A matroid  $M$  is an ordered pair  $(E, I)$  consisting of a finite set  $E$  and a collection  $I$  of subsets of  $E$  having the following three properties:

(I1)  $\phi \in I$

(I2) If  $I_1 \in I$  and  $I_2 \subseteq I_1$  then  $I_2 \in I$

(I3) If  $I_1, I_2 \in I$  and  $|I_1| > |I_2|$  then there exist  $i \in I_1 - I_2$  such that  $I_2 \cup \{i\} \in I$ .

The members of  $I$  are the independent sets of  $M$  and  $E$  is the ground set of  $M$ . A subset of  $E$  that is not in  $I$  is called dependent.

## Proposition

Let  $E$  be the set of column labels of an  $m \times n$  matrix  $A$  over a field  $F$  and let  $I$  be the set of subsets  $X$  of  $E$  for which the multiset of columns labelled by  $X$  is a set and is linearly independent in the vector space  $V(m, F)$ . Then  $(E, I)$  is a matroid.

## Example

Let  $A$  be the following matrix over the field  $R$  of real numbers

$$\begin{pmatrix} 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 0 & 1 \end{pmatrix}$$

If we denote the columns as 1, 2, 3, 4, 5 in order, then  $E = \{1, 2, 3, 4, 5\}$  and

$$I = \{\emptyset, \{1\}, \{2\}, \{4\}, \{5\}, \{1, 2\}, \{1, 5\}, \{2, 4\}, \{2, 5\}, \{4, 5\}\}$$

Thus the dependent sets of this matroid is,

$$\{\{3\}, \{1, 3\}, \{1, 4\}, \{2, 3\}, \{3, 4\}, \{3, 5\}\} \cup \{X \subseteq E : |X| \geq 3\}$$

## Circuits

A circuit in a matroid  $M$  is a minimal dependent set i.e., A dependent set whose proper subsets are all independent.

We shall denote the set of circuits of  $M$  by  $C$  or  $C(M)$ . Once  $I$  has been specified,  $C$  can be determined and vice versa. The members of  $I$  are those subsets of  $E$  that contains no member of  $C$ .

Thus a matroid is uniquely determined by its set  $C$  of circuits.

Clearly

$$(C1) \emptyset \notin C$$

$$(C2) \text{ If } C_1 \text{ and } C_2 \text{ are members of } C \text{ and } C_1 \subseteq C_2 \text{ then } C_1 = C_2$$

(C3) If  $C_1$  and  $C_2$  are distinct members of  $C$  and  $e \in C_1 \cap C_2$  then there is a member  $C_3$  of  $C$  such that  $C_3 \subseteq (C_1 \cup C_2) - e$ .

## Theorem

Let  $E$  be a set and  $C$  be a collection of subsets of  $E$  satisfying (C1)-(C3). Let  $I$  be the collection of subsets of  $E$  that contain no member of  $C$ . Then  $(E, I)$  is a matroid having  $C$  as its collection of circuits.

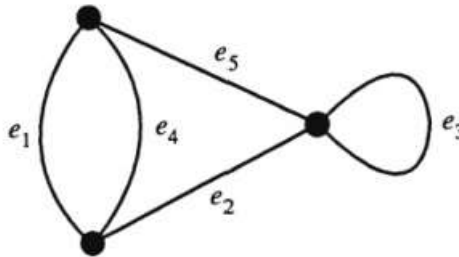
**Proposition**

Let  $E$  be the set of edges of a graph  $G$  and  $C$  be the set of edge cycles of  $G$ . Then  $C$  is the set of circuits of a matroid on  $E$ .

**Example**

Let  $G$  be the graph shown below and let  $M = M(G), E(M) = \{e_1, e_2, e_3, e_4, e_5\}$  and  $C = \{\{e_3\}, \{e_1, e_4\}, \{e_1, e_2, e_5\}, \{e_4, e_2, e_5\}\}$ .

Comparing  $M$  with the matroid  $M[A]$  in the first example, we see that under the bijection  $\psi$  from  $\{1, 2, 3, 4, 5\}$  to  $\{e_1, e_2, e_3, e_4, e_5\}$  defined by  $\psi(i) = e_i$ , a set  $X$  is a circuit in  $M[A]$  if and only if  $\psi(x)$  is a circuit in  $M$ . Equivalently, a set  $Y$  is independent in  $M[A]$  and  $M$  have the same structure or are isomorphic.



Matroid that is isomorphic to the cycle matroid of a graph is called graphic matroid.

Formally two matroids  $M_1$  and  $M_2$  are isomorphic, written  $M_1 \cong M_2$  if there is a bijection  $\psi$  from  $E(M_1)$  to  $E(M_2)$  such that, for all  $X \subseteq E(M_1)$ , the set  $\psi(X)$  is independent in  $M_2$  if and only if  $X$  is independent in  $M_1$ .

We call such a bijection  $\psi$  an isomorphism from  $M_1$  to  $M_2$ .

**Bases And Rank**

**Bases**

A basis or a base of  $M$  is the maximal independent set in  $M$ . If  $M$  is a matroid and  $B$  is its collection of bases, then

(B1)  $B$  is non-empty.

(B2) If  $B_1$  and  $B_2$  are members of  $B$  and  $x \in B_1 - B_2$ , then there is an element  $y$  of  $B_2 - B_1$ ;  $(B_1 - x) \cup y \in B$ . (Basis exchange axiom)

**Lemma :** All the members of  $B$  have the same cardinality.

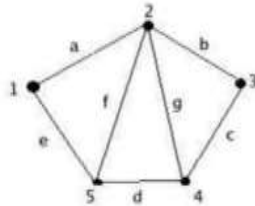
**Theorem**

Let  $E$  be a set and  $B$  be a collection of subsets of  $E$  satisfying (B1) and (B2). Let  $I$  be the collection of subsets of  $E$  that are contained in some member of  $B$ . Then  $(E, I)$  is a matroid having  $B$  as its collection of bases.

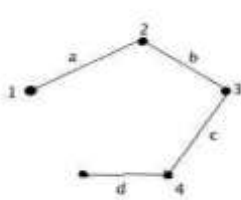
**Corollary :** Let  $B$  be a basis of a matroid  $M$ . If  $e \in E(M) - B$ , then  $B \cup e$  contains a unique circuit  $C(e, B)$ .

**Example**

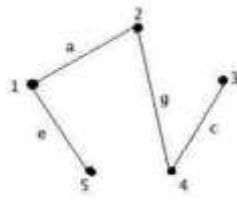
For graphic matroids, we will take the base of our matroid to be a spanning tree of graph  $G$ . Let  $G$  be the graph shown below



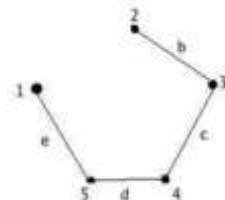
Then the bases are,  $\{a, b, c, d\}$ ,  $\{a, e, d, c\}$ ,  $\{b, c, d, e\}$ ,  $\{b, a, d, e\}$ ,  $\{c, b, a, e\}$ ,  $\{c, b, f, e\}$ ,  $\{c, d, f, a\}$ ,  $\{c, g, a, e\}$ ,  $\{c, g, f, e\}$ . Clearly (B1) is satisfied. We can now demonstrate (B2); If we choose  $B_1 = \{a, b, c, d\}$  and  $B_2 = \{c, g, a, e\}$ , then we can see the spanning trees of  $B_1$  and  $B_2$  in the following figures. Each spanning tree has 5 vertices and 4 edges. We can demonstrate (B2) by removing an element  $\{a\}$  from  $B_1$  and then there exist an element in  $B_2$  such that a new base is created,  $B_3 = (B_1 \setminus \{a\}) \cup \{e\}$ . Figure 3.3 shows the new base  $B_2$



3.1 Spanning Tree of  $B_1$



3.2 Spanning Tree of  $B_2$



3.3 Spanning Tree of  $B_3$

## Rank

We begin by defining a fundamental and very natural matroid construction. Let  $M$  be the matroid  $(E, I)$  and suppose that  $X \subseteq E$ . Let  $I|X$  be  $\{I \subseteq X : I \in I\}$ . Then the pair  $(X, I|X)$  is a matroid. We call this matroid the restriction of  $M$  to  $X$  or the deletion of  $E - X$  from  $M$ . It is denoted by  $M|X$  or  $M|(E - X)$ .

## Definition

Rank  $r(X)$  of  $X$  to be the cardinality of a basis  $B$  of  $M|X$  and call such a set  $B$  a basis of  $X$ . Clearly the function  $r$ , the rank function of  $M$ , maps  $2^E$  into the set of non negative integers.

$r$  has the following properties:

(R1) If  $X \subseteq Y$ , then  $0 \leq r(X) \leq |X|$

(R2) If  $X \subseteq Y \subseteq E$ , then  $r(X) \leq r(Y)$ .

(R3) If  $X$  and  $Y$  are subsets of  $E$ , then  $r(X \cup Y) + r(X \cap Y) \leq r(X) + r(Y)$

## Lemma

Let  $E$  be a set and  $r$  be a function on  $2^E$  satisfying (R2) and (R3). If  $X$  and  $Y$  are subsets of  $E$  such that  $r(X \cup Y) = r(X)$  for all  $y$  in  $Y - X$ , then  $r(X \cup Y) = r(X)$ .

## Theorem

Let  $E$  be a set and  $r$  be a function that maps  $2^E$  into the set of non-negative integers and satisfies (R1)-(R3). Let  $I$  be the collection of subsets  $X$  of  $E$  for which  $r(X) = |X|$ . Then  $(E, I)$  is a matroid having rank function  $r$ .

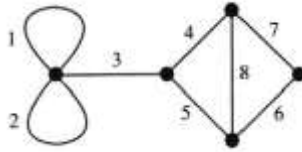
## Remark

Let  $M = M(G)$  where  $G$  is connected graph. Then a basis of  $M(G)$  is the set of edges of a spanning tree of  $G$ . It is well known that for a tree  $T$ ,  $|V(T)| = |E(T)| + 1$ .

Hence,  $r(M) = |V(G)| - 1$

### Example

Let  $M = M(G)$  where  $G$  is the graph shown below. Then as  $G$  is connected



$$R(M) = |V(G)| - 1 = 4$$

If  $X = \{4, 5, 6, 7, 8\}$ , then a basis for  $M|X$  is  $\{4, 5, 6\}$ , so

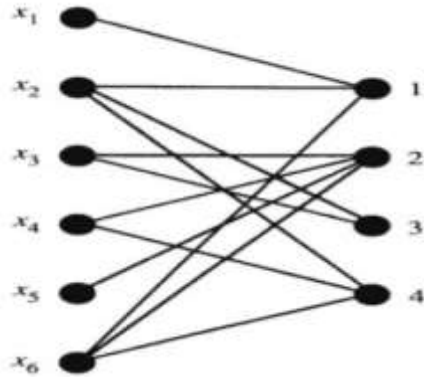
$$r(\{4, 5, 6, 7, 8\}) = 3$$

### Transversal Matroids

For a finite set  $S$ , a family of subsets of  $S$  is a finite sequence  $(A_1, A_2, \dots, A_m)$  such that  $A_j \subseteq S$  for all  $j$  in  $\{1, 2, \dots, m\}$ . Note that the terms of this sequence, the members of the family, need not be distinct. If  $J = \{1, 2, \dots, m\}$ , we shall frequently abbreviate  $\{A_1, A_2, \dots, A_m\}$  as  $(A_j: j \in J)$ . A transversal or system of distinct representatives of  $\{A_1, A_2, \dots, A_m\}$  is a subset  $\{e_1, e_2, \dots, e_m\}$  of  $S$  such that  $e_j \in A_j$ . For all  $j$  in  $J$ , and  $e_1, e_2, \dots, e_m$  are distinct. Equivalently,  $T$  is a transversal of  $(A_j: j \in J)$  if there is a bijection  $\psi: J \rightarrow T$  such that  $\psi(j) \in A_j$  for all  $j$  in  $J$ . If  $X \subseteq S$ , then  $X$  is a partial transversal of  $(A_j: j \in J)$  if  $X$  is a transversal of  $(A_j: j \in K)$  for some subset  $K$  of  $J$ . In the special case that  $(A_1, A_2, \dots, A_m)$  is a partition  $\pi$  of  $S$ , the set of partial transversals of  $A$  coincides with the set of independent sets of the partition Matroid  $M_\pi$ . The main result we are discussing in this chapter is that, for all families  $A$  of subsets of  $S$ , the set of all partial transversals of  $A$  is the set of independent sets of a matroid on  $S$ . Another way to view partial transversals uses the idea of a matching in a bipartite graph.

### Example

Let  $S = \{x_1, x_2, \dots, x_6\}$  and  $A = \{A_1, A_2, A_3, A_4\}$  where  $A_1 = \{x_1, x_2, x_6\}$ ,  $A_2 = \{x_3, x_4, x_5, x_6\}$ ,  $A_3 = \{x_2, x_3\}$ , and  $A_4 = \{x_2, x_4, x_6\}$ . Then the bipartite graph  $\Delta[A]$  is as shown in Figure.



The set  $\{x_1, x_2, x_3, x_4\}$  is a transversal of  $A$ . To check this, one needs only check that  $\{x_1 1, x_4 2, x_3 3, x_2 4\}$  is a matching in  $\Delta[A]$ . Similarly as,  $\{x_6 1, x_2 3, x_4 3\}$  is a matching in  $\Delta[A]$  the set  $\{x_6, x_2, x_4\}$  is a partial transversal of  $A$ . Clearly  $A$  has many other partial transversals.

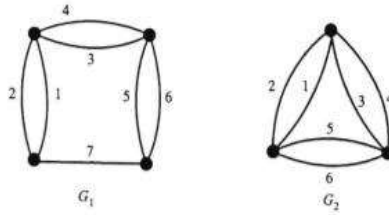
**Theorem**

Let  $A$  be a family  $\{A_1, A_2, \dots, A_m\}$  of subsets of a set  $S$ . Let  $I$  be the set of partial transversals of  $A$ . Then  $I$  is the collection of independent sets of a matroid on  $S$ .

**Example**

Let  $G_1$  and  $G_2$  be the graphs shown below. Let  $A_1 = \{1, 2, 7\}$   $A_2 = \{3, 4, 7\}$  and  $A_3 = \{5, 6, 7\}$ . Then, for  $A = (A_1, A_2, A_3)$  and  $S = \{1, 2, \dots, 7\}$ , then  $M[A] = M(G_1)$ .

In contrast,  $M(G_2)$  is not transversal. To show this, assume that  $M(G_2) = M[A']$  for some family  $A'$  of subsets of  $\{1, 2, 3, 4, 5, 6\}$ . As  $\{1\}$  and  $\{2\}$  are independent but  $\{1, 2\}$  is dependent, there is a unique member, say  $A_1'$  of  $A'$  meeting  $\{1, 2\}$ . Moreover,  $A_1'$  contains both 1 and 2. Similarly,  $A'$  has a unique member  $A_2'$  meeting  $\{3, 4\}$  and a unique member  $A_3'$  meeting  $\{5, 6\}$  and these members contain  $\{3, 4\}$  and  $\{5, 6\}$  respectively. As  $\{1, 3\}$ ,  $\{1, 5\}$  and  $\{3, 5\}$  must be partial transversals of  $A'$ , the sets  $A_1', A_2'$  and  $A_3'$  are distinct. This implies that  $\{1, 3, 5\}$  is a partial transversal of  $A'$ ; a contradiction. We conclude that  $M(G_2)$  is indeed non-transversal.



## Greedy Algorithm

Let  $G$  be a connected graph and let  $w$  be a function from  $E(G)$  into  $R$ . We call  $w$  a weight function on  $G$  and, for all  $X \subseteq E(G)$ , we define the weight  $w(X)$  of  $X$  to be  $\sum_{x \in X} w(x)$ .

The greedy algorithm for the pair  $(I, w)$  proceeds as follows:

1. Set  $X_0 = \phi$  and  $j = 0$
2. If  $E - X_j$  contains an element  $e$  such that  $X_j \cup e \in I$  choose such an element  $e_{j+1}$  of maximum weight, let  $X_{j+1} = X_j \cup e_{j+1}$  and go to (3)  
Otherwise, let  $B_G = X_j$  and go to (4).
3. Add 1 to  $j$  and go to (2).
4. Stop

## Theorem

Let  $I$  be a collection of subsets of a set  $E$ . Then  $(E, I)$  is a matroid if and only if  $I$  has the following properties:

(I1)  $\phi \in I$

(I2) If  $I \in I$  and  $I' \subseteq I$ , then  $I' \in I$ .

(G) For all weight functions  $w : E \rightarrow R$  the greedy algorithm produces a maximal member of  $I$  of maximum weight.

## Conclusion

The theory of matroids has its origins in graph theory and linear algebra, and its most successful applications in the past have been in the areas of combinatorial optimization and network theory.

Recently, however, there has been a flurry of new applications of this theory in the fields of information and coding theory. Its applications extend to diverse fields such as computer science, operation research, electrical engineering and more.

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### **MCM 41 supported perchloric acid catalytic system: A Versatile and Recyclable Heterogeneous Catalyst for Solvent-Free Green Synthesis of Novel 1,4-Dihydropyrano[2,3-c]pyrazole Heterocycle and Its Molecular Docking Studies**

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#### **Abstract**

Herein, we synthesized novel 1,4-Dihydropyrano[2,3-c]pyrazole heterocycle using a solvent-free approach with recyclable MCM 41 supported perchloric acid catalytic system. The reaction was carried out via multi-component one pot synthesis involving 1,3- Dimethyl barbituric acid, 4-Dimethyl amino benzaldehyde, acetoacetic ester and hydrazine hydrate at room temperature. MCM 41 supported perchloric acid catalytic system was known for its high catalytic activity compared to conventional heterogeneous catalysts, potentially reducing energy consumption and raw material usage in various chemical processes. The synthesized novel compound was characterized using <sup>1</sup>HNMR and FT- IR spectroscopic techniques. The biological significance of the newly synthesized compound was further validated through in silico docking studies. Computational analyses were conducted using software such as Auto Dock Vina, Discovery Studio, and Open Babel etc. This research highlights the synthesis of a pyrazole derivative via an environmentally sustainable approach, employing a recyclable catalyst. This work not only contributes to the field of medicinal chemistry but also adheres to the principles of green chemistry. Additionally, the docking studies demonstrated that the novel heterocyclic framework exhibits potential as an antimicrobial agent.

**Keywords:** Solvent free reaction, MCM 41 supported perchloric acid, Molecular docking, Pyrazole derivatives, Conventional synthesis.

## Introduction

Green chemistry and methodologies possess several advantages in organic synthesis over conventional methods of synthesis [1, 2]. Adopting the principles of green chemistry help the chemists in designing environment safer products thereby simplifying the conventional operational procedures [3]. Nowadays solvent less reactions are getting much attention in the sense of green chemistry as they are efficient and economical way for organic synthesis [4]. Acidic composites frequently have superior mechanical qualities, such as greater strength, hardness, and toughness and hence they are widely used as catalysts in organic synthesis [5]. Pyranopyrazoles are referred to as a fused five membered pyrazole ring with a six member pyrano ring. They are even more relevant at the study level because of their high pharmacological prominence and due to several activities of the heterocyclic core [6]. In the past decade, there has been a notable spike in interest surrounding pyrazole chemistry due to the invention of various exciting properties exhibited by numerous derivatives of pyrazole. Pyrazoles, hold significant importance in organic synthesis and are extensively studied within the azole family. Pyranopyrazoles are gaining much attention among chemists due to widespread synthetic utilities and potential biological activities such as anti-cancer, anti-bacterial, analgesic properties and also have acted as insecticidal [7]. A wide range of synthesis methods and synthetic analogs have been documented over the years, emphasizing their relevance in both research and practical applications [8]. Significant advancements have been made in the synthesis of diverse and biologically significant pyrano [2, 3-c] pyrazole derivatives using environmentally friendly methods. These advancements include the use of energy-efficient techniques like microwave and ultrasound-assisted synthesis, as well as the employment of benign catalysts and biodegradable composites [9]. To the best of our knowledge, we are the first to report the synthesis of a novel 1,4-Dihydropyran[2,3-c]pyrazole heterocycle using a recyclable and reusable MCM-41-supported perchloric acid catalytic system under

solvent-free conditions. This work details the green synthesis, characterization, and molecular docking studies of the newly synthesized compound.

## **Experimental**

### **General:**

The reagents such as 4-Dimethylamino benzaldehyde, 1, 3-Dimethyl barbituric acid, methanol, hydrazine hydrate, ethanol and acetoacetic ester were purchased from commercial sources. The reaction was monitored using thin layer chromatography (TLC) on glass plates coated with silica gel-G using chloroform and methanol as mobile phases and visualized by iodine vapors. <sup>1</sup>H NMR spectra of compounds were found with the help of VARIAN 400 MHZ NMR spectrometer. IR spectrum of the compound was recorded using Shimadzu Spirit FT- IR spectrometer. The values of chemical shifts are quoted in delta scale in ppm relative to tetramethylsilane (TMS) as an internal standard and DMSO D<sub>6</sub> as solvent system.

### **General Procedure for Synthesis of Pyrazole Heterocycles under Conventional method:**

Hydrazine hydrate (3.35 mmol) and acetoacetic ester (3.35 mmol) were added to the mixture of 4-Dimethylamino benzaldehyde (3.35 mmol) and 1,3-Dimethylbarbituric acid (3.35 mmol) taken in a RB flask and stirred at room temperature using a magnetic stirrer after 10 ml of methanol (solvent) was added. To this PTS catalyst was added. A suction pump was used to filter the precipitate that had developed once the reaction was finished, as determined by TLC. After being collected, the product was cleaned. This is followed by recrystallization using chloroform -methanol mixture.

### **General procedure for the synthesis of pyrazole heterocycles under solvent- free conditions using recyclable and reusable MCM 41 supported perchloric acid catalytic system:**

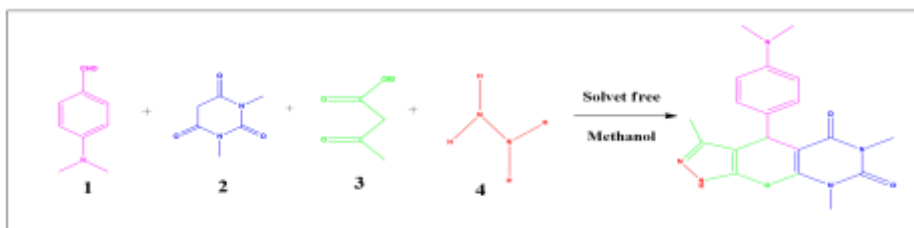
MCM 41 supported perchloric acid catalytic system (150 mg) was added to a combination of Hydrazine hydrate (3.35 mmol), Acetoacetic ester (3.35 mmol), 4-Dimethylamino benzaldehyde (3.35 mmol) and 1,3 Dimethyl barbituricacid (3.35 mmol).

The reaction mixture was placed in a mortar and continuously ground with a pestle at room temperature. Following the reaction's completion (as shown by TLC), the product was separated by dissolving it in a mixture of chloroform and methanol, and the residue contains a catalyst. The filtrate is recrystallized after the undissolved catalyst was removed through filtering.

### **General procedure for the recycling and reusing of MCM 41 supported perchloric acid catalytic system for the synthesis of pyrazoles under solventless conditions:**

Hydrazine hydrate (3.35 mmoles), Acetoacetic ester (3.35 mmoles), 4-Dimethylaminobenzaldehyde (3.35 mmol) and 1, 3 Dimethyl barbituric acid (3.35 mmol) were allowed to react together. At room temperature, the reaction mixture was placed in a mortar and continuously ground with a pestle. Following the reaction's completion, which was observed by TLC, a recycling analysis was carried out by adding ethyl acetate to the reaction mixture. The resulting catalyst, which is insoluble in ethyl acetate, was dried and cleaned using methanol before being utilized in the subsequent catalytic cycle. The yield of the product was used to calculate the reusability and recyclable nature of catalyst.

### **Results and discussion**



**Scheme 1: Scheme for the synthesis of pyranopyrazole derivatives.**

### Optimization of reaction conditions:

#### Comparative study of conventional and solvent-free methodologies

In the current study, when the reaction was carried out in conventional method using PTS as catalyst, it took 40-45 hrs for its completion while in solvent free method the reaction completed within 1-3 minutes using MCM 41 supported perchloric acid catalytic system in very high yields (82%) (Table 1).

**Table 1: Comparative study of conventional and solvent-free methodologies.**

Sl. No.	Products	Conventional Methods		Solvent-free Methods	
		Time (hrs)	Yield (%)	Time (min)	Yield (%)
1	Pyrazole derivative	48	62	3 min	82

#### Recyclability and reusability study of MCM 41 supported perchloric acid catalytic system

The MCM 41 supported perchloric acid catalytic system demonstrated recyclability for up to four cycles with minimal loss in catalytic activity. The reaction completed within 3 minutes in the initial cycle, with complete catalyst recovery upon filtration and methanol/ethyl acetate washing. Subsequent cycles yielded similar outcomes. However, by the fifth cycle, reduced yield and increased reaction time were observed, suggesting a decline in catalytic activity, possibly due to catalyst activity reduction.

**Table 2: Recyclability Data.**

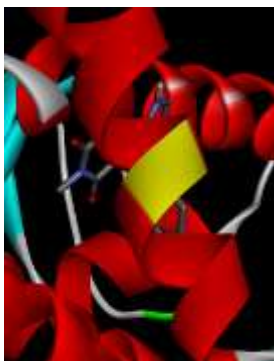
Entry	Reaction cycle	Time	Yield (%)
1	1 <sup>st</sup> cycle	3 min	82
2	2 <sup>nd</sup> cycle	3 min	82
3	3 <sup>rd</sup> cycle	3 min	82
4	4 <sup>th</sup> cycle	5 min	73

## ***In silico* Docking results**

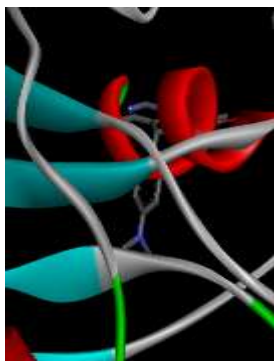
**Table 3: Docking scores**

<b>Protein</b>	<b>Binding affinity</b>
6uex	-8.6
6sbn	-7.7
1ex9	-5.4
5wze	-9.4
3jzz	-6.5
3h78	-7.5
2zco	-8.7
1t2p	-3.1
2w38	-3.0

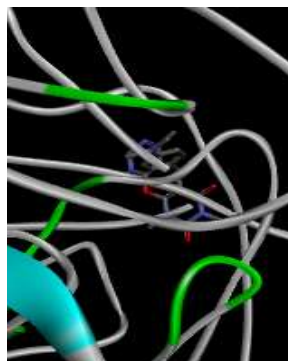
### **Docking scores:**



6uex

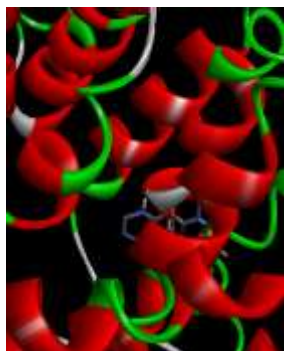


6sbn

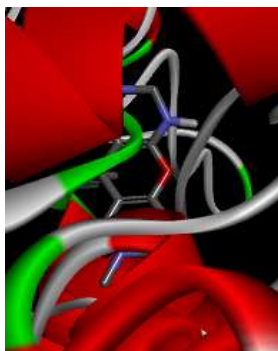


1t2p

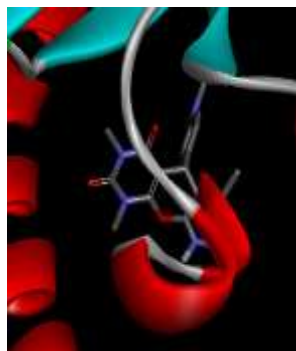
### **3D Diagrams**



2w38

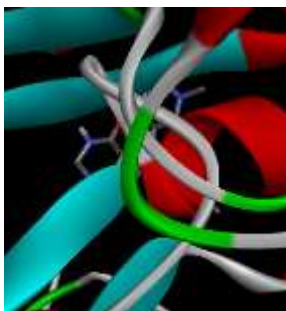


5wze

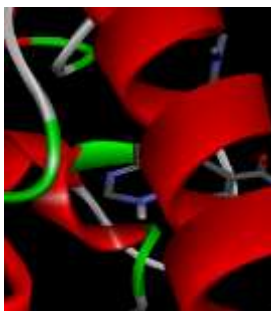


3jzz

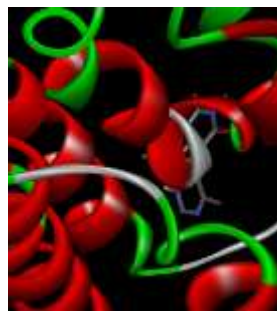
## 2D Diagrams



3h78



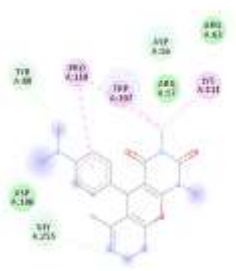
1ex9



2zco



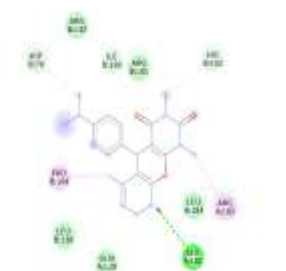
6uex



6sbn



1t2p



3h78



1ex9



2zco



2w38



5wze



3jzz

Based on the docking scores, we conclude that the protein 5WZE shows the strongest binding affinity for our synthesized pyrazoles, suggesting that these compounds possess enhanced antibacterial and anti-pathogenic properties. Following 5WZE, the next highest binding affinities were observed with the proteins 2ZCO, 6UEX, 6SBN, 3H78, 3JZZ, 1EX9, 1T2P, and 2W38, respectively.

## Conclusion

In summary, we have developed an efficient and environmentally friendly method for synthesizing pyrazoles from 1,3-Dimethylbarbituric acid, 4-Dimethylaminobenzaldehyde, acetoacetic ester, and hydrazine hydrate. This reaction was conducted using a recyclable and reusable MCM-41-supported perchloric acid catalytic system in a one-pot, three-component reaction under solvent-free conditions. The protocol is distinguished by its minimal environmental impact, mild reaction parameters, and straightforward experimental procedures. This green synthesis method outperforms conventional approaches in terms of reaction efficiency, yield, and simplicity. Key features include solvent-free conditions, the use of non-contaminating renewable catalysts, rapid reaction times, and ease of execution, enhancing its applicability for preparing various pyrazole derivatives. We have also conducted molecular docking studies on newly synthesized compounds, a modern strategy for identifying both the structural and biological properties of these compounds through virtual screening. Our molecular docking studies demonstrated that the novel heterocyclic framework exhibits promising potential as an antimicrobial agent. This research represents a significant contribution to the fields of medicinal chemistry and green chemistry.

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**A Study on Cashless Economy With Special Reference To  
Malappuram Municipality**

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**Abstract**

This study explores the cashless economy in Malappuram Municipality, focusing on residents' attitudes and the challenges they encounter with digital transactions. Through a structured survey, the research assesses the acceptance of cashless payment methods and identifies key concerns impacting their adoption. Findings reveal a growing willingness to engage in cashless transactions; however, significant barriers persist. Issues such as inefficient banking systems, unreliable internet connectivity, and security apprehensions emerged as major deterrents. Additionally, some respondents expressed a preference for traditional payment methods, citing a lack of trust in digital platforms. The study underscores the need for enhanced infrastructure and education to address these challenges and foster a more inclusive cashless economy. By understanding local attitudes and obstacles, stakeholders can develop strategies to promote effective digital payment solutions that meet the needs of the community, ultimately contributing to a smoother transition toward a cashless society in Malappuram.

**KeyWords:** Cashless Economy, Malappuram, Digital Transactions, User Attitudes Transaction Challenges

## **1. Introduction**

A cashless economy refers to an economic system with minimal cash circulation, where transactions are primarily conducted through electronic means such as credit and debit cards, e-banking, and mobile payments. This evolution from traditional credit cards and online banking to modern mobile payment systems has been significantly accelerated by advancements in technology and the COVID-19 pandemic. The future of cashless transactions envisions seamless digital payments, enhanced security through biometric verification, and the possibility of global currencies. However, discussions continue around issues of privacy and financial inclusivity.

The transition to electronic transactions has modernized payment systems and contributes to the reduction of black money generation. Increased digital transactions provide detailed records, enhancing transparency in business operations and financial exchanges. This transparency aids in combating tax avoidance and money laundering. Additionally, a cashless economy lowers banking service costs, enhances monetary policy effectiveness in managing inflation, and promotes economic growth. Furthermore, it mitigates risks associated with cash-related crimes, such as theft and robbery. Despite these advantages, a significant portion of the population remains outside the realm of digital banking, continuing to rely on cash. The effectiveness of a cashless economy is closely tied to the availability and quality of telecommunications infrastructure. Challenges also arise from the need to shift public attitudes and perceptions regarding digital payments, which can impede progress.

The Reserve Bank of India (RBI) reports a substantial increase in digital transaction usage, particularly following the demonetization initiative in 2016. The value of digital transactions soared from ₹109.80 trillion in March 2016 to ₹194.04 trillion in March 2019, reflecting a compound annual growth rate (CAGR) of 20.2%. In response, the government has actively promoted digital payment adoption, especially in rural areas, through initiatives like the establishment of Common Service Centres (CSCs) that offer digital financial services. The introduction of the Unified Payment Interface (UPI) has further facilitated instant money transfers via mobile phones, enhancing

accessibility and convenience for users across various demographics. Overall, while the cashless economy presents numerous benefits, addressing the existing gaps in infrastructure and public perception is crucial for its successful implementation.

### **1.1 Importance of The Study**

The study of the cashless economy in Malappuram Municipality is vital for several reasons. By understanding how digital transactions can enhance efficiency and attract customers, local businesses can adapt and thrive in a competitive marketplace. The study promotes financial inclusion by identifying barriers faced by unbanked or underbanked populations in accessing digital payment methods. This is particularly crucial in a region where socioeconomic disparities may exist. Additionally, examining consumer behaviour related to cashless transactions can help businesses tailor their services to meet local needs and preferences. This understanding can drive innovation and improve customer satisfaction. The study also assesses the technological infrastructure in Malappuram, highlighting areas needing improvement to support a cashless environment, such as internet connectivity and digital literacy programs. Moreover, it can inform local government policies aimed at fostering a secure and user-friendly cashless ecosystem, which is essential for ensuring the protection of consumer data and enhancing trust in digital transactions. Finally, in light of recent crises like the COVID-19 pandemic, exploring the cashless economy can bolster economic resilience, enabling faster recovery and adaptation to future challenges. Overall, this study serves as a roadmap for a modern financial landscape in Malappuram.

### **1.2 Research Problem**

A "cashless economy" refers to the transition from physical currency to digital platforms, including online transactions, the use of plastic cards, and internet banking. Digital payments benefit people in many ways. People do not have to worry about carrying paper money or wait in line to withdraw money from ATMs. Through e-payments they can pay anyone at any times. The cashless economy in Malappuram Municipality centres on understanding the current landscape of digital

financial transactions and the challenges associated with their adoption. With the rise of cashless payment methods, it is essential to identify the various instruments and methods being utilized, such as mobile wallets, UPI, and credit/debit cards. This knowledge will help assess their prevalence and effectiveness in the local context. As soon as people make an online payment, they receive receipts and feedback almost instantly. As more people engage in e-payments, nearly all payment service providers have begun offering attractive promotions to help users secure great deals.

However, the use of digital payments sometimes makes it difficult for people. Many a time while using e-payment services they are liable to pay service fees or a convenience fee which adds to their expense. There have been many incidents in which cyber criminals have manipulated people and money has been looted. As it is an online service, it may go down due to technical issues and people who get 100% reliable on this service for their payments may face an issue. Remote areas still rely on cash. People might find it difficult in making payments on the go while traveling to some remote areas. This study intends to investigate the techniques and obstacles associated with cashless payments, as well as people's attitudes toward these systems.. The study seeks to provide insights that can inform policymakers, financial institutions, and businesses, facilitating a smoother transition to a cashless economy while addressing the concerns of the community in Malappuram Municipality. For this here formulating the objectives like

### **1.3 OBJECTIVES**

1. To learn about people's attitude towards cashless economic system
2. To analyze problem associated with cashless transactions.

## **2. Materials and Methods**

The methodological frame work of this study comprised both primary data and secondary data. The primary data contains a field survey with a pre- determined questionnaire. The data collected by taking 70 households from the study area, and the questions are in the line with the objectives of the study. The study also utilizes secondary data. These data have been collected from various sources like Journals,

Medias, and Websites etc. The collected data are analysed and depicted through various statistical tools like tables, diagrams, percentage, and appropriate testing methods. For testing the hypothesis here using analysis of variance chi-square, cross tabulation. The collected data are analysed through the statistical package SPSS (version 25 ).

### 3. Results and Discussion

The data were collected using a well-executed questionnaire based on the study's objectives. Responses were gathered from 70 participants in Malappuram Municipality. The collected data were edited and coded, with errors and omissions examined. Tabulation was performed using statistical software. The processed data were analysed using various statistical tools suitable for this study. The analysis and interpretations are presented according to each objective, with the results outlined in the following manner There are 46 female respondents, comprising 65.7% of the total sample, and 24 male respondents, making up 34.3% of the total sample. The following table 1 shows the Payment Made Being Digitally in A Month

**Table -1**  
**Payment Made Being Digitally in A Month**

<b>Monthly payment</b>	<b>No of respondents</b>	<b>Percentage</b>
Less than 5000	36	51.4
5000-10000	15	21.4
10000-50000	6	8.6
Above 50000	1	1.4
No use	11	15.7
No answer	1	1.4
<b>Total</b>	<b>70</b>	<b>100.0</b>

**Source:** Field Survey

Thirty-six respondents (51.4%) indicated making digital payments less than 5,000 units in a month. This group represents individuals who engage in relatively lower levels of digital transactions,

where their monthly digital payments fall below the threshold of 5,000 units. Fifteen respondents (21.4%) stated that they make digital payments ranging from 5,000 to 10,000 units in a month. Six respondents (8.6%) reported making digital payments ranging from 10,000 to 50,000 units in a month. One respondent (1.4%) reported making digital payments above 50,000 units in a month. Eleven respondents (15.7%) stated that they do not make any digital payments. One respondent (1.4%) did not provide a specific answer to the question.

**Table 2**

**Complete knowledge about digital payment**

<b>Complete knowledge</b>	<b>No of respondents</b>	<b>Percentage</b>
Yes	19	27.1
No	18	25.7
May be	33	47.1
<b>Total</b>	<b>70</b>	<b>100.0</b>

**Source:**Field survey

19 respondents (27.1%) stated that they have complete knowledge about digital payment or cashless payment facilities. 18 respondents (25.7%) reported that they do not have complete knowledge about digital payment or cashless payment facilities. 33 respondents (47.1%) indicated that they may have complete knowledge about digital payment or cashless payment facilities. While some individuals may feel confident in their understanding, others may express uncertainty or lack of familiarity with these technologies. This underscores the importance of education and awareness initiatives to promote digital literacy and empower individuals to make informed decisions regarding digital payment.

**Testing of Hypothesis**

To identify the people’s attitude towards cashless transactions  
H0: There is no significant associations across gender regarding in monthly digital payment amount. For testing this hypothesis is here using the chi-square analysis

**Table 3****Payment Being Made Digitally in A Month and Gender Cross Tabulation**

Gender				
		Female	Male	Total
Payment being made digitally in a month	Less than 5000	26	10	36
	5000 - 10000	9	6	15
	10000 - 50000	1	5	6
	Above 50000	1	0	1
	No	9	2	11
	No Answer	0	1	1
Total		46	24	70

**Source: computed data****Chi-Square Tests**

Value		df	Asymptotic Significance (2-sided)
Pearson Chi-Square	11.005 <sup>a</sup>	5	.051
Likelihood Ratio	11.439	5	.043
No of Valid Cases	70		

**Source: Computed Data**

Attempt was made to examine whether there exists significant association across gender regarding digital payment. Accordingly, chi square test was conducted and the probability value was found to be below 1% level of significance (0.051) and hence null hypothesis is rejected. Accordingly, it is concluded that there exists significant association between gender and use of digital payment.

- The Pearson chi-square value is 11.005 with 5 degrees of freedom.
- The asymptotic significance (2-sided) value is .051, which is slightly above the conventional significance level of 0.05.

The chi-square test results indicate that there is a significant association between gender and the use of digital payment at a significance level of 0.05 for the likelihood ratio test. However, for the Pearson chi-square test, while the p-value is slightly above the conventional significance level, it still suggests a notable association between gender and digital payment usage.

Overall, the data highlights a significant shift towards digital payment methods, especially mobile payments, while traditional methods like cheques and even debit cards are less favoured. This insight could be valuable for businesses looking to adapt their payment options to meet consumer preferences.

**Table 4**  
**Reasons For Hitting Back From Cashless Transactions**

Reasons	No of respondents	Percentage
Can't keep up with technology	3	4.3
Concerned about security	13	18.6
Doesn't provide all services	50	71.4
Other	4	5.7
Total	70	100.0

**Source:** Field Survey

In the survey, 3 respondents (4.3%) cited difficulties keeping up with technology, indicating some individuals feel overwhelmed by the rapid changes in digital payment methods. Meanwhile, 13 respondents (18.6%) expressed security concerns, suggesting fears about the safety of digital transactions may discourage usage. Additionally, 4 respondents (5.7%) mentioned unspecified reasons, potentially including a preference for traditional payment methods or mistrust in digital platforms. Notably, 50 respondents (71.4%) indicated that the digital payment systems do not provide all the services they need, highlighting a significant barrier to adoption

**Table 5**  
**Problems Faced by Cashless Transactions**

<b>Problems</b>	<b>No of respondents</b>	<b>Percentage</b>
Inefficient banking system	19	27.1
Poor digital transactions	15	21.4
Poor internet facility	25	35.7
Limited cash availability	10	14.3
Lack of privacy	1	1.4
<b>Total</b>	<b>70</b>	<b>100.0</b>

**Source:** Field Survey

In the survey, 19 respondents (27.1%) reported issues stemming from an inefficient banking system, including transaction delays and technical glitches that disrupt cashless transactions. One respondent (1.4%) raised concerns about privacy. Additionally, 10 respondents (14.3%) faced problems with limited cash availability for cashless transactions, while 15 respondents (21.4%) experienced poor digital transaction experiences, such as failed transactions or incorrect charges. The most significant barrier identified was poor internet facilities, reported by 25 respondents (35.7%), highlighting that unreliable connectivity significantly hinders effective cashless transactions.

#### **4. Conclusion**

In conclusion, the study on the cashless economy in Malappuram Municipality reveals a complex interplay of attitudes and challenges faced by residents. While there is a growing acceptance of cashless transactions, evidenced by the increasing adoption of digital payment methods, significant concerns persist. Many respondents expressed issues related to inefficient banking systems and unreliable internet connectivity, which hinder seamless transaction experiences. Security apprehensions and a preference for traditional payment methods further complicate the landscape, indicating a need for enhanced trust in digital platforms. The study on cashless economy in Malappuram Municipality highlights the growing adoption of digital payment

methods, enhancing financial inclusion and reducing transaction costs. Findings suggest increased consumer convenience and efficiency in local businesses. Recommendations include further digital literacy initiatives and improved infrastructure to support the transition towards a fully cashless society.

Moreover, the findings highlight a critical gap in the services offered by existing cashless systems, suggesting that improvements are necessary to meet user expectations. Addressing these challenges through targeted infrastructure investments, better technological support, and increased awareness campaigns can foster a more inclusive cashless economy. Ultimately, for the transition to a cashless society to be successful, stakeholders must prioritize user experience and security, ensuring that all segments of the population can participate confidently in the digital economy. As Malappuram navigates this shift, understanding these dynamics will be crucial for policymakers and financial institutions aiming to promote a more robust and efficient cashless framework.

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### The Math behind the PageRank

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#### **Abstract**

PageRank, a significant algorithm in Google's search engine, measures website importance. This article explores the calculation methods and applications of PageRank algorithm. We discuss three calculation methods: iterative method, power method, and eigenvalue/eigenvector-based approaches. Applications of PageRank in information retrieval, social networks, academics are discussed. Also the advantages and disadvantages are examined.

**Keywords:** Internet as graph, Iterative method, Power method, Eigenvalue-Eigenvector method

#### **Introduction**

PageRank (PR), named after Larry Page, co-founder of Google, is a key algorithm used by Google Search to rank websites in search results. It measures a webpage's value by assessing links' quantity and quality. Mathematically, PageRank relies on graph theory, calculating a webpage's importance through its PageRank value. This value represents the webpage's ranking using PageRank methods.

Initially launched in 1999, Google became the top search engine, revolutionizing search results with PageRank's introduction. Google's Toolbar (2000) displayed PageRank scores for web pages. Beyond search, PageRank's applications extend to other domains.

This article provides an in-depth examination of PageRank calculation methods, applications, advantages, and disadvantages.

## Ranking of Webpages

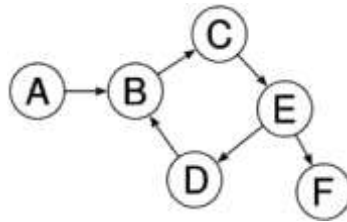
There are two popular algorithms to rank webpages:

1. HITS – Hypertext induced topic research
2. PageRank algorithm.

## Internet as graph

The World Wide Web hyperlink structure forms a huge directed graph where the nodes (vertices) represent web pages and directed edges represent the hyperlinks. In the figure 1, A, B, C, D, E, F represents web pages and edges represents hyperlinks.

PageRank works by counting the number and quality of links to a page to determine an estimate of how important the website is. The assumption is that the websites receiving more links from other websites are more important.



**Figure 1**

## Types of links

- Inbound link — These are links into the given page from outside, so from other pages.
- Outbound link — These are links from the given page to pages in the same site or other sites.
- Dangling link — These are links that point to any page with no outgoing links.

## PageRank Algorithm

PageRank (PR) is an algorithm used by Google search to rank web pages in their search engine results. In other words PageRank is an algorithm that measures the importance of web pages by evaluating the number and quality of links leading to the page. The PageRank algorithm is based on the link between pages of the web.

## 1. Original summation formula for page rank

Brin and Page the inventors of PageRank began with a simple summation equation, the roots of which actually derived from bibliometrics , the analysis of the citation structure among academic papers. The PageRank of a page  $P_i$  denoted by  $r(P_i)$  the sum of page ranks of all pages pointing into  $P_i$ .

$$r(P_i) = \sum_{P_j \in B_{P_i}} \frac{r(P_j)}{|P_j|} \quad ,$$

Where  $B_{P_i}$  is the set of pages pointing into  $P_i$  (back linking to  $P_i$  in Brin and Page's words) and  $|P_j|$  is the number of out links from page  $P_j$  . Notice that the PageRank of in linking pages  $r(P_j)$

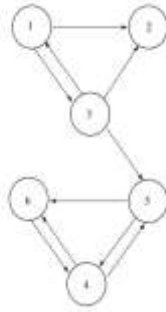
in equation is tempered by the number of recommendations made by  $P_j$ , denoted  $|P_j|$ .

The problem with equation is that the  $r(P_j)$  values, the PageRank of pages in linking to page  $P_i$  are unknown. To sidestep to this problem, Brin and Page used an iterative procedure. That is they assumed that, in the beginning, all pages have equal PageRank (of say  $\frac{1}{n}$  , where n is the number of pages in Google's index of the Web). Now the equation given is followed to compute  $r(P_i)$  for each page  $P_i$  in the index. The equation is successively applied, substituting the values of the previous iterate into  $r(P_j)$ . Now introduce some more notation in order to define this iterative procedure. Let  $r_{k+1}(P_i)$  be the PageRank of page  $P_i$  at iteration k+1.

$$r_{k+1}(P_i) = \sum_{P_j \in B_{P_i}} \frac{r_k(P_j)}{|P_j|}$$

This process is initiated with for all pages and repeated with the hope that the PageRank scores will eventually converge to some final stable values.

## Example



**Figure 2**

Webpage	Iteration 0	Iteration 1	Iteration 2	PageRank
1	$r_0(P_1) = \frac{1}{6}$	$r_1(P_1) = \frac{1}{18}$	$r_2(P_1) = \frac{1}{36}$	5
2	$r_0(P_2) = \frac{1}{6}$	$r_1(P_2) = \frac{5}{36}$	$r_2(P_2) = \frac{1}{18}$	4
3	$r_0(P_3) = \frac{1}{6}$	$r_1(P_3) = \frac{1}{12}$	$r_2(P_3) = \frac{1}{36}$	5
4	$r_0(P_4) = \frac{1}{6}$	$r_1(P_4) = \frac{1}{4}$	$r_2(P_4) = \frac{17}{72}$	1
5	$r_0(P_5) = \frac{1}{6}$	$r_1(P_5) = \frac{5}{36}$	$r_2(P_5) = \frac{11}{72}$	3
6	$r_0(P_6) = \frac{1}{6}$	$r_1(P_6) = \frac{1}{6}$	$r_2(P_6) = \frac{14}{72}$	2

In iteration 2,  $\frac{1}{36}$  is the greatest value, which gives a PageRank of 5. Thus 1 and 3 are the most important websites within this network.

## 2. Matrix Representation

Using matrices, at each iteration, compute a PageRank vector, which uses a single  $1 \times n$  vector to hold the PageRank values for all pages in the index. In order to do this, we introduce  $n \times n$  matrix  $\mathbf{H}$  and  $1 \times n$  row vector  $\mathbf{v}$ . The matrix  $\mathbf{H}$  is a row normalized hyperlink matrix

with  $H_{ij} = \frac{1}{|P_i|}$  if there is a link from node  $i$  to node  $j$  and 0 otherwise.

Consider once again the tiny web graph of Figure 2.

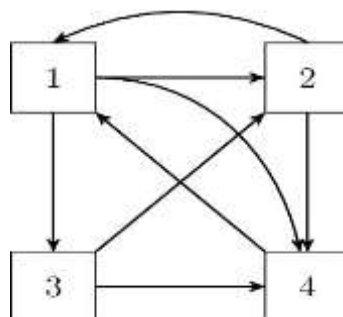
$$\begin{bmatrix} 0 & 1/2 & 1/2 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 \\ 1/3 & 1/3 & 0 & 0 & 1/3 & 0 \\ 0 & 0 & 0 & 0 & 1/2 & 1/2 \\ 0 & 0 & 0 & 1/2 & 0 & 1/2 \\ 0 & 0 & 0 & 1 & 0 & 0 \end{bmatrix}$$

The nonzero elements of row  $i$  corresponds to the out linking pages of page  $i$ , whereas the nonzero elements of column  $i$  correspond to the in linking pages of page  $i$ . Now introduce a row vector  $v_k$ , which is the PageRank vector at the  $k^{th}$  iteration. Generally on  $n^{th}$  iteration vector is given by  $v_n = H^n v$ , which is known as *Power method*. The initial vector  $v$  is the initial page rank assigned to every page. Here the

initial vector  $v$  is given by the matrix  $v = \begin{bmatrix} 1/6 \\ 1/6 \\ 1/6 \\ 1/6 \\ 1/6 \\ 1/6 \end{bmatrix}$

### 3. Computation using eigen value and eigen vector

Consider the graph of 4 Web pages. First we check the idea of how important each link is. Page 1 has a link to each of the other 3 pages, so each link receives 1/3 of Page 1's importance. Consider Page 2, it has 2 links. So Page 1 and Page 4 receive 1/2 of Page 2's importance.



**Figure 3**  
100

We see the pattern, if a node has  $k$  out links, then it passes  $1/k$  of its importance to each of the nodes it links to. Thus we get a system of equations:

$$\begin{aligned}x_1 &= \frac{1}{2}x_2 + x_4 \\x_2 &= \frac{1}{3}x_1 + \frac{1}{2}x_3 \\x_3 &= \frac{1}{3}x_1 \\x_4 &= \frac{1}{3}x_1 + \frac{1}{2}x_2 + \frac{1}{2}x_3\end{aligned}$$

Let's look at this matrix form, called a transition matrix (all the column sum is 1) of the above graph:

$$A = \begin{bmatrix} 0 & 1/2 & 0 & 1 \\ 1/3 & 0 & 1/2 & 0 \\ 1/3 & 0 & 0 & 0 \\ 1/3 & 1/2 & 1/2 & 0 \end{bmatrix}$$

To find PageRank vector, we have to consider eigenvectors and eigenvalues. Since the transition matrix is stochastic, by definition we know that the matrix has an eigenvalue of 1. This implies that there exists an  $\mathbf{x}$  such that  $\mathbf{Ax} = \mathbf{1x}$ . This  $\mathbf{x}$  is called the eigenvector, and it is the PageRank vector. Now solve  $\mathbf{Ax} = \mathbf{1x}$ , then we get the matrix:

$$\begin{bmatrix} 0 & 1/2 & 0 & 1 \\ 1/3 & 0 & 1/2 & 0 \\ 1/3 & 0 & 0 & 0 \\ 1/3 & 1/2 & 1/2 & 0 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix}$$

To find PageRank vector  $\mathbf{x}$ , we substitute to try to get variables in one variable form. As a result we get,  $x = \frac{x_1}{12} \begin{bmatrix} 6 \\ 4 \\ 9 \end{bmatrix}$ . This means that any scalar multiple of it will be an eigenvector for matrix corresponding to the eigenvalue 1. We multiply it by the scalar  $1/30$  ( $1/\text{sum of entries}$ )

and we get the PageRank vector  $\begin{bmatrix} 0.5 \\ 0.2 \\ 0.13 \\ 0.3 \end{bmatrix}$ , Page 1 ranking highest, followed by Page 4, Page 2 and Page 3.

It would be easy to solve our four equations by hand. There is also a systematic method for solving such a system of simultaneous equations (the Gaussian algorithm) which can be carried out by a computer. However finding PageRank for the entire World Wide Web involves a system of more than 14 billion Page rank equations, and it is not feasible to try to solve these equations directly, even by a computer.

### Google Matrices

A Google matrix is a particular stochastic matrix that is used by Google's PageRank algorithm. The matrix represents a graph with edges representing links between pages. The PageRank of each page can then be generated iteratively from the Google matrix using the power method. However, in order for the power method to converge, the matrix must be stochastic, irreducible and aperiodic. Then final Google matrix  $G$  can be expressed as:

$$G = \alpha M + (1 - \alpha) \frac{1}{n} ee^T$$

Where:

- $G$  is the Google matrix
- $\alpha$  is the damping factor, typically set between 0.8 and 0.9
- $M$  is the transition matrix
- $\frac{1}{n} ee^T$  is the teleportation matrix, usually a matrix of equal probabilities (i.e., the matrix  $(\frac{1}{n}, \frac{1}{n}, \dots, \frac{1}{n})$ ).

### Applications

1. **Search Engines:** It helps determine the importance of web pages based on the website's link structure. Search engines such as Google include PageRank as one of many factors to rank search results and provide users with more accurate and helpful information.

2. **Citation Analysis:** In academic research, the PageRank algorithm can be applied to analyze citation networks. The algorithm can identify influential articles or researchers in a given field by treating academic articles as nodes and citations as links. This information helps to understand the impact and importance of scientific work.
3. **Content Recommendation:** PageRank can recommend related or similar content on a website or platform. By analyzing the link structure between different pages or articles, the algorithm can identify related pages and recommend them to users as related or recommended.
4. **Fraud detection:** PageRank can be used in fraud detection systems to identify suspicious fraud patterns. Also PageRank has applications in literature, sports, biology, chemistry, neuroscience and physics.

### **Real life Applications**

- **Sports** – The PageRank algorithm has been used to rank the performance of: teams in the National Football League (NFL) in the USA; individual soccer players; and athletes in the Diamond League.
- **Ranking tweets in twitter** - To use PageRank for ranking tweets in Twitter we can construct a synthetic graph as follows. Represent each user and each tweet by a node. Draw a directed link from user A to a user B if A follows B. Also, draw a directed edge from a user A to a tweet t if A tweets or retweets t. Now we can apply PageRank algorithm on this graph to obtain a ranking for tweets.
- **Suggesting friends over twitter:** Personalized PageRank is used by twitter to present users with other accounts they may wish to follow. told represent the wide variety of existing applications of PageRank point to a rich future for the algorithm in research contexts of all types. It seems intuitive that any problem in any field where a network comes into play might benefit from using PageRank algorithm.
- **Scientific research and academia:** PageRank has been used to quantify the scientific impact of researchers. The underlying citation and collaboration networks are used in conjunction with PageRank algorithm in order to come up with a ranking system for individual publications which propagates to individual authors.

In neuroscience, the PageRank of a neuron in a neural network has been found to correlate with its relative firing rate.

For the analysis of protein networks in biology PageRank is also a useful tool.

Scientists were able to use PageRank to help determine the position of water molecules in an ionic solution, enabling them to find the best ways to remove nuclear waste and toxic chemicals. PageRank essentially maps where toxic chemicals are likely to pool in the solution, enabling a waste cleanup team too quickly and efficiently contain and remove the toxic or radioactive contaminant.

### **Advantages of PageRank algorithm**

- Objective and unbiased
- Quality-focused
- Resilience to manipulation
- Scalability
- Query-independent
- Foundation for other algorithms.

### **Disadvantages of PageRank algorithm**

1. It's ordering does not favor current events. According to the algorithm, old pages typically have more votes because they have more links from other reputable pages. This means that a new page will not be as reputable until it has gained exposure and links from other pages.
2. It's use in ranking papers in the citation network, it does not account for the size of a field. The number of citations per paper in each field varies widely depending on the discipline, for example, an average paper is cited about 6 times in life sciences, 3 times in physics, and about 1 time in mathematics. The algorithm is therefore more likely to give a paper in a mathematics field a lower score than a paper in a life sciences field.
3. Rank can be raised by buying "links".

## **Conclusion**

PageRank is a global ranking of all webpages, regardless of their content. Throughout the paper we discussed different methods in calculating rank of web pages. Graph theory and linear algebra concepts are behind the methods of PageRank calculation. We have found a number of applications and advantages of PageRank. Even though it has many advantages there is some disadvantages also. Overall findings with PageRank suggest that the structure of the Web graph is very useful for a variety of information retrieval tasks.

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### **Analysis of caffeine presence in chocolate products: A comparative study using UV spectroscopy**

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#### **Abstract**

Chocolate, a globally cherished confection, contains caffeine, a natural stimulant found in cacao beans. The research examines 30 chocolate samples, evenly split between those produced in India and the United Arab Emirates (UAE). The experiment was conducted by dissolving samples of chocolate with water and qualitatively analysed using UV-Visible spectroscopy, known for its precision and cost-effectiveness at a range of 200nm-400nm. The study reveals that 53.3% of Indian chocolates and 73.3% of Arabian chocolates contain caffeine, indicating regional differences in manufacturing practices or ingredient sourcing. Among four identical brands analyzed across both regions, only one brand maintained consistent caffeine levels, while others showed variability. These findings underscore the need for standardized production processes and regulatory oversight to ensure uniform caffeine content in chocolates globally. The results have implications for consumer awareness, regulatory bodies, and manufacturers, emphasizing the importance of accurate labelling and quality control. Future research should focus on quantifying caffeine levels, understanding regional differences, and evaluating the health impacts of caffeine in chocolates.

**Keywords:** Caffeine, Chocolate, UV-Visible Spectroscopy, Analysis

#### **1.INTRODUCTION**

Chocolate, derived from cacao beans, has been enjoyed for centuries, evolving from a bitter beverage in ancient Mesoamerican

cultures to a diverse range of beloved treats. This evolution has led to variations in flavor, texture, and composition, heavily influenced by manufacturing processes and ingredient selections across regions. A critical yet often overlooked aspect of chocolate is its caffeine content, which varies by type; dark chocolate typically contains more caffeine than milk or white chocolate. Caffeine, a natural stimulant, not only enhances chocolate's taste but also affects consumer health, necessitating greater awareness regarding its levels[1].

Recent focus on the nutritional aspects of chocolate has highlighted the need for accurate labeling of its caffeine content. While the U.S. Food and Drug Administration (FDA) recognizes caffeine as generally safe, excessive intake can lead to health issues such as addiction and anxiety. With rising global chocolate consumption, understanding its caffeine content is essential for informed dietary choices.

This research employs ultraviolet-visible (UV-Vis) spectroscopy to analyze caffeine levels in chocolate products, specifically comparing samples from India and the United Arab Emirates (UAE). The study aims to investigate how regional manufacturing processes and ingredient sourcing influence caffeine content. The findings are expected to inform industry practices, guiding manufacturers toward standardized production and better compliance with regulatory standards. Additionally, consumers will gain valuable insights into caffeine levels, promoting healthier dietary choices[2].

Ultimately, this research serves as a foundation for future studies on caffeine quantification in chocolate, potentially utilizing advanced techniques like high-performance liquid chromatography (HPLC)[3,4]. By enhancing transparency in chocolate labeling and increasing public awareness of caffeine's health implications, this study contributes significantly to food science and public health. In summary, this research represents a crucial step in addressing the complexities of caffeine content in chocolate. By employing UV-Vis spectroscopy, it not only contributes to the field of food science but also offers practical applications for industry stakeholders, regulators, and health-conscious consumers[5]. The findings will foster greater transparency in chocolate labeling and enhance public awareness of the potential health impacts of caffeine consumption.

## **2.MATERIALS AND METHODOLOGY**

In this study, the analysis of caffeine in various chocolate samples was conducted using an ultraviolet-visible (UV-Vis) spectrophotometer. The reagents used included distilled water and acetone, while laboratory equipment comprised droppers, beakers, tissue paper, glass rods, and test tubes. The spectrophotometer was calibrated to scan the wavelength range of 230 to 400 nm, which allowed for the determination of the maximum absorbance wavelength for caffeine, identified at 275 nm. This wavelength was subsequently selected for further analysis to accurately quantify caffeine content in the chocolate samples.

### **2.1 SAMPLE COLLECTION:**

The sample collection process aims to gather a total of thirty chocolate samples, evenly distributed between the locally produced Indian chocolates and the foreign-made chocolates from the UAE. Fifteen chocolate varieties produced in India and available locally will be collected for analysis. Additionally, fifteen different chocolate varieties imported from the United Arab Emirates (UAE) was included which was directly exported. A total of 30 chocolates were collected. Importantly, the collected samples explicitly mentioned on their ingredients labels that they contain no caffeine content and labelling of chocolates was done as Indian Chocolates as IC from 1 to 15 and Arabian Chocolates as AC 1 to 15.

### **2.2 METHODOLOGY:**

#### **Preparation of Samples**

A step-by-step method is to be followed for the analysis,

#### **1.Dilution**

- Accurately weigh 1g of chocolate sample and place it into the beaker.
- Add 25ml of distilled water, to the beaker.
- Stir the contents into a solution until it melts.

#### **2.Filtration**

- Transfer the solution into a test-tube.
- Place the test tube into the manual centrifuge.



**Figure 1:Ultraviolet-Visible Spectrophotometer**

- Filter the solution manually by centrifuge
- Discard the supernatant and collect the clear solution.

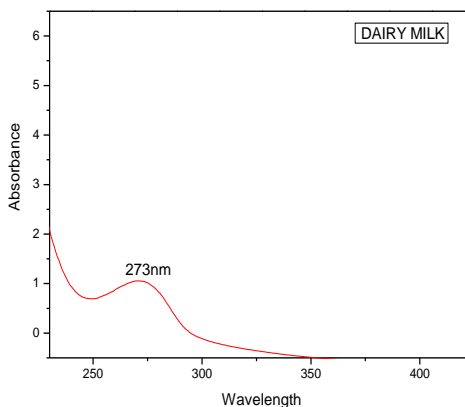
### **UV-Visible Spectroscopy**

The sample prepared was placed in a quartz cuvette. The absorbance was measured at 272-275nm. A total of 30 samples were measured and spectrum was plot using Orgin software.

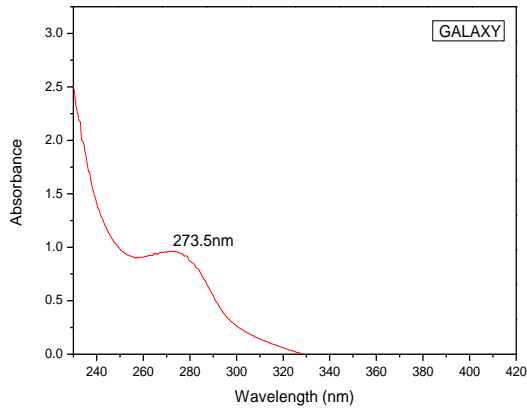
## **3.RESULTS AND DISCUSSION**

### **INDIAN CHOCOLATE**

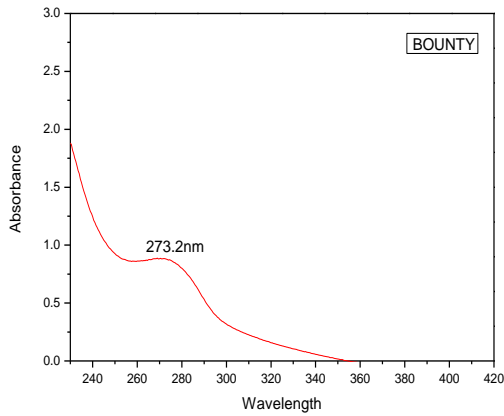
Out of 15 chocolates from Indian Market 8 Chocolate identified the Presence of Caffeine.



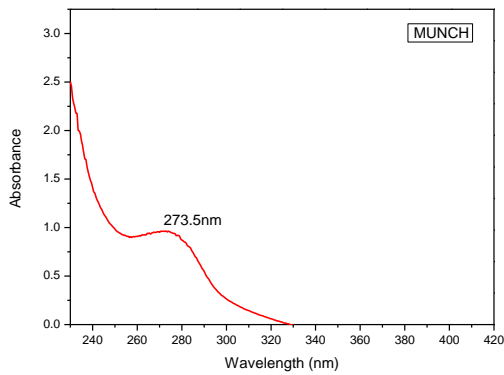
**Graph 1:Spectrum obtained from IC1**



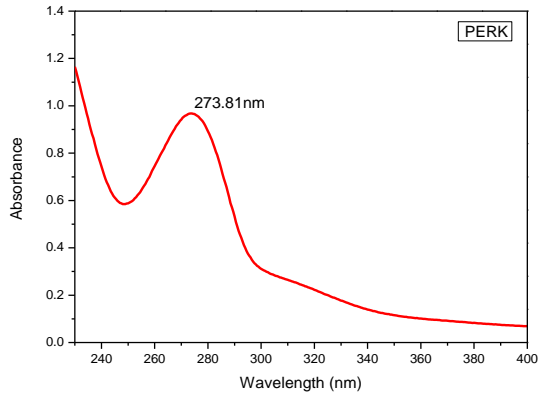
**Graph 2: Spectrum Obtained from IC2**



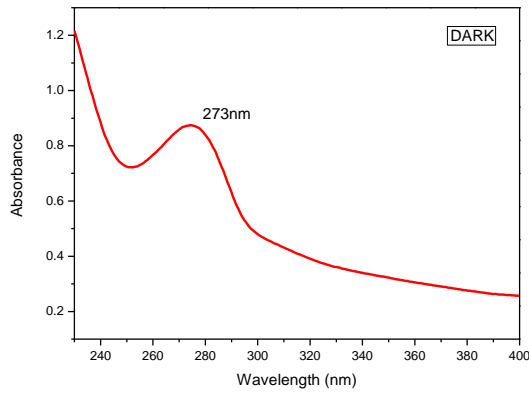
**Graph 3: Spectrum obtained from IC3**



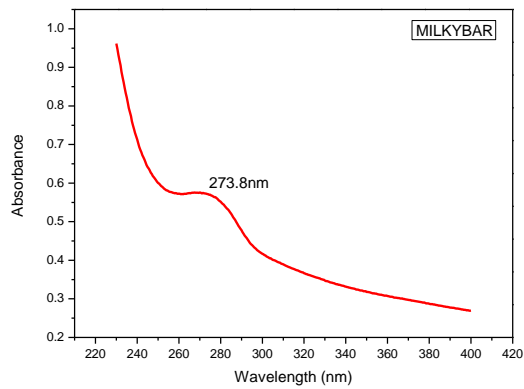
**Graph 4: Spectrum obtained from IC5**



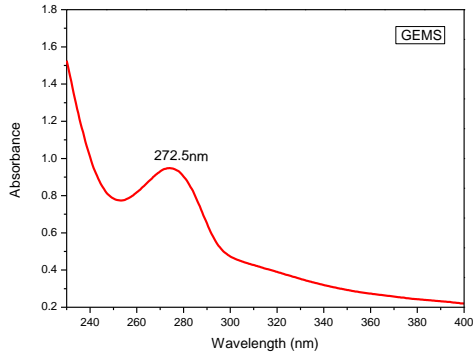
**Graph 5: Spectrum obtained from IC6**



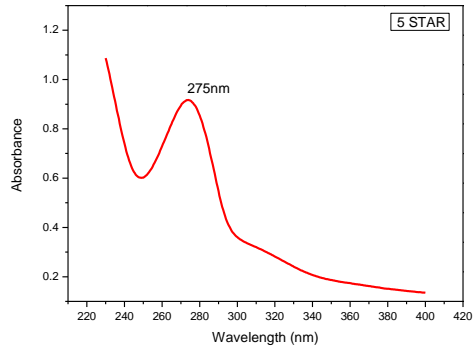
**Graph 6: Spectrum obtained from IC10**



**Graph 7: Spectrum obtained from IC13**



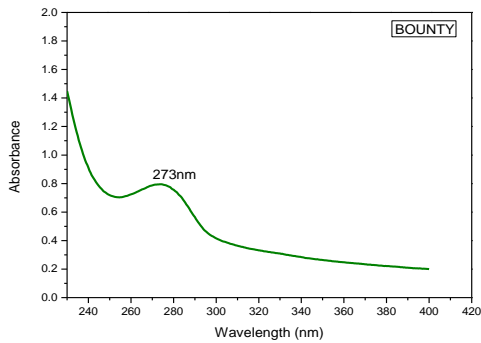
**Graph 8: Spectrum obtained from IC8**



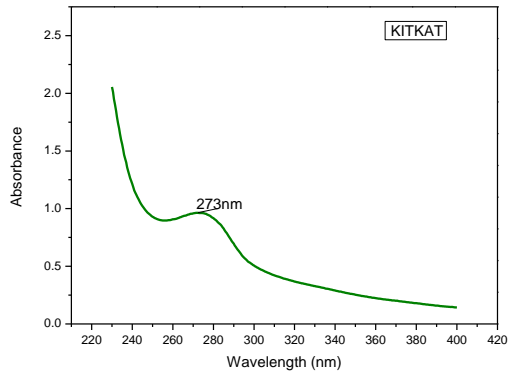
**Graph 9: Spectrum obtained from IC7**

**ARABIAN CHOCOLATE**

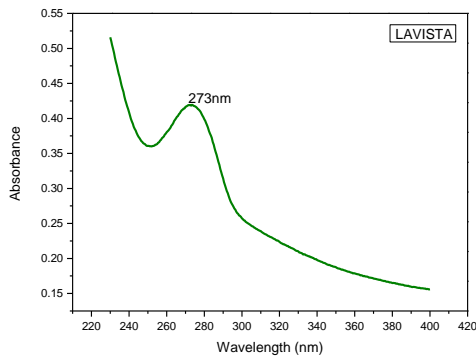
Out of 15 chocolates from Indian Market 11 Chocolate identified the Presence of Caffeine



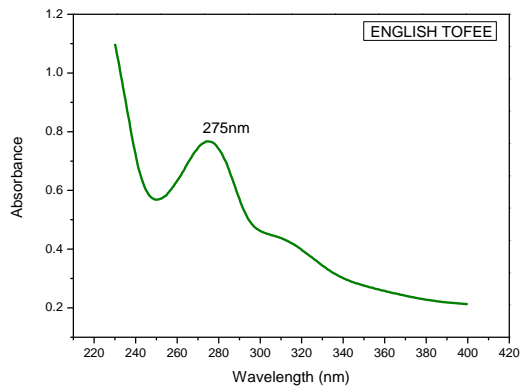
**Graph 10: Spectrum obtained from IC3**



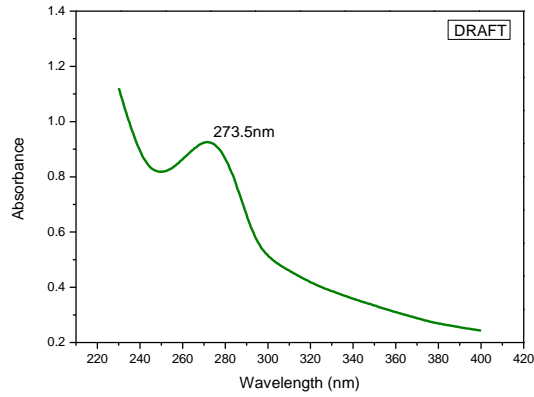
**Graph 11: Spectrum obtained from IC4**



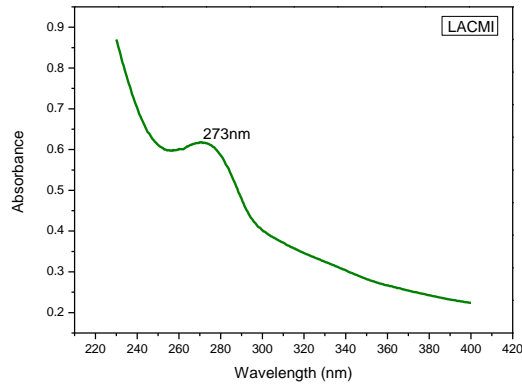
**Graph 12: Spectrum obtained from IC5**



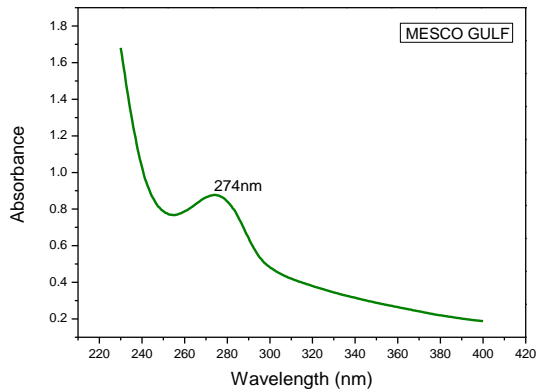
**Graph 13: Spectrum obtained from IC7**



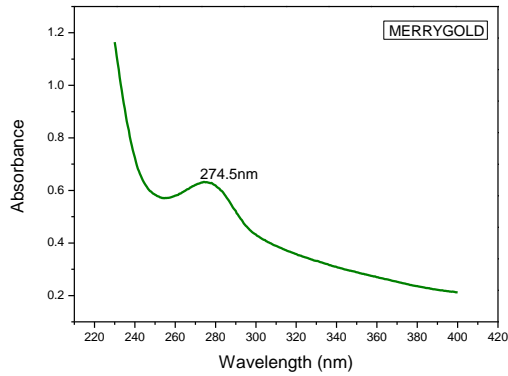
**Graph 14: Spectrum obtained from IC9**



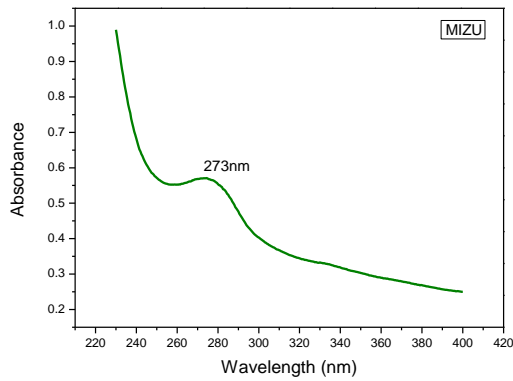
**Graph 15: Spectrum obtained from IC10**



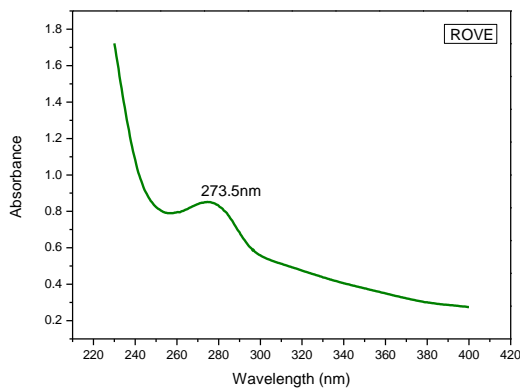
**Graph 16: Spectrum obtained from IC11**



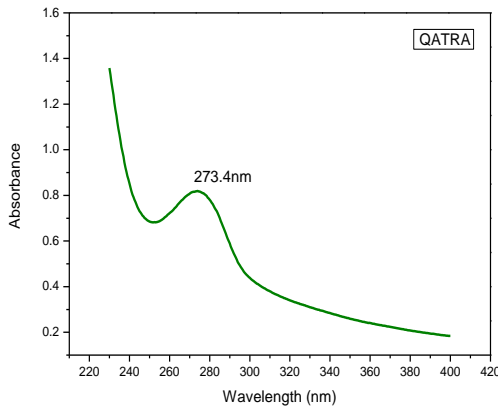
**Graph 17: Spectrum obtained from IC12**



**Graph 18: Spectrum obtained from IC13**

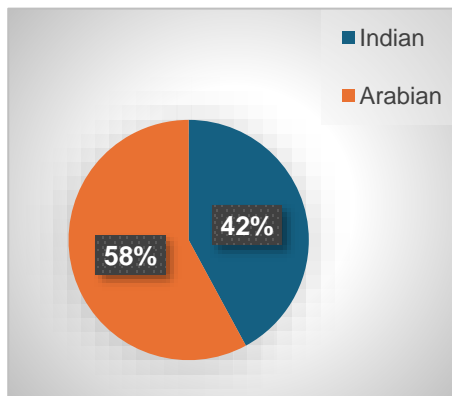


**Graph 19: Spectrum obtained from IC14**



**Graph 20: Spectrum obtained using IC8**

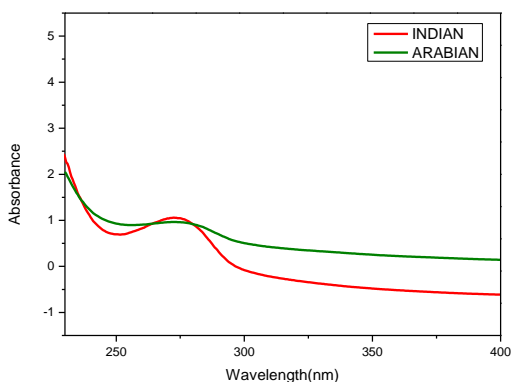
This study aimed to analyze the presence of caffeine in chocolate products through UV spectroscopy, highlighting significant regional differences and brand consistency.



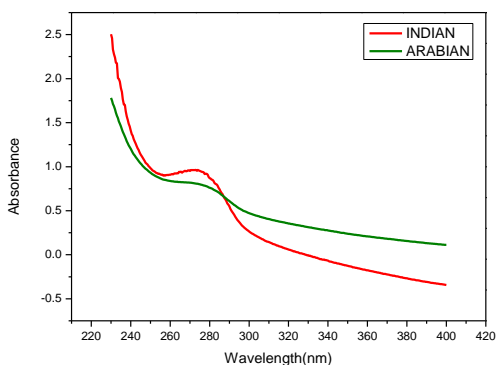
**Graph 21: Percentage of samples showing presence of caffeine in regions**

The examination of 30 chocolate samples—15 from India and 15 from Arabia—revealed that 53.3% of Indian chocolates and 73.3% of Arabian chocolates contained detectable caffeine levels. . In addition to the general sample set, the study included a targeted comparison of four identical chocolate brands available in both India and Arabia. This disparity suggests that various factors, such as consumer preferences, manufacturing practices, and regulatory standards, influence caffeine inclusion in chocolate products and regulatory standards. The

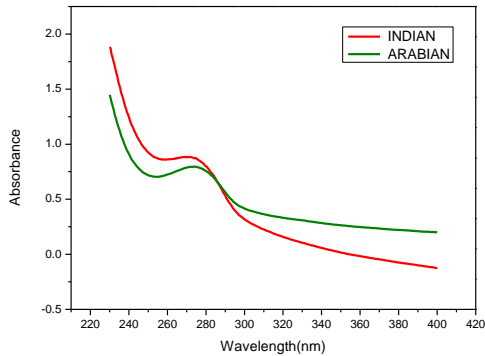
comparison of four identical chocolate brands available in both India and Arabia revealed intriguing insights, on analysis of the chocolate showed consistency in one brand, only 1 out of the 4 brands showed the presence of caffeine in both Indian and Arabian samples. This suggests that this brand maintains a consistent formulation and ingredient sourcing across different regions, ensuring uniformity in caffeine content regardless of the market. Such consistency could be attributed to stringent quality control measures and standardized production processes employed by the brand to meet global standards and consumer expectations. In contrast, the remaining three brands exhibited caffeine in either the Indian or the Arabian versions, but not in both.



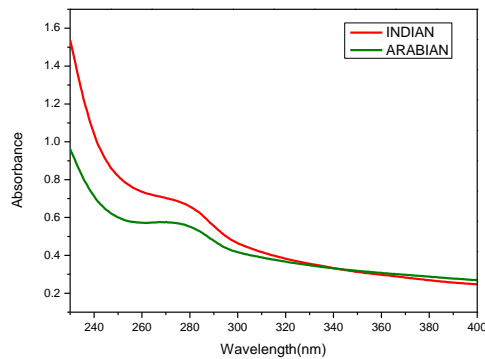
**Graph 21: Comparison of IC1 and AC1**



**Graph 21: Comparison of IC2 and AC2**



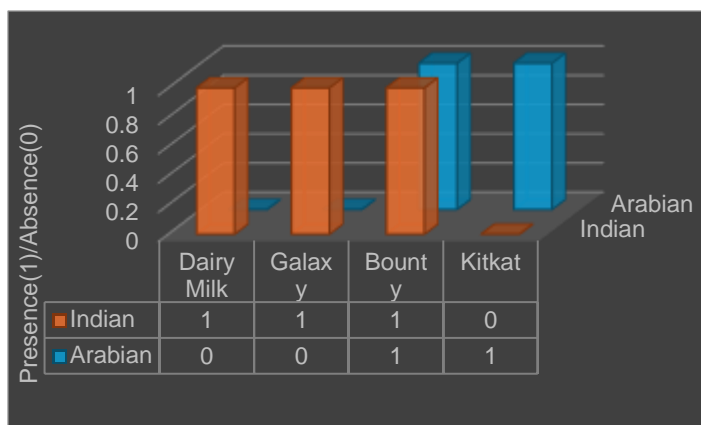
**Graph 23: Comparison of IC3 and AC3**



**Graph 24: Comparison of IC4 and AC4**

The comparative analysis showed the presence of peak in IC3 and AC3 sample of same brand, in others showed the absorbance graph for the presence of Caffeine in IC1, IC2 and AC4 samples. This finding suggests significant regional variability in the formulation or manufacturing processes of these brands. The presence of caffeine in only one brand across both regions indicates that this particular brand may have a standardized production process and ingredient sourcing, ensuring consistent caffeine content regardless of the market. On the other hand, the discrepancy observed in the other three brands points to several potential factors at play. Local regulatory standards may differ, requiring manufacturers to adjust their formulations to comply with specific regional laws. Ingredient sourcing practices might vary between regions, leading to natural differences in caffeine content.

Additionally, consumer preferences could influence the decision to include or exclude caffeine, with manufacturers tailoring their products to meet local tastes and demands.



**Graph 22: Comparison of Caffeine in 4 chocolate brands**

This variability highlights the complexity of maintaining uniform product formulations in a global market and underscores the need for further research into the specific reasons behind these differences. Understanding these factors can help manufacturers achieve greater consistency and cater to the diverse preferences of consumers worldwide. Several factors could contribute to this variability such as Local regulatory standards, different regions may have varying regulations concerning caffeine content in food products, prompting manufacturers to adjust their formulations to comply with local laws, the source of cocoa and other ingredients might differ between regions, affecting the caffeine content in the final Product, Consumer Preferences in which they could include variations in caffeine content.

The study's findings carry significant implications. The variability in caffeine content across regions emphasizes the need for consumers, especially those sensitive to caffeine, to be informed about potential levels in chocolate products. Regulatory bodies may utilize these results to enforce safety standards and standardize caffeine levels globally. Furthermore, the observed regional differences could prompt manufacturers to harmonize their production practices, adopting standardized formulations and ingredient sourcing. Future research

should focus on quantifying exact caffeine content, distinguishing between naturally occurring and added caffeine, and exploring the health impacts of caffeine in chocolates. Additionally, understanding the reasons behind regional differences and their effects on consumer satisfaction and brand perception could provide valuable insights for the industry

#### **4.CONCLUSION**

In conclusion, this study employed UV spectroscopy to analyze caffeine levels in chocolate products from Indian and Arabian markets, revealing significant regional variations and brand-specific consistencies. Caffeine was detected in 8 Indian samples and 11 Arabian brands, highlighting both uniformity and variability among identical brands. One brand maintained consistent caffeine content across regions, while others showed notable disparities, likely due to local regulations, ingredient sourcing, and consumer preferences. These findings underscore the importance of consumer awareness regarding caffeine levels, particularly for those managing their intake for health reasons. Regulatory bodies can leverage these insights to enforce consistent standards, and manufacturers may consider harmonizing production practices to align with global consumer expectations. Future research should focus on quantifying caffeine levels, exploring its origins in chocolate, and investigating health impacts, as understanding these regional variations is crucial for optimizing product formulations and addressing diverse market demands.

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### **Muslim Culture In Malayalam Movies (1990-2024)**

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#### **Abstract**

We live in a very transparent age. The present is largely out of bounds as far as the previous past. The role played by mass media in building and destroying human values in a transparent world is immense. Although cinema is only a form of entertainment among the public in Kerala, cinema is a universal medium. Cinema plays a huge role in establishing the vision of the society and giving direction to the audience. Cinema is a great art form that makes the audience aware of different peoples, scientific disciplines, different levels of cultures and perspectives. But cinema, which opens different avenues of knowledge to its viewers, is also a dangerous platform capable of poisoning people's minds. Hollywood movies often portray Asians in a very primitive way. We can see the presence of Asians in Hollywood films as characters who are very different from the western society such as bad accent, primitive culture. There is constant criticism of Hollywood for sharing such negative messages through movies. Movies like Ghost in the Shell (2017) and Memoir of a Gheisha (2005) are examples of bad orientalism in Hollywood movies. Malayalam cinema has propagated the untrue notion that Kerala Muslims are a culturally backward and anti-modern people. If there is at least one Muslim character (by race, language or dress) in the film, they tend to be the ones who rant about the victim and perpetrator of terrorism, or who are irrationally angry and resentful of the Western way of life.

**Key Words:** Cinema, Kerala Muslims, Hollywood, Terrorism

## **Introduction**

Malayalam cinema introduces Kerala Muslims as a society rich in such people. If the character is male, he is a misogynist. There are many examples of stereo type images that have been portrayed in this way. Sajan's 1991 film *Amina Tylers* reinforces the Muslim stereotype. The screenwriter has filled the film with characters like uneducated Muslims, misogynist men and oppressed women. We see Umma as a symbol of helplessness as she bears mute witness to her father's misogynistic behavior. In Malayalam films, the filmmakers usually presented helpless female characters enslaved in a male-centered society, and films such as *Paadam onnu Oru Vilapam* (2003), *Perumazhakalam* (2004), *Thattathinmarayathu* (2012), *Vilapangalkkappuram* (2009) all portray Islam's position on women in a bad way. Islam's stances on aspects such as triple talaq, nikah, polygamy, child marriage, violent attitude of Muslims, obsession with food etc. are mainly mocked by Muslims.

There are many boxes office hit films in the Malayalam industry where Muslims are portrayed as backward and stereotypical. Today, the changes made by filmmakers from the Muslim community in the film industry have resulted in the release of films that break the stereotypes of the Muslim community. After 2010, in the Malayalam cinema scene, which has been openly anti-Islamic, some film lovers have come forward to portray Islamic values and the social life of Muslims in a way that is in line with reality. *Adaminte makan Abu* (2011), directed by Salim Ahmed, was the first to succeed in portraying Islamic precepts and the real life of Muslims before the audience. After Films like *KL 10 pathu*(2015), *Sudani from Nigeria* (2018), *Tallumala* (2022), *Sulaikha Manzil* (2023) and *Kadina Katorami Andakataham* (2023) broke Muslim stereotyping. These films were successful in introducing the Muslim culture of Malappuram to the general public of Kerala.

## **Growth and development of cinema**

Who invented cinema? From the point of view of the French, cinema is the contribution of the Lumière brothers. If you ask Americans, they will say that Thomas Alva Edison invented film. But film is not the result of the efforts of one person. It is a cumulative effort of various scientists. It has evolved over time. In 1891, Thomas Alva Edison and

William Dixon invented the first motion picture viewing device, the Kinetoscope 1894, the Maguire & Baucus Company acquired the foreign rights to the Kinetoscope, and as a result the machines became widespread throughout Europe. A Kinetoscope exhibition in Paris inspired the Lumière brothers (Auguste Lumière Louis Lumiere) to enter the field of motion picture direction. The birth of cinema itself is considered to be the public screening of the motion picture in 1895 by the Lumière brothers, who had made many popular short films, to about 200 members of a private company. It was with this event that beyond being an art form, the huge commercial potential behind cinema was realized and cinema began to be promoted worldwide.

By 1914, several film production companies had been established. As more people were willing and willing to pay to see movies, cinema became more popular, large movie studios and theaters were established, and cinema evolved into what it is today. Cinema was greatly promoted by the invention of television in 1927 and its proliferation in the following years. During these periods, motion pictures began to be telecasted after theatrical release. Cinema was the dominant form of popular entertainment in the 1930s–1940s. Watched twice a week, it has become an indispensable part of everyday life. The home viewing experience improved further with the advent of cable television in the 1980s. c. with the advent of VCR (video cassette recorder), movie companies started releasing old and new movies in the form of video cassettes. As the audience started watching movies by renting or buying such cassettes, the audience could watch the movies they wanted at the time of their choice with the ease of choosing a book. With the introduction of DVD (Digital Video Disc) in the 1990s, film became more transparent. DVD became more popular as a medium for recording, storing and playing back films with more data than the video case. New technologies introduced in the late 20th and early 21st centuries further expanded the television possibilities of motion pictures. Different systems have emerged these days that guarantee hundreds of channels through satellite and digital cable. Most of them were playing movies continuously. At this time VOD (Video on Demand) also came into the picture. Through this, viewers can watch movies directly to their television or computer screen on demand with the help of internet. Over

the past two decades many platforms like HBO Disney plus Amazon Prime Netflix Original have been active in the field of movies and web series. Popular platforms with huge popular support have been continuously securing many series due to commercial reasons.

As of January 2024, Netflix Original has over 260 million subscribers in over 190 countries. This can understand the modern society's obsession with movies and serials.

### **Role of cinema in society**

Acting as a mirror reflecting the joys, struggles and complexities of society, cinema has been an important part of modern culture for over a century. Through films, audiences witness stories that resonate with their own experiences. By portraying diverse cultures, lifestyles and issues, the film builds empathy in the audience and makes them aware of their own quality of life. Studies indicate that a large part of the world's population regularly relies on movies to escape from the tedium of daily life and relax for a while. The acceptance of the film in the society is huge. There are many audiences who are obsessed with the lead role and approach the film with practical intelligence. However, many scientific studies have found that watching movies regularly has a lasting effect on the brain of the audience. Different types of movies have different effects on the brain of the audience. Scary and intense movies can increase adrenaline and cortisol levels. It may evoke memories of traumatic events experienced by the audience. Comedy and romantic movies can lower the blood pressure of the audience. A large audience perceives movies as mere time-pass or short-term entertainment. But studies suggest otherwise. Cinema is more than just entertainment. Cinema, which exposes the audience to the precious expanses of knowledge and technology, is also a dangerous platform for poisoning people's minds. Films can also create a generation rich in harmful mindsets by portraying them in a negative light. 13 The latest trend is to show alcohol, drugs, murder, etc. in movies. Such violence is actively seen in most of the new web series on OTT platforms such as Netflix and Amazon Prime. But popular platforms are often not interested in making films that create social awareness or promote morality in areas like education, family planning, financial security, etc. Many psychiatrists believe that a child

today may see more violence in 30 minutes of TV or movies than the average child experiences in a lifetime. Each of the films attempts to interact, at least indirectly, with the psychological levels of each viewer. Therefore, the innate potential of cinema to evoke human emotions has been misused for ages. Many film companies and directors use film to inject their personal, political or ideological views into the audience. The penetration of such trends into the film industries will lead to an influx of stereotyped images and stereotypical images that create negative impacts on the society and hurt individual roots. All these scenes are seemingly harmless. But the impact it will have on the viewers will be terrible. So the audience has a heavy responsibility to reject bad movies and accept good movies.

### **Propaganda movies and Stereo type movies**

The word propaganda is used to spread false propaganda against a group with religious or political enmity. In the past, it had the meaning of just propaganda, but this term began to be used in the sense of hate propaganda and propaganda during the Hitler's German dictatorship. He himself established the Ministry of Propaganda to inflame the minds of the German people with anti-Semitism. There are many propaganda films released during this time to protect their religious and political interests. A lot of propaganda is part of Islamophobia in India. The pictures have been released. Cinematic chronology is only used as a tool for propaganda through films released with such a tainted agenda.

The stereo type cinema role played by establishing the vision of the society is indispensable. Good or bad, movies have the ability to last forever. Hence, cinema is often misused to paint any matter, even if it is baseless, in the social media. For this purpose, stereotype means the continuous display of meaningless objects. There are different types of stereotypes. Gender stereotypes are constructed perceptions based on one's gender or sexuality. Racist stereotypes that racialize characters as black, white, or Asian. Through movies we can see various forms of stereotypes such as social-class stereotypes, nationalism stereotypes that show the working but economically backward population as violent and uneducated. Stereotypes can generate huge misconceptions in the minds of the audience. Many stereotypes may have lifelong effects on

viewers. Such misconceptions can be changed to some extent by making stereotype-breaking movies, making the younger generation aware of the media agenda, and ensuring media literacy education for children.

### **Islamophobia in Global Cinema**

Islamophobia is a new term that refers to prejudice and discrimination against Islam or Muslims. In the Middle Ages, the Christian government spread propaganda by making the Muslims uncivilized and violent. The thinking behind this was that they would benefit from the Crusades. Later in the modern era, Islamophobia became active. The term was coined in the late 1980s. After the September 11, 2001 trade center attacks, Islamophobia gained global notoriety. In addition to Asian hatred, overt Islamophobia also contributes to the influx of stereotypical characters in Hollywood films. We can see a lot of parallel Arab Muslim characters in Hollywood films who dress traditionally, talk about violence, and engage in terrorism. Jack George Shaheen, who researched Arab stereotypes in Hollywood, says: "Between the 1930s and 1950s there were many English films that portrayed Arabs badly." From this, it can be understood that Islamophobia has arisen in the film industry in its infancy. "In over 900 films, the main villains are Egypt, the characters will be from Palestine." Over a hundred movies have come out of Hollywood depicting Egyptians. Ninety-five percent of them ridicule or dehumanize Egyptians." The common features of these films are negative, violent, sexual and anti-democratic Muslim characters. They will be adept at planning and executing bombings. Muslim women will be deprived of even freedom of speech and doomed to live a helpless life at the whims of their husbands. The Islamophobic stereotype in a movie/TV show is identified by undergoing the Riz test.

### **Indian Cinema**

Hindi film scene known as Bollywood is the first film industry of Indian cinema. Hari Chandra Sakha ram known as Savedad was produced a film know the wrestlers (1899) is considered the first Indian film. Dadhasaheb Phalka is known as the father of Indian cinema. His film Raja Harichandra released in 1913 was the first full-length film in India. With

the development of cinema over time. Around 328 films were produced in 1931. After independence many films were made based on different themes. 19 Filmmakers like Satyajit Ray and Bimal Roy released films focusing on social issues. In the 1960s, films made by directors such as Ritzyak Ghattak and Mrinal Sen gained worldwide attention, and this is considered the golden age of Bollywood. Many legends emerged during this time. There was great progress in the field of music too.

### **Islamophobia In Bollywood**

There was a time when Bollywood was famous for producing films that promoted Hindu Muslim brotherhood and communal friendship. The golden age of Bollywood was the period when the government canceled the film genre to promote India's constitutional values. But all that situation has changed. Today, movies injected with Islamophobia get a screening certificate and are shown in theaters with ease. Earlier, the Censor Board did not allow screening of such anti-communal films. But now under the BJP rule, Islamophobia is being spread transparently through the film industry. A movie titled Kashmir Files was released In March 2022. Produced by Vivek Agnihotri, who blindly supports the BJP, the film discusses the plight of Kashmiri Pandits during the exodus of the 1990s. The film is full of baseless developments. All Muslims are portrayed badly in the film. One is a deviant, the other a despicable Kashmiri Pandit family's hideout to a terrorist group, and even Muslim children are seen threatening Hindus and being cruel to them. Another Islamophobic product is The Kerala Story (2023), which was released as part of the national advocacy campaign. Directed by Sudeepo Sen, the film's theme reinforces the myth of love jihad. Malappuram district people are portrayed as communal terrorists who have brainwashed around 32,000 non-religious young women into Islam and sent them for jihad activities in Iraq and Syria. As part of the election campaign in Karnataka, Prime Minister Narendra Modi has spoken promoting the Kerala story. At a rally in Bellary, Karnataka, he told the 20 crowd that "Kerala Story is based on a terrorist conspiracy. This film exposes the ugly face of terrorism". He appealed to the people that everyone should watch this movie. After this, many BJP political activists came forward in support of the movie and released the movie in many

places and as a result the movie made millions. Movies like *Lipstick Under My Burqa* (2017), *72 Hoorain* (2019) and *Tanhaji* (2022) are agenda movies filled with Islamophobia.

## **Conclusion**

From 1990 to 2022, there has been a significant transformation in the representation of Muslims in Malayalam cinema, primarily driven by young filmmakers from the Malabar region. Earlier portrayals often depicted Muslims in a negative light, emphasizing stereotypes and cultural misrepresentations. Director Ashraf Hamza highlighted the linguistic discrepancies in films, where Muslim characters often spoke in a degraded dialect compared to their Hindu counterparts, reinforcing existing stereotypes. The film "Naran" is cited as an example where only one Muslim character deviated linguistically from the standard Malayalam spoken by others.

Zakaria Mohammed, director of "Sudani from Nigeria," pointed out that past films like "Aaram Tampuran" unfairly represented Malappuram with bomb-related narratives, which do not reflect reality. He emphasized the need to showcase the true essence of Malappuram and its people. In contrast to the 1990s, where Muslim characters had to exemplify good moral values and oppose the abuse of their religion, contemporary films allow Muslim characters to exist without the burden of proving their faith or being labeled negatively.

While Malayalam cinema has made strides in breaking stereotypes and presenting more nuanced portrayals, issues like Islamophobia still persist, rooted in historical misrepresentations. Despite these challenges, cinema remains a powerful medium for initiating social change, capable of challenging and transforming audiences' perceptions and fostering a more inclusive narrative in contemporary Malayalam film.

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9. Explore regional cinema's portrayal of communities like Muslims in Malayalam films. [www.filmibeat.com](http://www.filmibeat.com)

### **Biochemical Sensitivity of Surface Plasmon Resonance Sensors**

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#### **Abstract**

Biochemical sensors based on surface plasmon resonance (SPR) are highly efficient tools for label free chemical detection and for the investigation of real time biomolecular interactions. This flexible, powerful and highly sensitive technique is widely used for rapid detection in medical and biological fields. The current research work focus on the surface plasmon resonance of the metal's gold and copper through simulation analysis. The theoretical analysis was based on Fresnel's equations of electromagnetic waves that describe the behaviour of light waves when they encounter an interface between two media with different refractive indices. The propagating surface plasmon waves are analysed on the planar structure on prism based Kretschmann Raether configuration. The angular scanning method of SPR detection was employed in this process. The reflected light intensity was measured for an angular range of  $0^\circ$  to  $90^\circ$ . Also, SPR bio sensitivity was studied by employing a simulated sugar solution environment to the metal surface. The detection sensitivity of SPR based sensors are revealed through this work.

**Key words:** Surface plasmon resonance, biochemical sensor, simulation analysis, angular scanning method

#### **1. Introduction**

In the current era of modern technology, both scientific research and commercial applications demand sensors for rapid and exact

analysis. Surface plasmon resonance (SPR) [1-5] biosensors are sophisticated detection and analysis tool with multiple applications in biotechnology, health care diagnosis, drug detection, preservation of the environment, food security and hygiene biological field and fluorescence-based correlated emissions [6-12]. Relative to traditional sensing techniques, plasmonic sensing technology's affordable manufacturing costs and versatility have made them the industry frontrunner in commercial sensors.

Surface plasmon resonance (SPR) occurs when plane-polarized light impacts a thin, semi-transparent metal sheet (such as silver or gold) placed at the bottom of a high-RI prism. When incoming light photons reach a certain critical angle of incidence, the metal surface absorbs them and transfers the energy to electrons, which transform into surface plasmons. A decrease in the intensity of reflected light indicates the production of surface plasmons. These circumstances are particularly sensitive to any changes occurring near to the metal-dielectric interface, such as the formation of molecular layers and the adsorption of molecules onto the metal surface. This optical approach analyses changes in the refractive index (RI) of a medium in close proximity to a metallic surface as a result of surface binding events. The composition of the metal and the wavelength of the incoming radiation play important roles in the generation of surface plasmons.

SPR sensing techniques can use phase, angular, intensity, and wavelength interrogation methods [13-19]. The angular scanning method provides a large dynamic window for a wide range of practical applications. This method of SPR detection is a prism based set up on Kretschmann Raether configuration [20-22]. It involves a thin metal film on top of a high-refractive-index prism, typically made of glass. When light is incident on the prism at a specific angle, an evanescent wave is generated at the metal-dielectric interface. When the angle of incidence matches the SPR angle, the evanescent wave couples with the surface plasmons, leading to a sharp decrease in reflected light intensity.

The present research works the SPR studies were conducted on the metal thin film in the nanometre range. Gold and copper are used for the simulation analysis of SPR response from the planar structures. Theoretical analysis was carried out on the basis of Fresnel's equations

for light waves. The SPR reflection dip was analysed and the studies were continued for biochemical sensitivity of these metals. Simulated sugar solution environment was used for the study of biochemical sensitivity of surface plasmons. The study shows the shift in the reflection dip in the presence of foreign particles on the metal surface.

## 2. Experimental Methods

Simulation analysis was carried out for the theoretical study of SPR response and its biochemical sensitivity from the metal's gold and copper. WinSpall Software is used to carry out the simulation operations. This is based on Fresnel's equations of electromagnetic radiations. These equations describe how light waves behave when they pass across an interface between two mediums with distinct refractive indices. By modifying the parameters such as the extinction coefficient, thickness, and refractive index, different SPR curves may be produced. Additionally, it offers a configuration for producing various curves for various incident light wavelengths, and appropriate prisms may be chosen.

SPR became apparent when light was incident on a thin metal layer via a prism with a sufficient refractive index. For incidence angles greater than the critical angle, light experiences entire internal reflection. However, due to evanescent waves, free electrons within the metal vibrate, resulting in surface plasmons. At the plasmon resonance angle, incident light is absorbed due to the phase matching condition between the incident light and the surface plasmon at the metal dielectric interface. The incident wave vector's in-plane component needed to be matched. This criterion results from solving Maxwell's equation for the boundary conditions, which states that the in-plane component of the electric field has to be continuous across the interface. The wave vectors, of the incident light in-plane of the interface ( $k_x$ ) and the surface plasmon ( $k_{sp}$ ), are given by

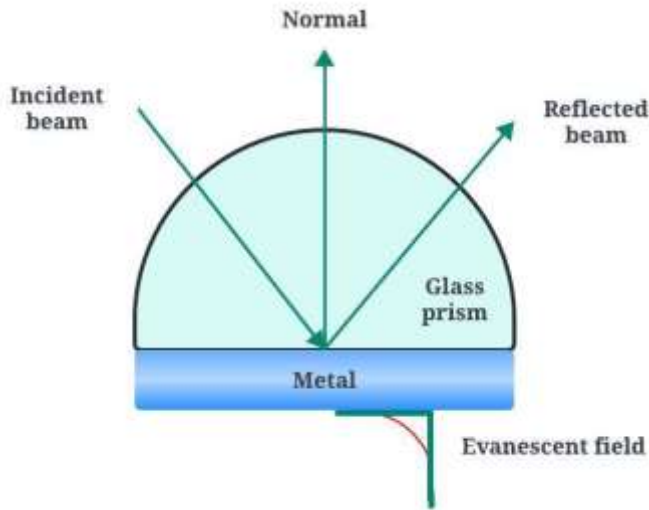
$$k_x = k_o n_p \sin \theta_i \text{ and } k_{sp} = k_o \left( \frac{\epsilon_m \epsilon_s}{\epsilon_m + \epsilon_s} \right)^{1/2} \quad (1)$$

Where  $\epsilon_m$  is the dielectric constant of the metal (m) and  $\epsilon_s$  is the effective dielectric constant at the metal dielectric interface. For SPR

absorption to occur, the light wave vector must equal the surface plasmon wave vector, as provided by:

$$k_{sp} = k_x = k_o n_p \sin \theta_{sp} \quad (2)$$

The most used method for excitation of surface plasmons is the attenuated total internal reflection method or prism coupling method. Kretschmann Raether configuration for the study of surface plasmons were shown in the figure-1.

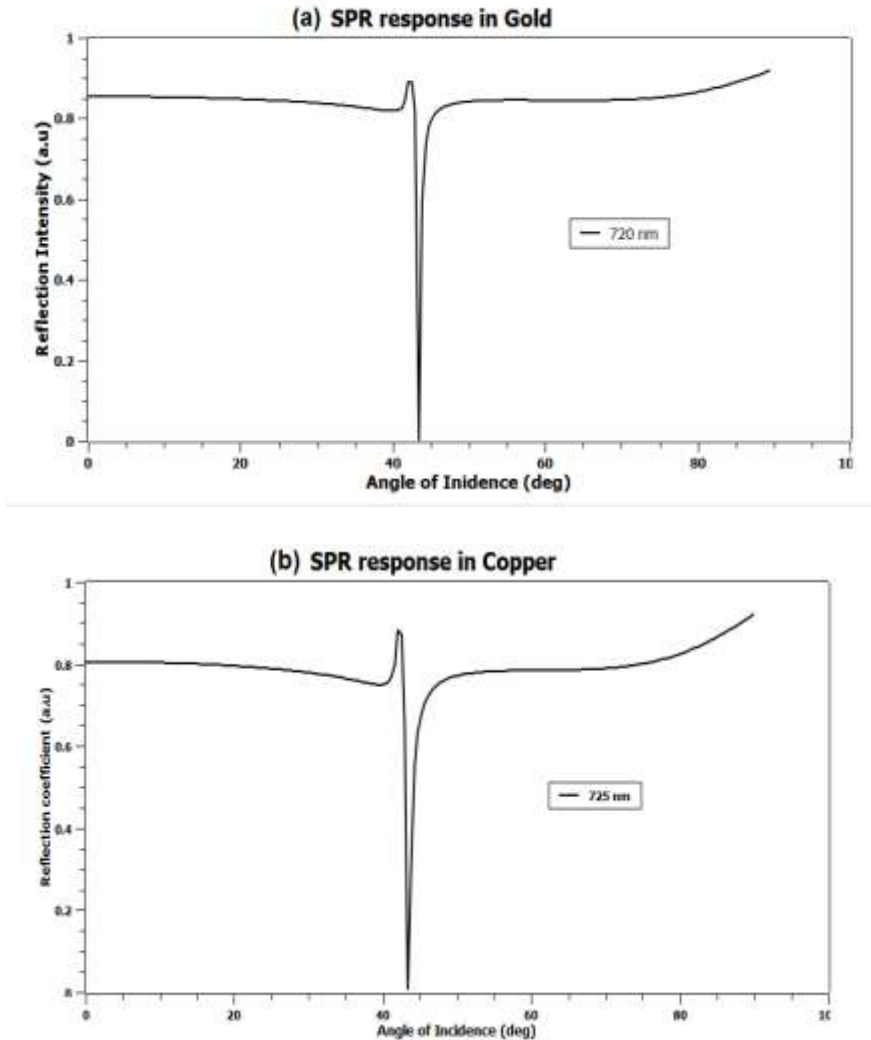


**Figure-1: SPR setup in the Kretschmann configuration**

In this setup the samples composed of metallic films on a glass substrate in air is attached to the glass prism. Light from below, at an angle relative to the film's normal, strikes the metal film from the glass side through prism. SPPs on the metal/air side may be triggered if the specified momentum matching conditions are achieved.

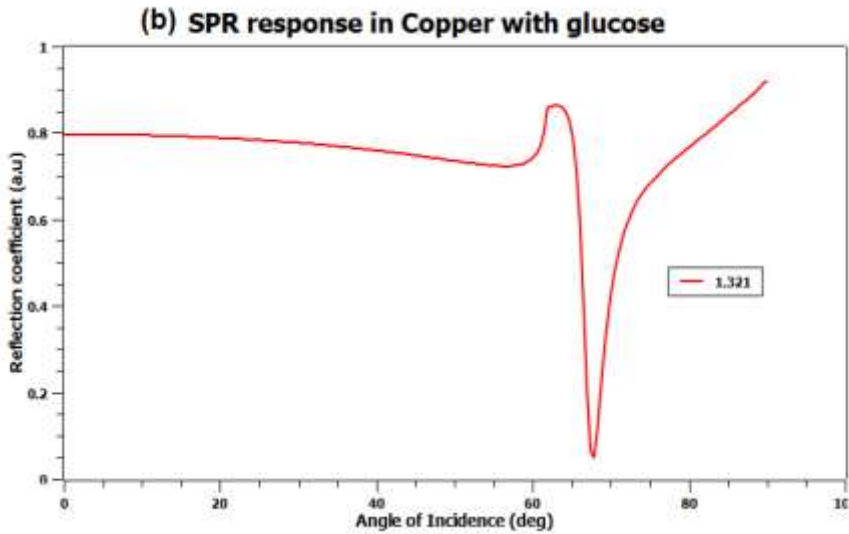
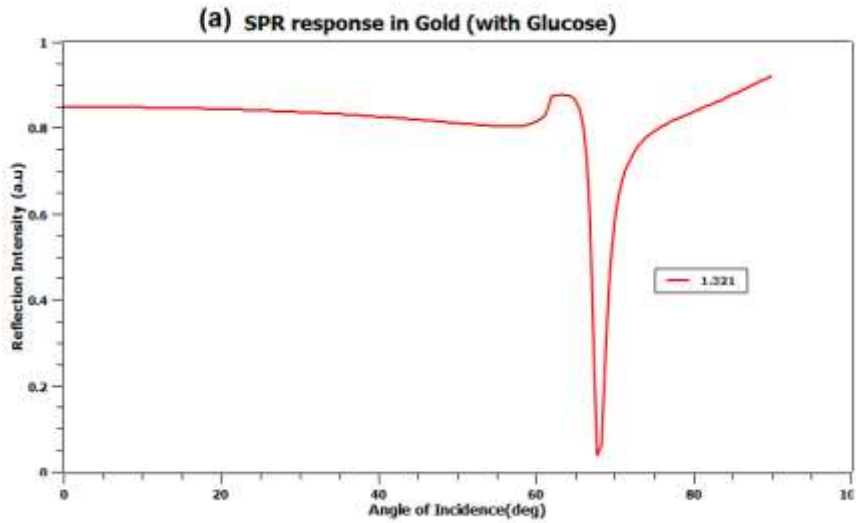
### 3. Results and Discussion

Surface plasmon resonance reflection curves were generated for an excitation wavelength of 500 nm. The thin metal planar films in the nanometer range were used for the analysis of the creation of surface plasmons theoretically. For gold films in the 50 nm thickness the Winspall generated SPR curve is shown in the figure-2(a) and for copper film is given in figure-2(c).



**Figure-2: (a) Simulated SPR response from gold thin film (b) Simulated SPR response from copper thin film**

Planar gold films in the nanometre range (50 nm) were excited with radiations of 720 nm wavelength. The generations of surface plasmons are detected by a sharp dip in the reflection curve in this angle scanning method of SPR detection. For gold film the dip was at 43.5°. The fullwidth at half maximum (FWHM) of the curve is 0.59. For thin copper film in the nanometer range (40 nm) (figure-2 (c)), the reflection dip shown in the curve is at 43.4°. The FWHM of this reflection dip is 0.96. It is higher than gold film but almost similar to an ideal SPR curve.



**Figure-3: (a) Simulated SPR response from gold thin film with glucose (b) Simulated SPR response from copper thin film with glucose**

To understand the chemical sensitivity of these metal SPR active structures, the simulation analysis was continued with glucose as the chemically active substance. By providing the refractive index corresponding to the glucose solution, the angle scanning process was done so as to find the change in the SPR curve. A drastic shift was

observed in the SPR curve of gold film, shown in the figure-3(a). The new SPR angle was at  $67.9^\circ$ , a shift of  $24.4^\circ$  was obtained for the gold metal planar system with glucose solution. For copper metal planar system, the presence of glucose shows a shift in the SPR curve with reflection angle at  $67.6^\circ$ . A shift of  $24.1^\circ$  was obtained in the presence of glucose. Thus, these two metal planar thin film systems are found to be highly sensitive to the biochemical environment that can be determined via angle scanning method of SPR detection.

#### **4. Conclusion**

By employing the simulation analysis using WinSpall software, the SPR studies were conducted on metal planar thin films of gold and copper in the nanometre range. The study continued for the biochemical sensitivity of these materials by employing a glucose solution. A large shift in the reflection curve was obtained from the normal dip of gold and copper films. This reflects the high sensitivity of these metals for the glucose molecule. Thus, the angular scanning method of SPR detection is a reliable and highly sensitive pathway for biochemical sensing.

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### Some Properties of Fuzzy Chordal Graphs

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#### **Abstract**

This paper explores properties of fuzzy chordal graphs as initially defined by John N. Moder- son and Premchand S. Nair. We examine these graphs in comparison to chordal graphs within crisp graph theory and fuzzy chordal graphs, providing illustrative counter examples where appropriate.

**Keywords:**Fuzzy graph,fuzzy chordal graph,eccentricity

#### **1 Introduction**

Graphs are a widely used tool for modeling relationships, where vertices represent objects and edges denote connections between them. When ambiguity exists in defining these objects or their interconnections, a fuzzy graph model becomes useful. The concept of fuzzy subsets, introduced by L.A. Zadeh [1] in 1965, provided a foundation for managing uncertainty. Later, Rosenfeld [5] formalized the fuzzy graph model in 1975, allowing Yeh and Bang [6] to explore various connectivity concepts in fuzzy graphs, such as vertex and edge connectivity, and to apply these models in data clustering. Influential figures like Bhutani, Moderson, Vijayakumar, Sunitha, and Sunil Mathew further advanced fuzzy graph connectivity concepts following Zadeh and Rosenfeld's pioneering work.

In crisp graph theory, chordal graphs hold significance due to their treelike structure composed of complete graphs, which enables some NP-hard problems to be solved in polynomial time. A chordal

graph is characterized as a simple graph where every cycle longer than three has an additional edge, or "chord," connecting two non-consecutive vertices within the cycle.[2]

## 2 Preliminaries

### 2.1 Definition

[9, 8] Let  $G(V, E)$  be a graph with the pair of mappings  $\sigma : V \rightarrow [0, 1]$  and  $\mu : E \rightarrow [0, 1]$  such that the condition  $\mu(x, y) \leq \sigma(x) \wedge \sigma(y)$  for all  $(x, y) \in E \subseteq V \times V$ , then  $G(V, E, \mu, \sigma)$  is called a **fuzzy graph**.

### 2.2 Definition

[7, 8, 9] A **Path**  $P$  of length  $n$  is a sequence of distinct nodes  $x_0, x_1, x_2, \dots, x_n$  such that  $\mu(x_{i-1}, x_i) > 0$ , for  $i = 1, 2, \dots, n$  and the degree of membership of the weakest arc is defined as its strength. If  $x_0 = x_n$  and  $n \geq 3$  then  $P$  is called a cycle

### 2.3 Definition

[7, 8, 9, 4] The strength of connectedness between two nodes  $u$  and  $v$  is defined as the maximum of strengths of all paths between  $u$  and  $v$  and is denoted by  $\text{CONN-G}(u, v)$ .

### 2.4 Definition

[9] A chord  $(u, v)$  in a cycle of length greater than 3 of a fuzzy graph  $G(V, E, \mu, \sigma)$  is said to be a **fuzzy strong chord** if  $\mu(u, v) \geq S(u, v)$ , where  $S(u, v)$  is the strength of connectedness between the vertices  $u$  and  $v$ . A graph has fuzzy strong chord then it is fuzzy chordal graph

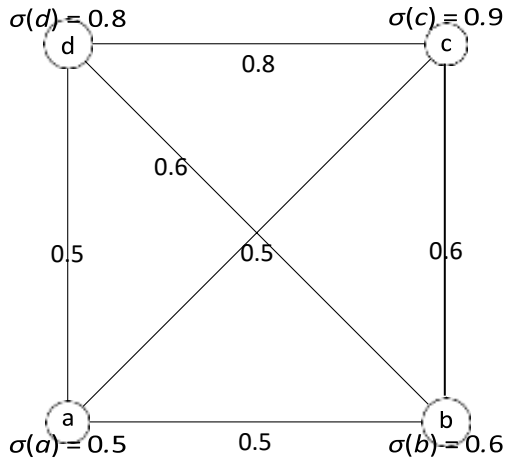
## 3. Properties of Fuzzy Chordal Graphs

### Theorem

[3, 9, 10] Every complete fuzzy graph is fuzzy chordal

### Example

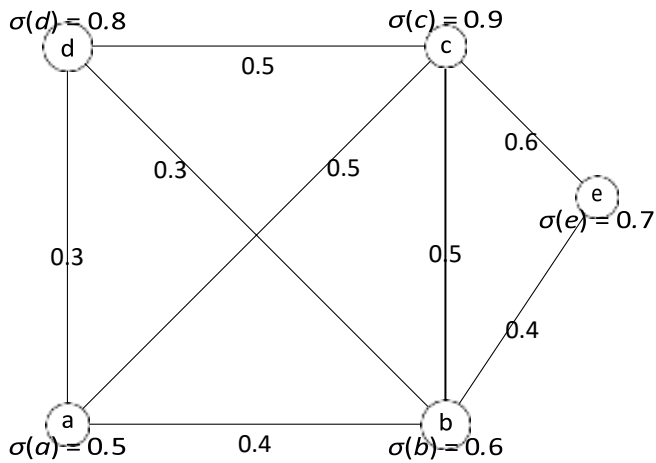
Let  $G$  be a complete fuzzy graph (see figure ) with four vertices  $a, b, c, d$  and  $(a, c)$  and  $(b, d)$  are fs-chord. so  $G$  is fuzzy chordal



**Remark**

The converse of above need not true. There exist fuzzy chordal graph which is not complete fuzzy graph

**Example**



Here this graph is fuzzy chordal but not complete fuzzy graph. Its membership value is not exactly the minimum of membership values of vertices.

**Theorem [3]**

If G is chordal and connected, then

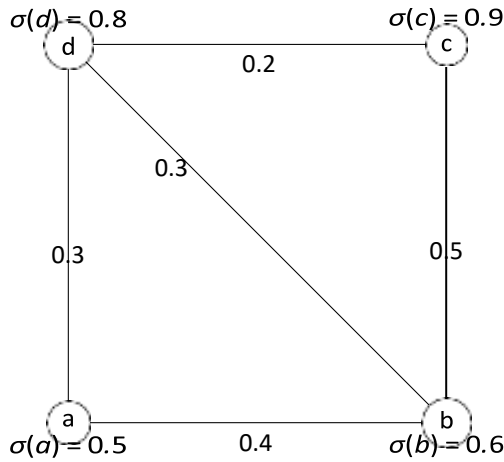
$$\frac{1}{2}d(G) \leq r(G) \leq \left\lceil \frac{1}{2}d(G) \right\rceil + 1.$$

**Proposition**

If G is fuzzychordal and connected. Then

$$\frac{1}{2}d(G) \leq r(G) \leq \left\lceil \frac{1}{2}d(G) \right\rceil + 1.$$

**Example**



$$d_f(a, b) = 0.4 \quad d_f(c, b) = 0.4$$

$$d_f(d, b) = 0.4$$

$$d_f(d, c) = 0.2$$

$$d_f(a, d) = 0.3$$

$$d_f(a, c) = 0.4$$

eccentricity

$$e(a) = 0.4$$

$$e(b) = 0.4$$

$$e(c) = 0.4$$

$$e(d) = 0.4$$

$$d(G) = 0.4$$

$$r(G) = 0.4$$

so

$$\frac{1}{2}d(G) + 1 = 1.2$$

The inequality satisfied

#### 4. Conclusion

In conclusion, this paper has presented an in-depth exploration of fuzzy chordal graphs, distinguishing them from crisp chordal graphs by examining their unique properties and connectivity structures. Through theoretical analysis and illustrative examples, we demonstrated that while every complete fuzzy graph is fuzzy chordal, the converse does not necessarily hold, underscoring the nuances in the relationship between completeness and chordality in fuzzy graph theory. The study of fuzzy strong chords, connectivity strengths, and the specific conditions required for a graph to be fuzzy chordal highlight the adaptability of these graphs in capturing relationships marked by uncertainty. Applications of fuzzy chordal graphs are particularly relevant in fields where ambiguous connections arise, such as data clustering, network analysis, and fields requiring flexible yet structured graph representations. These findings contribute to a deeper understanding of fuzzy graph theory and lay the ground-work for future research to further explore complex fuzzy graph structures and potential practical implementations. Future studies could investigate extensions of fuzzy chordal graph properties and their real-world applications, potentially enhancing methodologies for managing uncertainty in complex systems.

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### ملخص

تناولت هذه الأطروحة موضوع "إسهامات السيد أبي الحسن علي الندوي في الأدب العربي" مع تركيز خاص على كتابه "ماذا خسر العالم بانحطاط المسلمين". تم إعداد الأطروحة للحصول على شهادة البكالوريوس من جامعة كالكوت، تحت إشراف الأستاذ عبد الله عمر. يُعتبر أبو الحسن علي الندوي أحد أبرز المفكرين الإسلاميين والدعاة في القرن الماضي، وقد أسهم بشكل كبير في الأدب الإسلامي الحديث من خلال كتاباته الغزيرة التي تناولت مواضيع متعددة. كما أسس رابطة الأدب الإسلامي التي تهدف إلى نشر الأدب الإسلامي وتطويره. تتضمن الأطروحة تحليلاً لكتاب "ماذا خسر العالم بانحطاط المسلمين"، الذي يتألف من فصلين. يتناول الفصل الأول مضمون الكتاب، بينما يركز الفصل الثاني على تحليل حياة المسلمين في ظل موضوع الكتاب. يشدد الكتاب على ضرورة عودة الأمة الإسلامية إلى تاريخها الغني لتحقيق الإصلاح.

تضمن العمل مراجعة شاملة للمراجع الأدبية المتصلة بالموضوع، ويعبر الكاتب عن شكره لكل من ساعده في إتمام هذه الأطروحة. يُختتم الملخص بالدعاء بالتوفيق وزيادة العلم النافع.

### المقدمة

بسم الله الرحمن الرحيم الصلاة والسلام على اشرف الأنبياء والسيد المرسلين.....  
هذه الأطروحة كتبت حول موضوع "إسهامات السيد أبي الحسن علي الندوي في الأدب العربي مع إشارات خاصة إلى كتاب "ماذا خسر العالم بانحطاط المسلمين". تم اعداده الحصول على شهادة البكالوريوس من جامعة كالكوت تحت اشراف الاءستاذ عبد الله عمر ك بقسم اللغة العربية وآدابها بكلية ام إي اس كلدي للدراسات المتقدمة مناراكاذ

وهو أبو الحسن علي بن عبد الحي بن فخر الدين الحسن الندي، وهو من الأعلام المفكرين الإسلاميين، ومن أبرز الدعاة في القرن الماضي، وأحد رواد الأدب الإسلامي الحديث، وقد تميز ببراعته الأدبية، وموهبته العالية ويظهر ذلك جلياً من خلال كتاباته ومؤلفاته الضخمة، والتي غطت معظم المجالات والفنون الأدبية والدراسات الإسلامية، كما كرس حياته وجل اهتماماته للدعوة والإصلاح، ومعالجة القضايا الهامة للأمة الإسلامية، ومن جهة أخرى فقد كان له الفضل في تأسيس رابطة الأدب الإسلامي، والتي من أهم واجباتها العمل على نشر الأدب الإسلامي وتطويره والدعوة إليه، وقد توسعت نشاطاتها حتى وصلت إلى جميع أنحاء العال

يحلل كتاب "ماذا خسر العالم بانحطاط المسلمين" لأبوحسن علي الندوي . وفيه فصلان، الفصل الأول يتحدث عن مضمون كتاب "ماذا خسر العالم بانحطاط المسلمين"، والثاني عن إنحطاط حياة الاسلامي في ضوء الكتاب.

أنعم الله علينا أن يستفيد من هذا الكتاب وأن يصب على كل طالب نفعته إلى يوم القيامة اسمه ونسبه:

على أبو الحسن بن عبد الحي بن فخر الدين الحسني - ينتهي نسبه إلى عبد الله الأشتر بن محمد ذي النفس الزكية بن عبد الله المحض بن الحسن السبط بن علي ابن أبي طالب رضى الله عنه هاجر بعض أجداده وهو الأمير السيد قطب الدين محمد المدني (م 677هـ) إلى الهند في أوائل القرن السابع الهجري.

أبوه علامة الهند ومؤرخها السيد عبد الحي بن فخر الدين الحسني رحمه الله صاحب المصنفات المشهورة " نزهة الخواطر وبهجة المسامع والنواظر في تراجم علماء الهند وأعيانها - طبع أخيراً باسم : الإعلام بمن في تاريخ الهند من الأعلام في ثمانية مجلدات والهند في العهد الإسلامي" ، و "الثقافة الإسلامية في الهند". أمه - رحمها الله - كانت من السيدات الفاضلات المرثيات النادرات المؤلفات المعهودات، تحفظ القرآن وتكتب وتؤلف، وتقول الشعر.

ميلاده ونشأته:

ولد بقرية تكيه بمديرية راي بريلي في الولاية الشمالية - (Uttar Pardash) بالهند في 6 محرم 1333هـ الموافق عام 1914م. بدأ تعلمه للقرآن الكريم في البيت تعاونه أمه، ثم بدأ في تعلم اللغتين الأردية والفارسية.

توفي أبوه عام 1341هـ - ( 1913م) وهو لم يزل دون العاشرة، فتولى تربيته أمه الفاضلة، وأخوه الأكبر الدكتور عبد العلي الحسني الذي كان هو الآخر طالباً في كلية الطب بعد تخرجه من دار العلوم ندوة العلماء ومن دار العلوم ديوبند.

بدأ تعلم العربية على الشيخ خليل بن محمد الأنصاري اليماني عام 1342هـ (1924م) وتخرج عليه، كما استفاد. في دراسة اللغة العربية وآدابها - من عليه الشيخ عزيز الرحمن والشيخ محمد طلحة، وتوسع فيها وتخصص على الأستاذ الدكتور تقي الدين الهلالي عند مقدمه في ندوة العلماء عام 1930 م.

حضر احتفال ندوة العلماء بكانفور عام 1926م، وشد انتباه المشاركين في الاحتفال بكلامه العربي، واستعان به بعض الضيوف العرب في تنقلاته خارج مقر الحفل التحق بجامعة كهنأؤ في القسم العربي عام 1927م - وكان أصغر طلاب الجامعة سينا - وحصل على شهادة فاضل أدب في اللغة العربية وآدابها. قرأ أيام دراسة

اللغة العربية الأولى كتباً تعتبر في القمة في اللغة الأردية وآدابها ، مما أعانه على القيام بواجب الدعوة وشرح الفكرة الإسلامية الصحيحة، وإقناع الطبقة المثقفة بالثقافة العصرية.

عكف على دراسة اللغة الإنجليزية في الفترة ما بين 1928 1930م مما مكنته من قراءة الكتب المؤلفة . بالإنجليزية - في المواضيع الإسلامية والحضارة الغربية وتاريخها وتطورها، والاستفادة منها مباشرة. التحق بدار العلوم لندوة العلماء عام 1929م، وحضر دروس الحديث الشريف للعلامة المحدث المربي حيدر حسن خان وكان قد درس كتاب الجهاد من صحيح الإمام مسلم على شيخه خليل الأنصاري، ولأزمه سنتين كاملتين فقرأ عليه الصحيحين، وسنن أبي داؤد، وسنن الترمذي حرفاً

حرفاً، وقرأ عليه دروساً في تفسير البيضاوي أيضاً، وقرأ على الشيخ الفقيه المفتي شبلي الجبراجبوري الأعظمي بعض كتب الفقه.

تلقى تفسير سور مختارة من شيخه خليل الأنصاري، ثم تلقى دروساً في التفسير من الشيخ عبد الحي الفاروقي، وحضر دروس البيضاوي للمحدث حيدر حسن خان، ودرس التفسير لكامل القرآن الكريم - حسب المنهج الخاص للمتخرجين من المدارس الإسلامية - على العلامة المفسر أحمد على اللاهوري في لاهور عام 1351هـ / 1932م . أقام عند العلامة المجاهد حسين أحمد المدني عام 1932م في دار العلوم ديوبند عدة أشهر، وحضر دروسه في صحيح البخاري وسنن الترمذي، واستفاد منه في التفسير وعلوم القرآن الكريم أيضاً، كما استفاد من الشيخ الفقيه الأديب إعزاز علي في الفقه، و من الشيخ المقرئ أصغر علي في التجويد على رواية حفص .  
أسرته

أن أسرة الشيخ الندوي هي أسرة عربية الأصل وعريقة ذات فضل و علم ، ترجع جذورها إلى سيدنا الحسن بن علي بن ابي طالب ، رضي الله عنه، فاشتهرت بالأسرة الحسنية . وهي لاتزال تحافظ على أنسابها وصلاتها و بأصلها العربي ، و إن كانت تعيش في الهند منذ قرون ، و تمتاز بتمسكها ب الشريعة الإسلامية ، وبذل الجهد في نشر العلم وخدمة الإسلام والعمل الخير المسلمين وإن أول من هاجر من المدينة المنورة واستوطن بالهند من هذه الأسرة الشريفة هو الأمير السيد قطب الدين محمد المدني ( 581-677 هجري ) . فأقام في مدينة دملی فترة من الزمن، و تدولي مشيخة الإسلام فيها ، لادن الح اطره لم يطمئن على ذلك، فخرج مع جماعة كبيرة من أصحابه مجاهدا في سبيل الله ، و توفي عام 677 هجري في مدينة " لنره مان لك بدور " . فجزاه الله تعالى عن الإسلام خير الجزاء.

وقد بارك الله - تعالى - في ذرية الأمير السيد قطب الدين ، و تقبلها بقبول حسن و البته نباتا حسنا ، ونفع بها العوام والخواص من المسلمين ، حيث توفر فيها العلماء والدعاة والمجاهدون في سبيل الله والمربون المفكرون ، الذين حملوا أعباء التعليم والتربية والدعوة إلى الله ، وقادوا الحركات الدينية وترأسوا الهيئات الدعوية الإصلاحية في مختلف العصور والأزمان ، و برز فيهم السيد، وكان من الهند كما برز في ذريته عدد كبير من العلماء الفحول الذين لعبوا دورا هاما في خدمة الإسلام والمسلمين . و من أشهرهم السيد الإمام أحمد بن عرفان الشهيد الذي قاد حركة دعوية و إصلاحية هامة في تاريخ الهند ، و أسس حكومة إسلامية علي غرار الخلافة الراشدة في الحدود الشمالية الغربية للهند ، ولم تستمر هذه الحكومة الإسلامية طويلا نتيجة مؤامرات المستعمرين الإنجليز ضدها أهدافه ومهماته طرد الإنجليز الغاشمين من الهند و تحرير البلاد من براثنهم . و وقعت معركة حامية الوطيس بينه و بين جيوش السيخ - عملاء المستعمرين الانجليز - في منطقة بالاكوت في 24 ذي القعدة عام 1246 هجري الموافق 6 ماب وعام 1831م ، واستشهد فيها الإمام أحمد مع عدد كبير من أصحابه، وقد ترك الإمام السيد أحمد بن عرفان بعده أثرا عميقا في نفوس المسلمين طار صيته في أنحاء الهند في أنحاء العالم الإسلامي . الحسني الندوي هو السيد فخر الدين بن عبد العلي الحسني ولد عام 1256 ان زامداً نقياً وعالمأ ربانيا ، توفي في 10 رمضان 1326 هجري الموافق أكتوبر عام 1908م رحمه الله تعالى علم الله فضيل الحسني المتوفي في عام 1096 هجري في القرن الحادي عشر الهجري، الذي أنشأ المركز الديني التربوي والإصلاحي في بلدة " راي بريلي "

كما نبع من بعده في هذه الأسرة لكبار العلماء والمؤلفين والمؤرخين والادباء والدعاة ، الذين عرفهم العالم الإسلامي من خلال إنجازاتهم و مآثرهم. الى الدعوة والإرشاد والأدب واللغة والتاريخ .  
بدء التدريس

بدأ الشيخ أبو الحسن الندوي دراسته في وقت مبكر من حياته، حيث تعلم حروف الهجاء وبدأ بقراءة الكتب الصغيرة المكتوبة باللغة الأردية، واستطاع ختم القرآن الكريم وهو في سن صغيرة، والتحق بعد ذلك بالكتّاب التابع لمسجد الحي الذي كان يقطن فيه، وبعد أن أنهى دراسة مبادئ اللغة الأردية بدأ في تعلم اللغة الفارسية، وتعلمها على يد الشيخ البارغ الفذ محمود علي، الذي اشتهر عنه التهذيب والأدب والثقافة. وكان في نفس الوقت يقرأ كتب والده الصغيرة؛ من بينها كتاب تعليم الإسلام وكتاب نور الإيمان، كما تعلم الخط على يد أفضل الشيوخ في هذا الوقت. بحلول عام 1341 هجرية توفي والده فذهب للعيش مع أخيه الكبير السيد عبد العلي الحسني، واستمر في دراسة اللغة الفارسية حتى المرحلة المتوسطة، لكن أخاه أراد له أن يتعلم أيضاً اللغتين العربية والإنجليزية.  
تعلم اللغة العربية

تعلم أبو الحسن الندوي اللغة العربية على يد الشيخ خليل بن محمد بن حسين بن محسن الأنصاري اليماني، ودرس على يديه مبادئ الصرف والنحو، وقرأ على يديه عدداً من الكتب المهمة؛ كالطريقة المبتكرة، مدارج القراء، المطالعة العربية وكليلة ودمنة. ثم درس الكتب العربية المهمة والقديمة مثل مقامات الحريري والقصائد العشر، وكان حينها لم يتجاوز عمر الثانية عشرة، لذا أصبح يتكلم العربية بطلاقة. بحلول عام 1927م التحق الندوي بقسم الأدب العربي في جامعة لكانا وكان حينها لم يتجاوز الرابعة عشرة من العمر، إذ كان أصغر الطلاب سناً في الجامعة، واستطاع الحصول على شهادة فاضل أدب بتفوق، وحصل على منحة وميدالية ذهبية، وسلمه الحاكم الإنجليزي الشهادة بنفسه عام 1929م، وفي العام التالي استطاع الحصول على شهادة الفاضل في الحديث.  
رحلاته

سافر إلى مدينة لاهور عام ١٩٢٩م ، وكانت أول رحلة له إلى بلد بعيد. تعرف على علمائها و أعيانها و التقى بشاعر الإسلام الدكتور محمد إقبال، و كان قد ترجم بعض قصائده.  
سافر إلى الحج عام ١٩٤٧م ، وكانت أول رحلة خارج الهند وأقام هناك ستة أشهر، وتعرّف فيها على كبار علماء الحجاز من أمثال عبد الرزاق حمزه إمام الحرم المكي وأطلع فضيلته على مسوّد كتابه " ماذا خسر العالم بانحطاط المسلمين" أيض فأعجب به و شجع المؤلف على نشره.  
ورحل للحج مرة أخرى عام ١٩٥١م وتعرف على أدباء الحجاز وكتابها ثم تكررت رحلاته إلى البلاد المقدسة.

زار مصر للمرة الأولى عام ١٩٥١م، و مكث في القاهرة ستة أشهر تقريباً، و كان كتابه " ماذا خسر العالم بانحطاط المسلمين قد سبقه إلى الأوساط العلمية، فكان خير معرف لمؤلفه. و في الرحلة نفسها سافر إلى السودان و الشام و القدس و الأردن، و التقى بالسودان مع أعيانها و كبار رجالها.  
أقام في الشام ٤٨ يوماً و زار مدن سوريا و التقى مع كبار علمائها و أدبائها، و في فلسطين زار بيت المقدس و تشرف بزيارة المسجد الأقصى و صلى العيد فيه.

زار الشام للمرة الثانية زائراً في كلية الشريعة بجامعة دمشق عام ١٩٥٦م، وسافر في هذه الرحلة ١٩٥٦م إلى لبنان أيضاً، و التقى فيها مع الشخصيات الدينية و العلمية، وكذلك سافر في الرحلة نفسها إلى تركيا لأول مرة و مكث فيها أسبوعين طبعت مذكراتها بعنوان "أسبوعان في تركيا الحبيبة".

سافر إلى الكويت عام ١٩٦٢م و إلى الإمارات العربية المتحدة عام ١٩٧٤م و إلى قطر عام ١٩٩٠م و في عام ١٩٧٣م إلى أفغانستان و إيران و لبنان و العراق..

سافر إلى الأردن عام ١٩٨٤م و ألقى محاضرات في جامعة اليرموك و كذلك زار اليمن و ألقى محاضرات في جامعة صنعاء في العام نفسه، وزار المغرب الأقصى عام ١٩٧٦م،

وسافر إلى الجزائر عام ١٩٨٢م ، ثم عام ١٩٨٦م ، وسافر إلى بورما عام ١٩٦٠م، و إلى باكستان عام ١٩٦٤م ، ثم عام ١٩٧٨م ،

وسافر إلى بنغلاديش عام ١٩٨٤م.

كانت رحلته الأولى إلى أوروبا عام ١٩٦٣ و الثانية ١٩٦٤م، و الثالثة عام ١٩٦٩، و الرابعة إلى لندن كانت عام ١٩٨٣م بمناسبة تأسيس مركز أكسفورد للدراسات الإسلامية، ثم تكررت رحلاته إلى إنكلترا زار بلجيكا عام ١٩٨٥م و سافر إلى أمريكا وكندا عام ١٩٧٧م و زار أمريكا مرة أخرى عام ١٩٩٣م. سافر إلى ماليزيا عام ١٩٨٧م و ألقى محاضرات في عدة جامعات هناك،

سافر إلى تاشقند و سمرقند و خرتنك و بخارى، عام ١٩٩٣م لحضور مناسبة تأسيس مركز علمي تذكارا "للإمام البخاري".

رحلاته الدعوية

وتوجه إلى بومباي عام 1935م لدعوة الدكتور أمبيذكر زعيم المنبذين إلى الإسلام قام برحلة استطلاعية للمراكز الدينية في الهند عام 1939م.

سافر للحج عام 1947م ، وكانت أول رحلة له خارج الهند وأقام بالحجاز ستة أشهر، وتعرف على كبار علماء الحجاز، أمثال أصحاب الفضيلة الشيوخ عبد الرزاق حمزة عمر بن الحسن آل الشيخ، والسيد علوي المالكي، وأمين الكتبي، وحسن مشاط ومحمد العربي التباني، ومحمود شويل، وكانت رسالته إلى ممثلي البلاد الإسلامية" قد طبعت فكانت خير معرف لمؤلفها في الحجاز، وقد قرأها ذات يوم فضيلة الشيخ محمد علي الحركان على طلابه في المسجد النبوي الشريف، واطلع فضيلة الشيخ عبد الرزاق حمزة إمام الحرم المكي على مسودة كتابه ماذا خسر العالم بانحطاط المسلمين" فأعجب به وشجع المؤلف الناهض على نشره.

رحل الحج مرة أخرى عام 1951، وتعرف على أدبائها وكتابها بصفة خاصة، وعلى رأسهم معالي الشيخ محمد سرور الصبان والتقى بهم عدة لقاءات كان أهمها اللقاء في بستان البخاري بمكة المكرمة الذي حضره جمع من الشباب الأدباء والصحفيين وكبار الموظفين أمثال الأساتذة: سعيد العامودي وعبد القدوس الأنصاري، وعلي حسن فدعق ومحسن أحمد باروم وحسين عرب، وكانت الجلسة حسب تعبير سماحته كأنها جلسة نقاش للطلاب قدروا فيه مدى معرفته اللغة العربية، وسيروا فوزه في دراسته ومعلوماته العامة، واطلاعه على اللغة الإنجليزية، فكانت الأسئلة حيناً عن الأدب العربي وأعلامه المعاصرين، وأخرى عن الاشتراكية والأدب الإنجليزي والحضارة الغربية وما إلى ذلك، وكانت النتيجة أن طلب منه إلقاء سلسلة من الأحاديث على إذاعة جدة، فألقاها بعنوان: "بين العالم وجزيرة العرب" ثم تكررت رحلاته للبلاد المقدسة.

زار مصر للمرة الأولى عام 1951م وكان كتابه "ماذا خسر العالم بانحطاط المسلمين" قد سبقه إلى الأوساط العلمية والدينية والدعوية والأدبية فكان خير معرف لمؤلفه. ومكث في القاهرة ستة أشهر إلا قليلاً، وألقى سلسلة من الأحاديث والمحاضرات في مختلف النوادي والجمعيات التي تعرف فيها على شباب مصر والأوساط القديمة والجديدة، و استرعى انتباههم، والتقى فيها من كبار العلماء ومشايخ الأزهر مع شيخ الأزهر عبدالمجيد سليم، ومحمد ثلثوت، وأحمد محمد شاكر، و حسنين

محمد مخلوف ومحمد حامد الفقي، ومحمد عبد اللطيف دراز، ومحمد فواد عبد الباقي، ومصطفى صبري باشا (شيخ الإسلام سابقاً بالدولة العثمانية).

ومن القادة والزعماء مع سماحة المفتي أمين الحسيني، والأمير عبد الكريم الريفى، واللواء صالح حرب باشا.

ومن الدعاة والمفكرين الإسلاميين سيد قطب، ومحب الدين الخطيب، وأحمد الشرباصي، ومحمد الغزالي، وسعيد رمضان وصالح العشماوي، وبهي الخولي ومن الأدباء أحمد أمين، وعباس محمود العقاد، وأحمد حسن الزيات.

وكان من أهم الأحاديث التي ألقاها محاضرة في دار الشبان المسلمين بعنوان: "الإسلام على مفترق الطرق وأخرى بعنوان: "الدعوة الإسلامية وتطوراتها في الهند في حفل أقاله رئيس عام جمعيات الشبان المسلمين تكريماً له، والثالثة حول شعر" إقبال ورسائله في كلية دار العلوم والرابعة بعنوان: الإنسان الكامل في نظر الدكتور محمد إقبال" في جامعة فؤاد الأول، عدا محاضرات في عدد من المراكز الدعوية والجمعيات مثل شباب سيدنا محمد صلى الله عليه وسلم، وجمعية أنصار السنة المحمدية، والجمعية الشرعية، وجمعية العشيرة المحمدية، وجمعية مكارم الأخلاق، والرابطة الإسلامية وحضر ندوة دعوية في منزل سيد قطب حول كتابه: ماذا خسر العالم بانحطاط المسلمين". وفي الرحلة نفسها نشرت رسالته بعنوان: "اسمعي يا مصر" علق عليها سيد قطب قائلاً: "قرأت اسمعي يا مصر ويا ليت مصر قد سمعت".

ونظم له الإخوان رحلات وجولات دعوية زار فيها - عدا القرى والأرياف القناطر الخيرية وطنطا وبنا وحامول وحلوان وسنتريس والمحلة الكبرى ونكله والعريزية وقويسنا ونبروه، رافقه فيها ترجمان الإخوان والداعية الكبير محمد الغزالي، وذلك عدا لقاءات متكررة مع الطلاب في أروقة الأزهر والفنادق.

وسافر في الرحلة نفسها إلى السودان والشام والقدس والأردن، والتقى في السودان مع أعيانها وكبار رجالها، أمثال السيد علي مير غني باشا، والأستاذ إسماعيل بك الأزهرى رئيس وزراء السودان فيما بعد وشوقي أسد سكرتير جمعية التبشير الإسلامي، ومحمد عوض إمام المسجد الجامع، والحاج محمد سليمان قائد العمال ورئيس جمعية الشبان المسلمين.

أقام في الشام 48 يوماً، قضى 24 يوماً منها في دمشق وزار في باقيها حمص، وحماه، ومعرفة النعمان، و حلب، وحارم، فكانت فرصة للاتصال بالأوساط العلمية والدينية والأدبية المختلفة ومقابلة شخصياتها الموقرة وتبادل الآراء معها، فزار من مؤسسات الشام ومراكزها العلمية والأدبية مركز الإخوان المسلمين بجامع الدقاق والمجمع العلمي العربي بدمشق، والمكتبة الظاهرية، ومدرسة دار الحديث وجمعية التمدن الإسلامي وحضر إحدى جلسات البرلمان السوري المهمة المثيرة وألقى محاضرة في قاعة جامعة دمشق بعنوان: "شهادة العلم والتاريخ في قضية فلسطين" عدا محاضرات في كل من الهيئة العلمية الإسلامية، وجمعية التمدن الإسلامي، والجمعية الغراء، ومركز الإخوان المسلمين في حمص، ومركز الإخوان بحماة، وفي اجتماع كبير بحلب.

التقى في دمشق مع كبار علمائها وأدبائها أمثال أصحاب الفضيلة عبدالوهاب الصلاحي، ومكي كنانى، وأحمد الدفر، ومحمد بهجة البيطار، وأبي الخير الميداني، ومصطفى السباعي، ومحمد المبارك ومصطفى الزرقاء، ومحمد أحمد دهمان وأبي اليسر عابدين حفيد العلامة الشامي ومفتى الجمهورية وأحمد كفتارو، ومحمد سعيد برهاني، ومحمد علي حوماني، و تيسير ظبيان، ومحمد كمال خطيب ومحمد كرد علي، ومحمد عزة دروزة، و خليل مردم بك، وعبد القادر المغربي، وكان

يرافقه ويساعده في الوصول إلى الناس وزياراتهم الأستاذ عبدالرحمن الباني الذي كان مدرسا في كلية المعلمين بدمشق.

وكانت رحلته الثانية إلى أوروبا عام 1964م زار فيها لندن وبرلين وأخن وميونخ وبون، والرحلة الثالثة كانت عام 1969م بدعوة من المركز الإسلامي بجنيف زار فيها جنيف ولندن وبرمنغهام ومانشستر وبلنك برن وشيفلد وديوزبري وليدس وغلانغو، وألقى في كل منها محاضرات، منها محاضرة في جامعة برمنغهام، وأخرى في جامعة ليدس، وقد طبعت محاضراته وأحاديثه في أوروبا بعنوان : "حديث مع الغرب والرحلة الرابعة إلى لندن كانت عام 1983م بمناسبة تأسيس مركز أكسفورد للدراسات الإسلامية

وألقى في تلك المناسبة مقاله القيم بعنوان: الإسلام والغرب ثم تكررت رحلاته إلى إنكلترا. وسافر إلى أمريكا وكندا بدعوة من منظمة الطلاب المسلمين" عام 1977م حيث زار نيويورك وإنديانابولس، وبلومغتن، ومنهاتن ونيويورك، وشيكاغو، وجرسي ستي، وفيلادلفيا، وبالتيمور وبوستن، وترايت، وسالت ليك ستي وسان فرانسيسكو، وسان جوزي، ولوس أنجلوس، ومونتريال، وتورنتو، وواشنطن، وألقى محاضرات في كل من جامعة كولومبيا، وجامعة هارورد، وجامعة دنترائت وجامعة جنوب كاليفورنيا، وجامعة أوناء، وفي قاعة الصلاة بالأمم المتحدة، وفي اجتماعات المسلمين الخاصة، طبعت أهم محاضرات هذه الرحلة بعنوان : أحاديث صريحة في أمريكا" وزار أمريكا مرة أخرى عام 1993م.

سافر بدعوة من حركة "أبيم حركة الشباب المسلم إلى ماليزيا عام 1987م، فزار كوالالمبور وكو الاترنكانو، وألقى محاضرات في الجامعة الوطنية، والجامعة التكنولوجية، والجامعة الماليزية والجامعة الإسلامية العالمية، ومركز حركة "أبيم"، ومركز الحزب الإسلامي، ومعهد التربية الإسلامية واجتماعات عامة للمسلمين.

سافر إلى طشقند و سمرقند، وخرتتك، وبخارى عام 1993م لحضور مناسبة تأسيس مركز علمي تذكارا للإمام البخاري.

حياته العملية وجهوده الدعوية

تعين مدرسا في دار العلوم لندوة العلماء عام 1934م، ودرس فيها التفسير والحديث، والأدب العربي وتاريخه والمنطق.

تزوج عام 1934م، وعوضه الله عن أولاده من الصلب ابن الأخ الداعية الكاتب الموهوب (محمد الحسني رحمه الله) وأبناء الأخت الصالحين البررة الدعاة المخلصين محمد الثاني رحمه الله، محمد الرابع، ومحمد الخامس وهو المعروف بـ: واضح رشيد حفظهما الله)

استفاد من الصحف والمجلات العربية الصادرة في البلاد العربية - والتي كانت تصل إلى أخيه الأكبر، أو إلى دار العلوم ندوة العلماء مما عرقه على البلاد العربية وأحوالها، وعلمائها وأدبائها ومفكرها عن كتب.

بدأ يتوسع في المطالعة والدراسة - خارجاً عن نطاق التفسير والحديث والأدب والتاريخ أيضاً منذ عام 1937م، واستفاد من كتب المعاصرين من الدعاة والمفكرين العرب ، وفضلاء الغرب ، و الزعماء السياسيين.

قام برحلة استطلاعية للمراكز الدينية في الهند عام 1939م تعرف فيها على الشيخ المرابي عبد القادر الراي بوري والداعية المصلح الكبير محمد إلياس الكاندهلوي، وبقي على صلة بهما، فتلقى التربية الروحية من الأول وتأسى بالثاني في القيام بواجب الدعوة واصلاح المجتمع، ففضى زما في رحلات دعوية متتابعة للتربية والاصلاح والتوجيه الديني على منهجه، واستمرت الرحلات الدعوية - على اختلاف في الشكل والنظام - إلى مرض وفاته رحمه الله في ذي الحجة عام 1420 هـ .

أسس مركزا للتعليمات الإسلامية عام 1943م ونظم فيها حلقات درس للقرآن الكريم والسنة النبوية فتهافت عليها الناس من الطبقة المثقفة والموظفين الكبار.

اختير عضوا في المجلس الانتظامي [الإداري] لندوة العلماء عام 1948م ، وعين نائبا لمعتمد (وكيل) ندوة العلماء للشؤون التعليمية بترشيح من المعتمد العلامة السيد سليمان اللذوي رحمه الله - عام 1951م، واختير معتمداً - إثر وفاة العلامة رحمه الله - عام 1954م، ثم وقع عليه الاختيار أميناً عاماً لندوة العلماء بعد وفاة أخيه الدكتور السيد عبد العلي الحسني - عام 1961م.

أسس حركة رسالة الإنسانية عام 1951م.

أسس المجمع الإسلامي العلمي في لكهنأو عام 1959م

شارك في تأسيس هيئة التعليم الديني للولاية الشمالية (IP) عام 1960م، وفي تأسيس المجلس الاستشاري الإسلامي لعموم الهند عام 1961م، وفي تأسيس هيئة الأحوال الشخصية الإسلامية لعموم الهند عام 1972م .

دعا إلى أول ندوة عالمية عن الأدب الإسلامي في رحاب دار العلوم لندوة العلماء عام 1981م .

#### أهم مؤلفاته:

نشر له أول مقال بالعربية في مجلة "المنار" للسيد رشيد رضا عام 1931م حول حركة الإمام السيد أحمد بن عرفان الشهيد في بالاكوت عام 1831م)

ظهر له أول كتاب بالأردية عام 1938م بعنوان " سيرة سيد أحمد شهيد ونال قبولاً واسعاً في الأوساط الدينية والدعوية.

ألف كتابه " مختارات في أدب العرب" عام 1940م ، وسلسلة قصص النبيين" للأطفال وسلسلة أخرى

للأطفال باسم القراءة الراشدة في الفترة ما بين 1942-1944م

بدأ في تأليف كتابه المشهور ماذا خسر العالم بانحطاط المسلمين" عام 1944م، وأكمه عام 1947م، وقد طبعت ترجمته الأردية في الهند قبل رحلته الأولى للحج عام 1947م.

ألف - عام 1947م - رسالة بعنوان : إلى ممثلي البلاد الإسلامية موجهة إلى مندوبي المسلمين والعرب المشاركين في المؤتمر الآسيوي المنعقد في دلهي على دعوة من رئيس وزراء الهند وقتها : جواهر لال نهرو - فكانت أول رسالة له انتشرت في الحجاز عند رحلته الأولى.

كلفته الجامعة الإسلامية في عليكره (AMD) الهند، بوضع منهاج لطلبة الليسانس في التعليم الديني أسماه إسلاميات"، وألقي في الجامعة المليية بدلهي - على دعوة منها عام 1942م محاضرة طبعت بعنوان : بين الدين و المدنية".

دعي أستاذاً زائراً في جامعة دمشق عام 1956م، وألقى محاضرات بعنوان: التجديد و المجددون في تاريخ الفكر الإسلامي" ضمت - فيما بعد إلى كتابه الكبير رجال الفكر والدعوة في الإسلام ". ألقى محاضرات في الجامعة الإسلامية بالمدينة المنورة - على دعوة من نائب رئيسها سماحة الشيخ عبد العزيز بن عبد الله بن باز عام 1963م، طبعت بعنوان: "النبوة والأنبياء في ضوء القرآن". سافر إلى الرياض على دعوة من وزير المعارف السعودي - عام 1968م للمشاركة في دراسة خطة كلية الشريعة، وألقى بها عدة محاضرات في جامعة الرياض وفي كلية المعلمين، وقد ضم بعضها إلى كتابه: "نحو التربية الإسلامية الحرة في الحكومات والبلاد الإسلامية". ألف - بتوجيه من شيخه عبد القادر الراي بوري - كتاباً حول القاديانية، بعنوان: "القادياني والقاديانية" عام 1958م.

ألف كتابه " الصراع بين الفكرة الإسلامية والفكرة الغربية في الأقطار الإسلامية عام 1965م، وكتابه " الأركان الأربعة" عام 1967م، و "العقيدة والعبادة والسلوك" عام 1980م، و " صورتان متضادتان لنتائج جهود الرسول الأعظم والمسلمين الأوائل عند أهل السنة والشيعة، عام 1984م، و "المرتضى" في سيرة أمير المؤمنين علي بن أبي طالب عام 1988م. الصحافة:

شارك في تحرير مجلة " الضياء " العربية الصادرة من ندوة العلماء عام 1932م، ومجلة "الندوة" الأردنية الصادرة منها أيضاً عام 1940م، وأصدر مجلة " التعمير " الأردنية عام 1948م. وتولى كتابة افتتاحيات مجلة " المسلمون " الصادرة من دمشق في الفترة ما بين 59- 1958 م وكانت أولها هي التي نشرت فيما بعد بعنوان : ردة و لا أبا بكر لها"، كما ظهرت له مقالات في مجلة "الفتح" للأستاذ محب الدين الخطيب.

أشرف على إصدار جريدة "نداي" "ملت" الأردنية الصادرة عام 1962م، وكان المشرف العام على مجلة "البعث الإسلامي" العربية الصادرة منذ عام 1955م، وجريدة "الرائد" العربية الصادرة منذ عام 1959م، وجريدة "تعمير حيات" الأردنية الصادرة منذ عام 1963م، والمجلة الإنجليزية The Fragrance الصادرة منذ عام 1998م، أربعتها تصدر من ندوة العلماء، وكان هو المشرف العام على مجلة "معارف" الأردنية الصادرة من دار المصنفين بأعظم كره، ومجلة الأدب الإسلامي الصادرة من رابطة الأدب الإسلامي العالمية مكتب البلاد العربية، ومجلة كاروان أدب الصادرة من رابطة الأدب الإسلامي العالمية مكتب بلاد شبه القارة الهندية. تقدير وتكريم

اختير عضواً مراسلاً في مجمع اللغة العربية بدمشق عام 1956 م. وأدار الجلسة الأولى لتأسيس رابطة العالم الإسلامي بمكة المكرمة عام 1962م، نيابةً عن رئيسها مفتي عام المملكة العربية السعودية محمد بن إبراهيم آل الشيخ -وقد حضر أولها الملك سعود بن عبد العزيز آل سعود كما حضرها الملك محمد إدريس السنوسي حاكم ليبيا، وشخصيات أخرى ذات شأن وقدم فيها مقالته القيم بعنوان: الإسلام فوق القوميات والعصبيات.

اختير عضواً في المجلس الاستشاري الأعلى للجامعة الإسلامية بالمدينة المنورة منذ تأسيسها عام 1962م، ظل عضواً فيه إلى انحلال المجلس- وانضمام الجامعة في سلك بقية الجامعات السعودية تابعة لوزارة التعليم العالي - قبل أعوام. اختير عضواً في رابطة الجامعات الإسلامية منذ تأسيسها عام 1969 م.

اختير عضواً في المجمع العلمي العربي الهندي منذ تأسيسه 1976 م.  
 اختير عضواً مؤزراً في مجمع اللغة العربية الأردني عام 1980 م.  
 تمّ اختياره لجائزة الملك فيصل العالمية لخدمة الإسلام عام 1980 م.  
 مُنح شهادة الدكتوراه الفخرية في الآداب من جامعة كشمير عام 1981 م.  
 اختير رئيساً لمركز أكسفورد للدراسات الإسلامية عام 1983 م.  
 اختير عضواً في المجمع الملكي لبحوث الحضارة الإسلامية (مؤسسة آل البيت) عام 1983 م.  
 تأسست رابطة الأدب الإسلامي العالمية عام 1984 م واختير رئيساً عاماً لها.  
 أقام عبد المقصود خوجة - من أعيان جدة - حفلاً لتكريمه بجدة عام 1985 م.  
 اختير عضواً للهيئة الاستشارية لمجلة الشريعة والدراسات الإسلامية إحدى مجلات مجلس النشر العلمي في جامعة الكويت في ديسمبر 1988 م واستمر حتى توفاه الله.  
 أُقيمت ندوة أدبية حول حياته وجهوده الدعوية والأدبية عام 1996 م في تركيا على هامش المؤتمر الرابع للهيئة العامة لرابطة الأدب الإسلامي العالمية.  
 مُنح جائزة الشخصية الإسلامية لعام 1998 م في رمضان 1419 هـ وقدم إليه الجائزة ولي العهد لحكومة الإمارات العربية المتحدة محمد بن راشد آل مكتوم.  
 منح جائزة السلطان حسن البلقية العالمية في موضوع سير أعلام الفكر الإسلامي من مركز أكسفورد للدراسات الإسلامية عام 1998 م (1419 هـ).

منحه معهد الدراسات الموضوعية بالهند جائزة الإمام ولي الله الدهلوي لعام 1999 م - والتي تم منحها لأول مرة - وكان قد تقرر اختياره لهذه الجائزة في حياته ولكن وافته المنية قبل الإعلان الرسمي، وقد استلم هذه الجائزة باسم ابن أخته محمد الرابع الحسني الندوي في دلهي في 7 شعبان 1421 هـ (نوفمبر 2000 م).

منحته المنظمة الإسلامية للتربية والعلوم والثقافة (إيسكو ISESCO) -تقديرًا لعطائه العلمي المتميز للخدمات الجليلة التي قدمها إلى الثقافة العربية الإسلامية - وسام الإيسيسكو من الدرجة الأولى. وقد استلم هذا الوسام نيابة عنه ابن أخته أمين ندوة العلماء العام محمد الرابع الحسني الندوي وكيل ندوة العلماء للشؤون التعليمية عبد الله عباس الندوي في الرباط في 25 شعبان 1421 هـ. أهم الجوائز والشهادات التي منحت لسماحة الشيخ الندوي اعترافاً بخدماته العلمية والدينية

- ١- جائزة الملك فيصل العالمية لخدمة الإسلام ١٩٨٠ م
  - ٢ - شهادة الدكتوراه الفخرية في الآداب من جامعة كشمير ١٩٨١ م
  - ٣- جائزة الشخصية الإسلامية لعام ٥١٤١٩ التي منحت لسماحته من حكومة دبي .
  - ٤ - جائزة سلطان بروناي للخدمة الإسلامية عام ١٤٣٠ هـ
- نبذة عن مؤلفاته:

رجال الفكرة والدعوة في الإسلام  
 هذا الكتاب من ابرز مؤلفات الشيخ أبي الحسن علي الحسن الندوي، يتناول سير الأعلام الذين قادوا حركة الدعوة الإسلامية الإصلاحية والنهضة العلمية. وهو عمل موسوعي يرسم خلاله الطريقة المثلى للدعوة والثقافة والتربية وصياغة العقلية والواعية والكتاب جمع المحاضرات القيمة التي ألقيت على مسامع الطلبة في جامعة دمشق بناء على دعوة من القائمين عليها عام 1375 هـ، وعددها عشر محاضرات، ثم أضيفت إليها خمس مقالات، والكتاب يتوزع في أجزاء وفصول كما يلي: يبحث

الجزء الأول عن سيرة الحسن البصري وخلفائه، كما يتكلم على حركة التدوين في الإسلام وتنظيم الحياة على الأسس الدينية. ثم يتطرق إلى حياة الإمام احمد بن حنبل أبي الحسن الأشعري، ويليه بحث عن انحطاط علم الكلام وازدهار الفلسفة الباطنية. وقد خصص في هذا الجزء دراية مستفيضة لحجة الإسلام ي

حامد الغزالي ودوره في نقد الفلسفة ودحض أباطيل الدهريين والماديين بجانب دراسة وافية عن دوره مصلحا اجتماعيا. ويتناول الكتاب كذلك شخصية الشيخ عبد القادر الجيلاني والخدمات التي كرسها لتجديد معالم الدين والدعوة إلى الإسلام ويليه دراسة عن جلال الدين الرومي. والجزء الثاني يبحث عن شخصية الشيخ أحمد بن تيمية وتلاميذه ابن القيم الجوزية وابن عبد الهادي والحافظ بن رجب. والجزء الثالث خاص بالإمام السر هندي مجدد الألف الثاني، كما أن الجزء الرابع خاص بشخصية الإمام شاه ولي الله الدهلوي.

والكتاب بأجزائه عرض مقطعي لمسيرة التطور الفكري والثقافي التي يمثل كل واحد من هؤلاء الأعلام جزءا منها من القرن الأول وانتهاه بالقرن الرابع عشر الهجري. ومؤخرا صدر عن المجمع الإسلامي العلمي بلكناؤ الجزء الخامس من هذه السلسلة وموضوعه الإمام أحمد بن عرفان الشهيد قام بتأليفه الأستاذ محمد واضح رشيد الندوي مواصلة للخدمات العلمية التي بدأها العلامة الندوي ووفاء لصنيعه الجميل في مسيرة التأليف.

#### ماذا خسر العالم بانحطاط المسلمين

يعد هذا الكتاب من أعماله الرائعة، فهو يعج بالأفكار البناءة والاتجاهات والوهاجة والعواطف الجياشة عن واقع العالم والمسلمين. وكان صدوره في مستهل حياته الفكرية إلا أنه يضم بين دفتيه أفكارا ناضجة قطوفها دانية وهي أفكار عالم اطلع على أحوال العالم ممن شرقه إلى غربه وعرف شعوره ومزايا حياته ما اطلع على صفحات التاريخ التي سجلت فيها قصص البطولات. وكان صدور هذا الكتاب حدثا كبيرا في الأوساط الدينية والثقافية في العالم العربي والإسلامي. وصار حديث المحافل والمجالس لأنه رج القراء رجا، وكانه ينفخ في الصور فأحيى نفوسا وأشعل أرواحا، فأخذ الناس يقرؤونه مبهورين يخافون أن تنفذ صفحات الكتاب المحور الأساسي لهذا الكتاب يلمح في النص الآتي: "لم يكن انحطاط المسلمين أولا، وفشلهم وانزعاهم عن قيادة الأمم بعدا وانسحابهم من ميدان الحياة والعمل أخيرا، حادثا من نوع ما وقع وتكرر في التاريخ من انحطاط الشعوب والأمم وانقراض الحكومات والدول وانكسار الملوك والفاحين وانهزام الغواة المنتصرين، وتقلص المدنيات والجزر السياسي بعد المد، فما أكثر ما وقع مثل هذا في تاريخ كل أمة، وما أكثر أمثاله في تاريخ الإنسان العام. ولكن هذا الحادث كان غريبا لا مثيل له في التاريخ مع ان في التاريخ مثلا وأمثلة في حاث غريب."

والكتاب من أوله على آخره نداء إلى المسلمين في العالم كله لاستعادة روحهم وثقتهم بأنفسهم والاستمسك بالقيم الدينية والحضارية والثقافية التي كان عليها الرعيل الأول من الأمة. وقد أنهى تأليفه عام 1945 ممن وهي فترة زمنية شهدت تغيرات جذرية في مجال الفكر من جراء الانقلابات السياسية والدينية التي حدثت انذاك، مما كان له أثر في اتجاهات الكاتب. ويكفي هذا الكتاب فضلا أن أثنى عليه العلماء المعاصرون مثل الدكتور محمد يوسف موسى أحد أساتذة الأزهر حيث يقول: "أشهد لقد قرأت الكتاب حين ظهرت طبعته الأولى في أقل من يوم وأرغمت به غراما شديدا، حتى لقد كتبت في آخر صفحاته وقد فرغت منه إن قراءة هذا الكتاب فرض على كل مسلم يعم لإعادة مجد

الإسلام. بدأ الكتاب نقاشه مشيراً إلى الداهية الكبرى التي عمت العالم حين انحدر المسلمون، وهذه الداهية لم تحدث عشية وضحاها، وإنما تمت بالتدرج بحيث لم يظن إلى خطورتها احد، لأن المسلمين كانوا الروح للجسم البشري بما كانوا ورثة رسالة الأنبياء بصفة عامة والرسالة المحمدية بصفة خاصة. والمحرك الرئيس لهم لدفع عجلة الثقافة والإنسانية إلى الأمام هو الإيمان بالله الذي لا يضاويه أي عقيدة أخرى. ثم يسرد أسماء الأبطال الذين كرسوا حياتهم لخدمة هذه الرسالة.

وقد خصص هذا الكتاب فصلاً للمقارنة بين الحضارة الإسلامية والحضارة الغربية الحديثة. ويقول إن حضارة الغرب ذات جذور، وهي منبثقة من حضارة الإغريق والرومان، وطابعها المادية التي هدفها الابتزاز والاستعمار وجلب خيرات الآخرين، ولا يقيمون للقيم والأخلاق وزناً، مما نتج عنه النعرات القومية في كل دولة، زعماً منهم أنهم أفضل من غيرهم. وقد طبع هذا الكتاب عدة طبعات، ونفدت كلها إثر إصداره مباشرة، كما ترجم إلى عدد من اللغات العالمية مثل الإنجليزية والألمانية والفارسية، ومما لا شك فيه أن نداء الأستاذ أبي الحسن على الندوي صادف أذناً صاغية وقلوباً واعية وفعل في النفوس فعل السحر.

#### المسلمون في الهند

هو من أهم المؤلفات لأبي الحسن علي الحسن الندوي، وهذا الكتاب يتحدث عن الهند وعن المسلمين فيها قديماً وحديثاً، ويتناول هذا الحديث نواحي شتى في الحياة العلمية والاجتماعية والدينية، وعماً أضافه المسلمون إلى ثروة الهند منذ خولها وما أدخلوا عليها من إصلاحات، وتجديدات في مختلف نواحي الحياة، وعماً أنتجه المسلمون في الهند في العلوم الإسلامية وما زادوا إلى تراثها، ومن نبع فيها من العلماء الكبار والمؤلفين العظام، وعن مظاهر نشاط المسلمين العلمي والديني، ومراكزه الكبيرة في العصر الحاضر، وعن خصائص هذا الشعب وطبيعته وشخصيته وعن ماضيه وحاضره، وعن قضاياها الرئيسية ومشكلاته.

فيتناول هذه كلها في أبواب مثل دور المسلمين في حضارة الهند" و "تراث العلماء المسلمين العلمي في الهند وعنايتهم باللغة العربية" و "نوابع الشعب الهندي الإسلامي" و "تأثير اللغة العربية في اللات الهندية" و "الحضارة الإسلامية في الهند" و "الحركة العلمية القديمة في الهند مراكزها ومزاياها" و "مزايا منهج التعليم القديم" و "مراكز العلم والثقافة الإسلامية في الهند" و "الصوفية في الهند وتأثيرها في المجتمع" و المسلمون في الهند شعب ممتاز" و "الدور الذي قام به المسلمون في تحرير الهند" و "مشكلات الشعب الإسلامي الهندي" و "شخصية الشعب المسلم مقوماتها ومصادرها".

#### وفاته

كان سماحة الشيخ الندوي رحمه الله أصيب بجلطة " الفالج" بالجانب الأيمن من جسده في اليوم السادس عشر من شهر آذار عام ١٩٩٩ م ، و لقد تحسنت صحته بعد علاج و عناية مشددة وبفضل دعوات المسلمين له و لكن أنهكه هذا المرض و اشتد الضعف.

و كان من عادة الشيخ أنه يقضي شهر رمضان في بيته في القرية ، و لكن الأطباء قد قرروا بأن سماحة الشيخ سيقضي شهر رمضان في لكهنو هذه السنة لتسهيلات طبية و لكنه استأذن الأطباء لقضاء العشر الأواخر من الشهر المبارك في قريته "تكية كلان"، و سافر مع بعض أقربائه وعدد كبير من محبيه إلى القرية ٢٠ من رمضان و ٢٩ ديسمبر ١٩٩٩ م و يرافقه معالجوه الأطباء و كان اليوم الثالث من قدومه يوم . الجمعة وهو آخر يوم ١٩٩٩ م و آخر يوم لحياة سماحة شيخنا المربي الجليل في هذه الدنيا فقد وافاه الأجل في كان لسنة في ٢٢ أو ٢٣ البلاد العربية من رمضان المبارك و كان قد استعد لصلاة الجمعة وجلس يتلو سورة الكهف قبل الصلاة كعادته ، منذ الصغر و لكنه

شرح يتلو سورة "يسين" عوضاً عن سورة الكهف وقرأ عدة آيات ثم أصابته فجأة سكتة قلبية لقي على أثرها ربه عز وجل. فإنا لله و إنا إليه راجعون .

توفي في أيام مباركة في العشر الأواخر من شهر رمضان وقد صلى عليه صلاة الغائب في عدد من الأقطار الإسلامية و العربية حيث صلى عليه في الحرمين الشريفين صلاة الغائب عقب صلاة العشاء في أفضل ليلة من ليالي العام ليلة سبع وعشرين الليلة المباركة التي يرجى فيها إجابة الدعاء وقد صلى عليه ما يقارب ثلاثة ملايين مصل كما صلى عليه سماحة الشيخ أحمد كفتارو مع حشد كبير من المسلمين صلاة الغائب عقب صلاة الجمعة في دمشق الفيحاء في مجمع أبي النور الإسلامي . و وفاة الشيخ في هذه الأيام المباركة و انشغال المسلمين بالصلاة عليه والدعاء له في أكثر عواصم العالم الإسلامي كل هذا من بشائر الخير والرحمة له إن شاء الله تعالى.

أن يتعمد سماحة شيخنا الفاضل برحماته، وأن يلقبه الزلف والغفران ويرفع درجته في أعلى درجات المقربين عنده و أن يجعل الآخرة التي انتقل إليها خيراً له من الدنيا التي خرج منها و أن ينفعنا والمسلمين جميعاً به ظاهراً وباطناً. ويفيض علينا وعلى المسلمين أنوار بره و عرفانه. نسأل الله العلي القدير.

#### خاتمة

الحمد لله الذي وفقني لأن أتم هذه الأطروحة بعد البحث والدراسات وقد بذلت جهودي البالغة لإعداد هذه الأطروحة واستطعت أن أدرس وأبحث حول موضوع دراسة تحليلية عن موضوع كتاب "ماذا خسر العالم بإنحطاط المسلمين" لأبي حسن علي الندوي، هو مشهور بين كتاب الأدب العربي الهندي بكثرة مؤلفاته. وهو من علماء شبه القارة الهندية وهو مشهور بين العلماء. وهذا الكتاب يتضمن اصلاح الأمة وضرورة عودتها السريعة للنهل من تاريخها الغني. وله مؤلفات عديدة وبارزة في اللغة و الأداب وفي علوم أخرى.

وحاولت أن تكون هذه الأطروحة مشتملة على جميع جوانب الموضوع بحسب طاقتي أني جمعت الموارد وراجعت المراجع الأدبية المتصلة بهذه الأطروحة. واشكر الله شكر جزيلاً من صميم فوادي لمن ساعدتني لإتمام هذه الأطروحة أختتم هذه الأطروحة بتوفيق الله سبحانه الله زدنا علماً نافعاً، أمين.....

**“The role of trade union in employees satisfaction: A case study of KSRTC DEPOT Sulthan Bathery”**

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**ABSTRACT**

This study explores the impact of trade unions on employee satisfaction at the Kerala State Road Transport Corporation (KSRTC) Sulthan Bathery Depot. It highlights the critical role of trade unions in advocating for workers' rights, improving working conditions, and addressing grievances. The research employs a mixed-methods approach, combining primary data from a survey of 92 employees with secondary sources. The findings indicate a diverse range of opinions regarding the effectiveness of unions, revealing that while many employees view unions positively in terms of workload management and timely wage payments, scepticism remains regarding their overall impact on job satisfaction. A Chi-square analysis confirms a significant relationship between trade union activities and employee satisfaction. Recommendations include enhancing educational initiatives, fostering better communication between unions and management, and prioritizing the welfare of all employee categories. The study underscores the importance of trade unions in promoting a supportive work environment, emphasizing the need for continual adaptation to meet the evolving needs of the workforce.

**INTRODUCTION**

Trade Unions in India have played a crucial role in settling industrial disputes, representing both workers' and employers' interests. Historically, the trade union movement began with the factory

system in India, leading to the formation of the first unions by 1920. Key unions include the All India Trade Union Congress (AITUC), Indian National Trade Union Congress (INTUC), Hind Mazdoor Sabha (HMS), and Bharatiya Mazdoor Sangh (BMS). These unions aim to secure better wages, improve working conditions, protect workers' rights, and maintain industrial peace. Kerala has a strong trade union presence, particularly in the transport sector through the Kerala State Road Transport Corporation (KSRTC), where unions have influenced labour-management relations. Trade Unions not only protect workers' rights but also contribute to employee satisfaction, which is essential for enhancing productivity and overall organizational success.

The employment conditions of KSRTC (Kerala State Road Transport Corporation) workers in Kerala are shaped by various factors, including government policies, union activities, and operational challenges. KSRTC employs workers in diverse roles such as drivers, conductors, clerks, mechanics, station masters, and sweepers, each critical to its operations. Employees are classified as permanent, contract, or casual, with permanent employees enjoying better job security and benefits, while contract and casual workers face job insecurity and fewer benefits. KSRTC's wage structure is based on roles and seniority, but in recent years, financial difficulties have led to salary delays, particularly affecting casual and contract workers. Long working hours, especially for drivers and conductors, often extend beyond eight hours without adequate rest, raising concerns about worker welfare. Unions play a crucial role in advocating for better wages, job security, and benefits like pensions, health insurance, and dearness allowance, though disputes between unions and management frequently lead to strikes and service disruptions. While permanent employees enjoy pension benefits, financial instability has resulted in delayed pension payments and irregular salaries.

Working conditions in depots and garages are often challenging, particularly for maintenance staff, who face hazardous environments and insufficient safety measures. Grievances related to wages, working conditions, and delayed payments are common, with room for improvement in grievance redressal processes. Ongoing financial struggles, including delayed disbursement of salaries and arrears, have

created uncertainty for employees, especially contract and casual workers. The government has introduced reforms aimed at improving KSRTC's financial viability through measures like voluntary retirement schemes and operational restructuring, but these have been met with both support and resistance from workers and unions. Overall, while unions have been instrumental in advocating for workers' rights, financial challenges continue to impact job security, wages, and working conditions, leaving many workers uncertain about their future in KSRTC.

Several studies highlight key aspects of employment satisfaction in the context of public transportation organizations. Dr. K Saravana (2016) focused on KSRTC passengers' satisfaction, pointing out that factors like bus fares, timeliness, employee behavior, and service quality outside Kerala affect overall satisfaction. Parvathy R Nair (2019) examined absenteeism and its impact on work performance, suggesting that management style changes could reduce absenteeism and improve satisfaction. Lekshmy SN and Dr. P Devakumar (2017) explored job satisfaction among female conductors in KSRTC, emphasizing the need for organizational commitment to address turnover and improve employee retention.

## **SIGNIFICANCE OF THE STUDY**

This study examines the role of Trade Unions in employee satisfaction at KSRTC's Sulthan Bathery Depot. It identifies programs and policies that enhance worker satisfaction and provides a comprehensive reference for future research on the relationship between unionism and employees, addressing gaps in previous unidimensional studies.

## **OBJECTIVES OF THE STUDY**

The objectives of the study are to examine the role of trade unions in enhancing employee satisfaction and to identify the contributions made by trade unions for the welfare of employees. Additionally, the research aims to assess the effectiveness of union initiatives in addressing worker grievances and improving working conditions. By analyzing the interplay between trade union activities and employee morale, this study seeks to provide insights into how unions can further support and advocate for their members' needs and interests.

## **METHODOLOGY**

The methodological frame work of this study comprised both primary data and secondary data. The primary data contains a field survey with a pre- determined questionnaire. The data collected by taking 92 households from the study area, and the questions are in the line with the objectives of the study. The study also makes use of secondary data. These data has been collected from various sources like Journals, Medias, and Websites etc. The collected data are analysed and depicted through various statistical tools like tables, diagrams, percentage, and appropriate testing methods. For testing the hypothesis here using Chi-square test.

## **RESULT AND DISCUSSION**

The study on the satisfaction of workers at KSRTC Sulthan Bathery Depot reveals insightful findings about the gender distribution, educational background, job roles, membership tenure, and opinions on the role of trade unions. Out of 92 respondents, 46.7% identified as female and 53.3% as male, showing a slight predominance of male participants in the sample. Educational attainment among the respondents varied significantly, with 19.5% holding a diploma, 16.3% being graduates, and 19.6% having pursued postgraduate studies. A notable percentage had completed "Plus Two" (20.7%) and SSLC (21.7%), showcasing a diverse range of educational backgrounds.

In terms of roles within the organization, clerks made up 13% of the workforce, conductors 14%, drivers 9%, mechanics 13%, peons 9%, station masters 12%, storekeepers 12%, superintendent officers 15%, and sweepers 2.17%. Each category plays an essential role in the overall functioning of the depot.

Membership in the trade union showed a broad range of tenure, with 34% of respondents being members for less than one year, 32.6% for less than five years, and 32.6% for more than five years. This indicates a diverse range of union membership duration among the workers. Regarding employment type, 17.39% of respondents were casual labourers, 28.2% held contract positions, 32% were permanent full-time employees, and 22% were permanent part-time employees.

The survey also examined union membership fees, with 65.2% of respondents indicating that their union required a membership fee, while 34.8% reported no fee. When asked about the union's stance on strikes, 55.4% believed that the union supports strikes, while 44.6% disagreed, indicating a divided opinion among the workers.

Regarding trade union support for workers' interests, 55.4% believed unions serve this purpose, while 44.6% disagreed. Satisfaction with the role of unions in improving working conditions also showed mixed results, with 30.4% of respondents either highly satisfied or satisfied, while 13% expressed dissatisfaction. A substantial 21.7% remained neutral, reflecting varying levels of engagement with union activities.

Perceptions of the union's role in handling grievances also varied. While 21.7% were highly satisfied, a significant portion (28.3%) remained neutral, and 22.8% expressed satisfaction. Respondents were divided on unions' role in ensuring timely wage payments, with 29.3% satisfied, 14.1% highly satisfied, and a notable 18.5% highly dissatisfied.

The study also found mixed opinions on unions' role in ensuring gender justice, handling employee transfers, and disbursing dearness allowances, with varying levels of agreement, disagreement, and neutrality. Overall, the findings show a diverse range of opinions regarding trade union effectiveness, with a majority viewing their efforts positively while some workers remain skeptical.

## **THE ROLE OF TRADE UNIONS IN EMPLOYEE SATISFACTION**

The relationship between trade unions and employee satisfaction is a critical area of study, particularly within organizations like the Kerala State Road Transport Corporation (KSRTC). This study aims to examine this relationship and assess how trade unions contribute to the overall satisfaction of their members. To guide this inquiry, a null hypothesis (H<sub>0</sub>) was established: There is no significant relationship between the statistical level and the role played by the trade union.

To evaluate the hypothesis, a Chi-square analysis was conducted, focusing on various aspects of trade union activities that relate to employee satisfaction. The findings from this analysis are presented in the table below:

**Table 1****Trade union activities relate to employee satisfaction**

	<b>Pearson's Value</b>	<b>Likelihood Ratio</b>	<b>DF</b>	<b>P Value</b>	<b>Number of Valid Cases</b>
Trade union in the allotment of workload	136.737	113.692	45	<.001	92
Trade union in improvement of working conditions	161.169	108.610	45	<.001	92
Trade union in the payment of wages and salary on time	171.674	144.243	45	<.001	92
Trade union in grievances handling	174.939	112.349	45	<.001	92

**Source:** Computed data

The Chi-square analysis provides significant insights into the role of trade unions in enhancing employee satisfaction. First, the analysis reveals a strong relationship between the trade union's involvement in workload distribution and employee satisfaction, as indicated by a Pearson's value of 136.737 and a p-value of less than 0.001. This underscores the union's crucial role in ensuring equitable allocation of tasks among members. Additionally, the findings highlight a statistically significant association between trade union initiatives aimed at improving working conditions and employee satisfaction, demonstrated by a Pearson's value of 161.169 and a similarly low p-value. The analysis also shows a robust link between the timely payment of wages, facilitated by the trade union, and overall employee satisfaction, with a Pearson's value of 171.674. This emphasizes the importance of financial reliability in fostering a content workplace. Finally, the results indicate that the trade union's effectiveness in handling grievances is vital for employee satisfaction, supported by a Pearson's value of 174.939.

Together, these findings illustrate that the various roles played by trade unions significantly impact the overall satisfaction and well-being of employees.

Based on the Chi-square analysis, the null hypothesis (H<sub>0</sub>) is rejected, affirming that there is a significant relationship between the statistical level and the role played by trade unions in enhancing employee satisfaction within KSRTC. The data strongly emphasize the importance of trade union activities in various dimensions of workers' welfare and overall job satisfaction. As such, the role of trade unions is not merely supportive but essential in promoting a more satisfied and engaged workforce, which ultimately benefits the organization as a whole.

## **CONCLUSION**

The study on the role of trade unions in enhancing employee satisfaction at the KSRTC Sulthan Bathery Depot underscores their critical importance in advocating for workers' rights and improving overall workplace conditions. The findings indicate a generally positive perception of trade unions among employees, highlighting their contributions to wage negotiations, grievance handling, and the promotion of better working conditions. However, the presence of skepticism among some workers points to the need for ongoing improvements in union practices and communication strategies.

To enhance the efficacy of trade unions and further boost employee satisfaction, several recommendations can be implemented. First, trade unions should actively engage in educational initiatives that inform workers about their rights, benefits, and the importance of union membership. This can empower employees to voice their concerns and participate more actively in union activities. Second, establishing stronger communication channels between union representatives and management can facilitate quicker resolutions to conflicts and grievances. Joint committees can be formed to foster collaboration and transparency in decision-making processes. Finally, unions must prioritize the welfare of all employee categories, particularly casual and contract workers, to ensure equitable treatment and support. By advocating for comprehensive policies that address the needs of all

workers, trade unions can enhance job security and satisfaction across the board. In conclusion, while trade unions play a pivotal role in improving employee satisfaction at KSRTC, continued efforts to evolve and adapt to the workforce's changing needs are essential for fostering a more engaged and satisfied employee base.

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### Cryptographic Applications of Pell-Like Equation

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#### Abstract

This project investigates Pell's Equation and its generalization, the Pell-like Equation, highlighting their roles in cryptography. These equations form the basis for defining L-Groups, which are specialized cryptographic groups used to develop secure protocols such as the Diffie-Hellman key exchange and the ElGamal cryptosystem. By leveraging the mathematical properties of L-Groups, these protocols enable two parties to create a shared secret key or encrypt messages without directly sharing sensitive data, relying instead on the difficulty of the discrete logarithm problem for security. Through structured analysis, the project demonstrates how these cryptographic applications protect data confidentiality and integrity by translating complex mathematical problems into practical security tools. The work illustrates the deep connections between number theory and cryptography, showcasing Pell's Equation as a valuable framework for building secure communication protocols and encouraging further research in mathematically grounded cryptographic methods.

**Keywords:** Pell-like equations, L-Groups, Diffie-Hellman Key Exchange, Elgamal Cryptosystem

#### Introduction

This project explores Pell's Equation and its cryptographic applications, highlighting its role as a fundamental problem in number theory with significant uses in secure communications. Pell's Equation,

defined as  $X^2 - P.Y^2 = 1$ , where  $P$  is a square-free positive integer, has intrigued mathematicians since antiquity, including through **Bhaskara's** solution to  $X^2 - 61.Y^2 = 1$  and further work by **Wallis** and **Brouncker**. A broader form, the **Pell-Like Equation**  $X^2 - P.Y^2 = k$  (with  $k$  as any integer), has extended these applications, contributing to cryptographic methods that utilize the equation's properties. The project is structured into key sections: An introduction to Pell's Equation and its properties; a definition of **L-Groups**, cryptographic groups derived from Pell-like equations; and finally, practical applications of LGroups in cryptography, demonstrating how mathematical principles support secure key exchanges and encryption.

### **Pell's Equation**

In number theory, a Diophantine equation is one for which integer solutions are sought (or, sometimes, solutions in rational numbers). Typically, the number of variables is greater than the number of equations, allowing for the possibility of infinitely many solutions. The task of finding these solutions can sometimes be very challenging. A very famous quadratic Diophantine equation is Pell's equation.

#### **Definition**

Let  $P$  be a positive integer which is not a perfect square. The equation

$$x^2 - Py^2 = 1 \tag{1}$$

is called Pell's equation.

#### **Definition**

A Pell-like equation is a generalization of Pell's equation, taking the form;

$$x^2 - Py^2 = k \tag{2}$$

where  $P$  is a positive integer that is not a perfect square and  $k$  is an integer.

**Note:** Solutions to Pell's equation can be found using continued fraction expansion of  $\sqrt{P}$ .

**Theorem:** If  $p, q$  is a positive solution of  $x^2 - Py^2 = 1$ , then  $\frac{y}{x}$  is a convergent of the continued fraction expansion of  $\sqrt{P}$ .

**Example**

Let  $P = 7$ , then  $x^2 - 7y^2 = 1$

Using the continued fraction expansion of  $\sqrt{7}$ , we find that  $x = 8, y = 3$  satisfies the equation  $8^2 - 7 \cdot 3^2 = 1$

**Note:**

The fundamental solution of the equation  $x^2 - Py^2 = 1$  to be its smallest positive solution.

**Theorem:** Let  $x_1, y_1$  be the fundamental solution of the equation  $x^2 - Py^2 = 1$ . Then every positive solution of the equation can be represented as pair of integers  $(x_n, y_n)$ , where  $x_n$  and  $y_n$  defined by

$$x_n + y_n\sqrt{p} = (x_1 + y_1\sqrt{p})^n, \quad n = 1, 2, 3, \dots$$

Thus, every positive solution is generated from the powers of the fundamental solution  $(x_1, y_1)$

**Example**

For  $x^2 - 35y^2 = 1$ , the fundamental solution is  $x = 6, y = 1$ . Using this, a second solution is  $x_2 = 71, y_2 = 12$ , which satisfies  $71^2 - 35 \cdot 12^2 = 5041 - 5040 = 1$ .

A third positive solution is  $x_3 = 846, y_3 = 143$ , satisfying  $846^2 - 35 \cdot 143^2 = 1$

**L-Groups**

Let  $P, q$  be odd primes and  $G = \{(x, y) \in \mathbb{Z}_q^2 : x^2 - Py^2 = k\}$ , where  $(k/P) = (k/q) = 1$ . We can define a binary operation on  $G$  as follows. Since  $(k/q) = 1$  we know there is  $a \in \mathbb{Z}$  such that  $a^2 \equiv k \pmod q$ .

Thus, for  $(x, y), (z, w) \in G$ , we may define  $(x, y) \cdot (z, w) = \left(\frac{xz + Pyw}{a}, \frac{xw + yz}{a}\right)$

Then  $G$  is a group under this operation.

*Note:* The order of group  $G$  is

$$|G| = q - \left(\frac{P}{q}\right)$$

## Application of L-Groups

### The Diffie-Hellman Key Exchange

Symmetric key cryptography relies on a shared secret key for both encryption and decryption, posing a challenge in securely distributing this key between communicating parties. The Diffie-Hellman key exchange protocol addresses this issue by allowing two parties to establish a shared secret key over an insecure channel without directly sharing the key. This is achieved through the use of a public prime number  $p$  and a base  $g$ , where each party selects a private key, computes a public key, and exchanges these public keys. Both parties can then compute the same shared secret key based on their private key and the other party's public key. The security of this method is grounded in the computational difficulty of the discrete logarithm problem, making it infeasible for an attacker to derive the private keys from the exchanged public information.

**Note:** Let  $G$  be an L-Group and  $g \in G$ . Choose  $x \in \mathbb{N}$  and compute  $b = x \cdot g$ . Make  $g$  and  $b$  public. The discrete log problem is the problem of finding  $x$ .

### Example

Suppose that Alice and Bob want to communicate securely using a symmetric key cryptosystem. To implement the Diffie-Hellman Key exchange they do the following:

#### 1. Initialization

Publicly agree on a large prime number  $q$  and a generator  $g$  of the multiplicative group  $Z_q^*$  of integers modulo  $q$ .

#### 2. Key generation

Alice generates a private key  $x$  (a random integer such that  $1 \leq x \leq p - 2$ )

Bob generates a private key  $y$  (a random integer such that  $1 \leq y \leq p - 2$ )

#### 3. Compute public values

Alice computes her public value,  $u = g^x \bmod q$ , Bob computes his public value,  $v = g^y \bmod q$

#### 4. Exchange public values

Alice sends her public values  $u$  to Bob, Bob sends his public values  $v$  to Alice.

## 5. Compute shared secret

Alice computes the shared secret  $K_a = v^x \bmod q$ , Bob computes the shared secret  $K_b = u^y \bmod q$ .

### Example

Let  $q = 23, g = 5$

Choose  $x = 6$  and  $y = 15$

Alice's public value  $u$ ,

$$\begin{aligned}u &= g^x \bmod q \\ &= 5^6 \bmod 23 = 8\end{aligned}$$

Bob's public value  $v$ ,

$$\begin{aligned}v &= g^y \bmod q \\ &= 5^{15} \bmod 23 = 19\end{aligned}$$

Alice sends  $u = 8$  to Bob and Bob sends  $v = 19$  to Alice.

$$\begin{aligned}K_a &= v^x \bmod q \\ &= 19^6 \bmod 23 = 2 \\ K_b &= u^y \bmod q \\ &= 8^5 \bmod 23 = 2\end{aligned}$$

Now, both Alice and Bob share the secret value  $K = K_a = K_b = 2$ , which they can use for further secure communication.

### Using L-Group:

We will now implement the Diffie-Hellman key exchange protocol in L-Groups.

1. They agree on a public L-Group,  $G$  and  $g \in G$ .
2. Alice and Bob choose random natural numbers  $x$  and  $y$  (respectively) and compute  $u = x \cdot g, v = y \cdot g$  (respectively).
3. Alice publicly sends  $u$  to Bob and Bob publicly sends  $v$  to Alice.
4. Alice then computes  $K_a = x \cdot v$  and Bob computes  $K_b = y \cdot u$ .

### Example

Let  $P = 3, q = 7$ , and  $k = 1, G = \{(x, y) \in \mathbb{Z}_7^2 : x^2 - 3y^2 = 1\}$  with the binary operation defined as:

$$(x, y) \cdot (z, w) = \left( \frac{xz + 3yw}{a}, \frac{xw + yz}{a} \right)$$

where  $a$  is such that  $a^2 \equiv 1 \pmod{7}$ .

**step 1:** Alice and Bob agree on the public group

$$G = \{(1,0), (6,0), (2,1), (5,1), (0,3), (0,4), (2,6), (5,6)\}$$

and the element  $g = (2,1)$ .

**step 2:** Alice chooses  $x = 4$  and computes:  $u = 4 \cdot (2,1)$

Let's compute  $u$ :

$$\begin{aligned} (2,1) \cdot (2,1) &= \left( \frac{2 \cdot 2 + 3 \cdot 1 \cdot 1}{1}, \frac{2 \cdot 1 + 2 \cdot 1}{1} \right) = \left( \frac{4 + 3}{1}, \frac{2 + 2}{1} \right) \\ &= (7, 4) \equiv (0, 4) \pmod{7} \\ (0,4) \cdot (2,1) &= \left( \frac{0 \cdot 2 + 3 \cdot 4 \cdot 1}{1}, \frac{0 \cdot 1 + 4 \cdot 2}{1} \right) = \left( \frac{0 + 12}{1}, \frac{0 + 8}{1} \right) \\ &= (12, 8) \equiv (5, 1) \pmod{7} \\ (5,1) \cdot (2,1) &= \left( \frac{5 \cdot 2 + 3 \cdot 1 \cdot 1}{1}, \frac{5 \cdot 1 + 1 \cdot 2}{1} \right) = \left( \frac{10 + 3}{1}, \frac{5 + 2}{1} \right) \\ &= (13, 7) \equiv (6, 0) \pmod{7} \end{aligned}$$

So,  $u = (6,0)$ .

Bob chooses  $y = 5$  and computes:  $v = 5 \cdot (2,1)$

Let's compute  $v$ :

$$\begin{aligned} (2,1) \cdot (2,1) &= (0,4) \\ (0,4) \cdot (2,1) &= (5,1) \\ (5,1) \cdot (2,1) &= (6,0) \end{aligned}$$

$$(6,0) \cdot (2,1) = \left( \frac{6 \cdot 2 + 3 \cdot 0 \cdot 1}{1}, \frac{6 \cdot 1 + 0 \cdot 2}{1} \right) = (12, 6) \equiv (5, 6) \pmod{7}$$

So,  $v = (5,6)$ .

**step 3:** Alice sends  $u = (6,0)$  to Bob and Bob sends  $v = (5,6)$  to Alice.

**step 4:** Alice computes:

$$\begin{aligned} K_a &= 4 \cdot (5,6) \text{ Let's compute } K_a: \\ (5,6) \cdot (5,6) &= \left( \frac{5 \cdot 5 + 3 \cdot 6 \cdot 6}{1}, \frac{5 \cdot 6 + 6 \cdot 5}{1} \right) = \left( \frac{25 + 108}{1}, \frac{30 + 30}{1} \right) \\ &= (133, 60) \equiv (0, 4) \pmod{7} \\ (0,4) \cdot (5,6) &= \left( \frac{0 \cdot 5 + 3 \cdot 4 \cdot 6}{1}, \frac{0 \cdot 6 + 4 \cdot 5}{1} \right) = \left( \frac{0 + 72}{1}, \frac{0 + 20}{1} \right) \\ &= (72, 20) \equiv (2, 6) \pmod{7} \end{aligned}$$

$$(2, 6) \cdot (5, 6) = \left( \frac{2 \cdot 5 + 3 \cdot 6 \cdot 6}{1}, \frac{2 \cdot 6 + 6 \cdot 5}{1} \right) = \left( \frac{10 + 108}{1}, \frac{12 + 30}{1} \right) \\ = (118, 42) \equiv (6, 0) \pmod{7}$$

Thus,  $K_a = (6, 0)$ .

Bob computes:

$$K_b = 5 \cdot (6, 0) \text{ Let's compute } K_b: \\ (6, 0) \cdot (6, 0) = \left( \frac{6 \cdot 6 + 3 \cdot 0 \cdot 0}{1}, \frac{6 \cdot 0 + 0 \cdot 6}{1} \right) = \left( \frac{36 + 0}{1}, \frac{0 + 0}{1} \right) = (36, 0) \equiv (1, 0) \pmod{7}$$

$$(1, 0) \cdot (6, 0) = \left( \frac{1 \cdot 6 + 3 \cdot 0 \cdot 0}{1}, \frac{1 \cdot 0 + 0 \cdot 6}{1} \right) = \left( \frac{6 + 0}{1}, \frac{0 + 0}{1} \right) = (6, 0) \equiv (6, 0) \pmod{7}$$

Therefore, both Alice and Bob compute the same shared secret key:

$$K_a = K_b = (6, 0)$$

## ElGamal Cryptosystem

ElGamal cryptosystem is a public-key cryptosystem named after its inventor, Taher ElGamal.

The security of an ElGamal system relies on the computational infeasibility of the discrete log problem.

### Algorithm:

1. Key generation: Bob uses the following steps to create his public and private key.
  - (a) Select a large prime number  $q$ .
  - (b) Select a generator  $g$  of the multiplicative group  $Z^*_q$  of integers modulo  $q$ .
  - (c) Select a private key  $x$ , a random integer such that  $1 \leq x \leq q - 2$ .
  - (d) Compute  $b = g^x \pmod{q}$ .
  - (e) The public key is  $(q, g, b)$ .

Bob encrypts a message  $m$  for Alice which Alice decrypts.
2. Encryption: Bob should do the following.
  - (a) Obtain Alice's public key  $(q, g, b)$ .
  - (b) Represent the plaintext message  $m$  as an integer such that  $0 \leq m \leq p$ .
  - (c) Select a random integer  $r$  such that  $1 \leq r \leq p - 2$ .
  - (d) Compute  $y = g^r \pmod{q}$ .

- (e) Compute  $e = m \cdot b^r \bmod q$ .
- (f) The ciphertext is the pair  $C=(y,e)$ .
3. Decryption: To recover plaintext  $m$  from  $C$ , Alice should do the following.
- (a) Obtain the shared secret  $d, d=y^x \bmod q$ .
- (b) Compute the modular inverse of  $d$ , denoted as  $d^{-1}$ .
- (c) Recover the plaintext message  $m, m = e \cdot d^{-1} \bmod q$ .

### Example

Let  $q=23, g=5$  key generation: choose private key  $x=6$

$$\begin{aligned} \text{compute,} & & b = g^x \bmod q \\ & = 5^6 & \bmod 23 = 8 \end{aligned}$$

public key is  $(q, g, b) = (23, 5, 8)$ .

private key is  $x=6$ .

*Encryption:* Let  $m=15$ , choose  $r=3$

$$\begin{aligned} y &= g^r \bmod q \\ &= 5^3 \bmod 23 = 10 \\ e &= m \cdot b^r \\ &= 15 \cdot 8^3 \bmod 23 = 21 \end{aligned}$$

Ciphertext is  $(y, e) = (10, 21)$

*Decryption:* Shared secret  $d, d = y^x \bmod q$

$$\begin{aligned} &= 10^6 \bmod 23 = 6 \\ d^{-1} &= 6^{-1} \bmod 23 \end{aligned}$$

Using the extended Euclidean algorithm,

$$6^{-1} \bmod 23 = 4$$

so,

$$m = e \cdot d^{-1} = 21 \cdot 4 \bmod 23 = 15$$

The decrypted plaintext  $m=15$  matches the original plaintext.

### Using L-Group:

We will now implement the ElGamal Cryptosystem protocol in L-Groups. Suppose that Alice wishes to receive a secret message from Bob. She must first create a public key so that Bob can encrypt a message for her:

1. She chooses an L-Group, say  $G, g \in G$ , and a random  $x \in \mathbb{N}$ .
2. She then computes  $b = g^x$ .
3. Her public key is  $(g, b, G)$ .

4. She also needs to create a private key to be able to decrypt the ciphertext after receiving it. Let  $x$  be Alice's private key.

Let  $m$  be the message Bob wants to send to Alice. We assume that, through a prescribed standard protocol,  $m$  has been converted, by Bob, into

$M \in G$ . We call this embedding  $m$  in the group,  $G$ .

Bob uses Alice's public key to encrypt  $M$  as follows:

1. Bob chooses a random  $r \in \mathbb{N}$ .
2. Bob computes, in  $G$ ,  $y = g^r$ ,  $s = b^r$ , and then  $e = s \cdot m$ .
3. Bob's encrypted message is the pair  $(y, e)$ .
4. Bob sends  $(y, e)$  to Alice.

To decrypt  $(y, e)$ , Alice does the following:

1. She computes  $d = y^x$  and then  $C = d^{-1} \cdot e$ .
2. She then unembeds  $C$  from  $G$  to get  $M$ .

### Example

Let  $P = 5$ ,  $q = 11$ , and  $k = 1$ , the group  $G$  is defined as:

$$G = \{(x, y) \in \mathbb{Z}_{11}^2 : x^2 - 5y^2 = 1\}$$

and its elements are

$$G = \{(1,0), (10,0), (2,4), (9,4), (4,5), (7,5), (4,6), (7,6), (2,7), (9,7)\}$$

$$\text{The operation on } G \text{ is defined as: } (x,y) \cdot (z,w) = (xz + 5yw, xw + yz)$$

**Key Generation:** Alice chooses  $g = (1,0)$  and a random private key  $x = 3$ .

Alice computes  $b = g^x = (1,0)^3 = (1,0)$ .

Alice's public key is  $(g, b, G) = ((1,0), (1,0), G)$ . Alice's private key is  $x = 3$ .

**Encryption:** Bob wants to send the message  $m = (2,4)$ .

Bob chooses a random  $r = 2$ .

Bob computes  $y = g^r = (1,0)^2 = (1,0)$ .

Bob computes  $s = b^r = (1,0)^2 = (1,0)$ .

Bob computes  $e = s \cdot m = (1,0) \cdot (2,4) = (2,4)$ .

Bob's encrypted message is  $(y, e) = ((1,0), (2,4))$ .

**Decryption:** Alice receives  $(y, e) = ((1,0), (2,4))$ .

Alice computes  $d = y^x = (1,0)^3 = (1,0)$ .

The inverse of  $d = (1,0)$  is  $d^{-1} = (1,0)$ .

Alice computes  $C = d^{-1} \cdot e = (1,0) \cdot (2,4) = (2,4)$ .

Alice retrieves the original message  $(2,4)$ .

## Conclusion

This project on Pell's Equation and its applications in cryptography provides a link between mathematical exploration and practical implications. In the context of cryptography, Pell's Equation emerges as a powerful tool for ensuring the confidentiality, integrity, and authenticity of transmitted information. By understanding the principles of Pell's Equation and quadratic irrationalities, cryptographic systems can be fortified to withstand adversarial threats and safeguard sensitive data. This project reveals the importance of mathematics in Designing Secure Communication Protocols. Overall, This Project Serves As A Valuable resource for individuals seeking to deepen their understanding of Pell's Equation and its implications in cryptography. By bridging the gap between theoretical concepts in number theory and practical applications in cryptography, this project offers a new perspective on the intricate relation between mathematics and information security. Through its exploration of Pell's Equation and cryptographic principles, this project paves the way for further research and innovation in the field of secure communication systems.

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### **A Study on Customer Satisfaction of Online Banking Service: A Case Study of Kannadi Grama Panchayath**

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#### **Abstract**

Online banking, or internet banking, is an electronic payment system that allows customers to perform financial transactions through their financial institution. This study investigates the dimensions and attributes that determine online banking service quality, emphasizing that the success of these services depends on customer awareness, acceptance, and satisfaction. A quality measurement framework is proposed to suggest enhancements in online banking service delivery. The research highlights that customer satisfaction is influenced by factors such as user interface design, security measures, customer support responsiveness, and feature availability, including mobile banking and electronic bill payment. The evolution of banking technology in India has led to significant advancements, including online deposits and digital account transfers, making banking processes faster and more convenient. Given the shift towards digital banking, this study aims to provide insights into customer satisfaction levels and identify areas for improvement in online banking services, ultimately contributing to a more effective and competitive banking landscape.

#### **Introduction**

Online banking, also referred to as internet banking, web banking, or home banking, enables customers to conduct a variety of financial transactions via a secure electronic platform provided by banks or financial institutions. This study aims to explore the dimensions and

attributes influencing the quality of online banking services. The effectiveness of these services is closely tied to customers' awareness and acceptance, as well as their overall satisfaction with the online banking experience.

The primary objective of online banking systems is to automate banking transactions, offering customers faster and more efficient service. Typical transactions conducted through online banking include checking account balances, reviewing recent transactions, making electronic bill payments, and transferring funds between accounts. Factors such as user interface design, security protocols, customer support responsiveness, and features like mobile banking significantly impact customer satisfaction. As online banking continues to grow in popularity, understanding these dimensions is essential for banks to enhance service delivery and meet the evolving expectations of their customers.

The advancement of technology has transformed the banking sector in India, introducing features such as online deposits, e-bill payments, digital account transfers, and mobile wallet usage. This study will further assist customers in understanding their satisfaction levels with digital banking services, ultimately contributing to improved service quality and customer retention.

### **Scope of the Study**

The scope of this study encompasses an in-depth exploration of online banking, particularly focusing on its influence on customer satisfaction. In the modern technological era, daily tasks have been significantly streamlined, with banking being a prime example of this digital transformation. The advent of online banking has revolutionized how customers interact with financial institutions, allowing them to conduct various transactions—from account openings to fund transfers—without the need for physical visits to bank branches. This digital shift has not only enhanced the efficiency of banking operations but has also reduced the inconvenience of long waiting times, fostering a more user-friendly experience.

Furthermore, the study seeks to analyze the factors contributing to customer satisfaction, including usability, security features, and

customer support responsiveness. By understanding these elements, banks can refine their service offerings to attract a larger customer base. The competitive landscape of the banking industry has intensified as institutions strive to provide superior online services to retain existing customers and draw in new ones. Overall, this research aims to provide valuable insights that can help banks improve their online service quality, ultimately enhancing customer satisfaction and loyalty in a rapidly evolving digital banking environment.

### **Research Problem**

As Indian banking customers increasingly transition to online banking, driven by factors such as demonetization and advancements in technology, understanding customer satisfaction has become critical in this competitive landscape. E-banking was introduced to enhance service delivery, allowing for 24/7 access to financial services. However, while traditional banking relies on personal relationships to foster customer loyalty, online banking must focus on delivering high-quality services in terms of speed, security, and convenience.

With no guarantee that current service levels will meet future demands, banks must continuously improve their offerings. This study emphasizes the necessity of utilizing customer satisfaction as a metric for evaluating and enhancing service quality. By understanding the unique relationship between banks and their customers, this research aims to identify the key factors influencing satisfaction and provide actionable insights for better service delivery.

### **Objectives**

- To find out the factors influencing online banking services.
- To study the problems faced by online banking service.

### **Methodology**

This study employs a mixed-methods approach, utilizing both primary and secondary data to comprehensively analyze online banking and customer satisfaction. Primary data was collected through structured interviews with 70 respondents from Kannadi Grama Panchayat in Palakkad District, ensuring a representative sample of the

local population. The interview schedule was designed to capture various dimensions of online banking service quality, including user experience, satisfaction levels, and specific challenges faced by customers.

In addition to primary data, secondary data was gathered from diverse sources, including books, journals, magazines, websites, and newspapers, to provide a broader context and support the research findings. This dual approach enhances the reliability and validity of the study. The collected data was systematically analyzed, and visual representations such as tables, percentages, graphs, and pie diagrams were created to illustrate key trends and insights. This methodology enables a thorough examination of the factors influencing customer satisfaction in online banking.

## Reviews

- **Rakesh H M & Ramya T J (2021):** In their research titled "A Study on Factors Influencing Consumer Adoption of Internet Banking in India," the authors explore the critical factors affecting the adoption of internet banking. They emphasize that marketing experts should highlight the benefits of online banking services to enhance consumer awareness and attract more users.
- **Jyothna Sharma, Jagdeep Singh, and Ananddeep Singh (2020):** This study, "Impact of E-Banking Service Quality on Customer Satisfaction," investigates the relationship between the quality of e-banking services and customer satisfaction. Using random sampling, the authors found that factors such as responsiveness, security, and effective communication significantly influence customer satisfaction in e-banking.
- **Amruth Raj Nippatlapalli (2020):** In "A Study on Customer Satisfaction of Commercial Banks: Case Study on State Bank of India," the paper defines customer satisfaction as a measure of how well banking services meet or exceed expectations. This study highlights the importance of understanding customer experiences to enhance satisfaction in the banking sector.
- **Liu and Li (2020):** Their research examines how timely and effective customer support significantly impacts satisfaction levels in online

banking. They provide insights into differences in satisfaction levels between public and private banks, shedding light on service quality factors crucial for enhancing customer experiences.

- **A.M. Banu N. S. Mohamed et al. (2019):** This paper identifies key factors influencing customer satisfaction with online banking, including customer awareness, security concerns, and the usability of online platforms. The study underscores the importance of addressing these factors to improve customer experiences and satisfaction levels.

These reviews collectively contribute to understanding the dynamics of online banking and customer satisfaction, offering insights into factors influencing adoption and service quality.

## **Results and Discussions**

### **Factors Influencing Online Banking Services.**

The survey aims to gather insights on awareness and usage of e-banking services among customers. Participants are asked to indicate their familiarity with various services, including internet banking, mobile banking, credit cards, and debit cards. Additionally, the survey inquires about preferred online banking activities, such as transferring funds, making online purchases, or regularly checking bank statements. Respondents will also specify their mode of access, whether through a computer, mobile device, or other sources. A key question addresses the convenience of accessing online banking services anytime and anywhere, along with satisfaction regarding service charges imposed by banks. Finally, the survey seeks to identify the most influential factors driving users to online banking, such as availability, ease of use, and security.

The survey results indicate varying levels of awareness and preferences regarding e-banking services among respondents. Mobile banking was the most recognized service, with 42.9% awareness, followed by multiple choice options (21.4%) and internet banking (17.1%). In contrast, awareness of credit cards (5.7%) and debit cards (12.9%) was notably lower. When it comes to preferences for e-banking usage, online payments led with 37.1%, while transfer funds online and multiple choice options were also popular, accounting for 22.9% and 28.6%, respectively.

A significant majority (97.1%) preferred mobile devices for internet banking, emphasizing the trend toward mobile banking apps. Additionally, 94.3% of respondents felt they could access online banking services anytime and anywhere, highlighting its convenience. Most respondents (72.9%) expressed satisfaction with the service charges for online banking, although perceptions of fairness varied. Finally, ease of use (52.9%) emerged as the primary factor influencing the adoption of online banking, followed by all-time availability (38.6%).

### **Problems Faced By Online Banking Service.**

The survey addresses key aspects of user experience with online banking services, focusing on various factors that influence customer satisfaction and security. Respondents are asked whether banks collect personal information carefully, with a simple yes or no option. The effectiveness of transaction notifications is assessed through a range of agreement levels, from "strongly agree" to "strongly disagree." Additionally, participants evaluate the user-friendliness of online banking services, again using a scale of agreement. The clarity of language and content on bank websites is also gauged, with a straightforward yes or no question. Respondents are queried on whether bank websites provide comprehensive details about products and services, as well as their experiences during net banking registration. Finally, the survey explores specific problems users encounter while using online banking, including time delays in fund transfers, accessibility for those with limited education, and issues related to slow system performance.

The survey shows a high level of satisfaction among online banking users, with 98.6% trusting that personal information is handled carefully, 95.7% finding the website language clear, and 95.7% satisfied with available features. Additionally, 62.9% agreed and 18.6% strongly agreed that the service is user-friendly, and most respondents were content with transaction notifications, though 17.1% were neutral. While 51.4% faced registration difficulties, issues with fund transfer delays (25.7%), slow system speed (27.1%), and usability challenges for non-educated users (14.3%) were noted. Addressing these challenges could enhance accessibility and user experience for all banking customers.

The survey results indicate strong satisfaction with online banking, as 95.7% of respondents reported contentment with the available features and services. This high level of satisfaction suggests that the bank's offerings align well with customer needs and expectations. Additionally, 67.1% of respondents expressed overall satisfaction with their online banking experience, reflecting positive engagement and usability. However, while most are satisfied, this leaves room for further improvement to address the needs of the remaining 32.9% who may have mixed or less favorable experiences. Enhancing areas like ease of use and accessibility could help further boost user satisfaction across all demographics.

## **Conclusion**

This research report reveals that most bank customers are aware of online banking services, but there is still a need for increased customer education on new technologies and service offerings. Strengthening customer interactions and creating a welcoming atmosphere could help retain current customers and attract new ones, contributing to the growth of Indian and global banks. The study highlights five critical factors—ease of use, usefulness, self-efficacy, trustworthiness, and prompt service—that influence the adoption of internet banking, with demographic factors like age, gender, education, and occupation playing significant roles in Kerala. Service quality dimensions, including reliability, responsiveness, efficiency, security, and website design, strongly correlate with customer satisfaction, which in turn supports customer loyalty. Popular internet banking applications include mobile recharges, balance checks, bill payments, and fund transfers. These findings underscore the need for ongoing improvements in service quality and customer education to enhance the online banking experience.

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**Sol-gel Synthesis and Characterization of Lanthanide  
Modified  
TiO<sub>2</sub>-MCM-41 Mesoporous Materials**

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**Abstract**

In this work lanthanide modified TiO<sub>2</sub>-MCM-41 materials have been synthesized by simple sol- gel method. The resultant materials were well characterized by powder X-ray diffraction (XRD), FT-IR spectroscopy, BET analysis, and Transmission Electron Microscopy (TEM). X-ray diffraction analysis indicates that the synthesized materials consist of anatase phase TiO<sub>2</sub>. When Ti-MCM-41 was modified by europium, terbium, lanthanum ions there occurs a reduction in crystallinity and crystallite size of anatase TiO<sub>2</sub>. The FT-IR spectra TiO<sub>2</sub>-MCM-41 showed the presence of Ti-OH, Ti-O-Si and Ti-O bonds. With the addition of lanthanide species several vibrations of TiO<sub>2</sub>-MCM-41 have been suppressed. The BET analysis gives information about the surface area and pore size distribution of the materials. The surface area of the TiO<sub>2</sub>-MCM-41 has been reduced after incorporation with lanthanide species and is prominent in Tb-TiO<sub>2</sub>- MCM-41. The morphology of the materials was clearly investigated using TEM analysis. This study will be helpful for understanding the effect of lanthanide ions on the textural properties of the TiO<sub>2</sub>-MCM 41 nanomaterials.

**Keywords:** Mesoporous materials, Ti- MCM 41, Lanthanide, sol-gel method, textural properties.

## 1. Introduction

Periodic mesoporous materials are novel materials possess high surface areas, large uniform pore sizes and large pore volumes. These properties make mesoporous materials as attractive candidates for adsorption [1], catalysis [2], drug delivery [3], to fuel cells [4] and sensors [5]. A big advantage of mesoporous materials is that the large mesopores allow for effective transport of reactant and product molecules to and from the active sites, thus modifying diffusion problems that are widely prevalent in microporous materials. Also, the large surface area facilitates the high dispersion of catalytically active sites. In recent years, periodic mesoporous materials have been employed as supports for dispersing photocatalyst materials [6]. These catalysts have been used for photocatalytic degradation of organics, dyes, polluting gases, and splitting of water. Mesoporous materials offer greater flexibility for incorporation of a larger number of photoactive sites. The mesoporous material can be used to limit the size of semiconductors and thus due to quantum confinement effects, the conduction band edge is shifted to more negative values, resulting in a greater thermodynamic potential for the photogenerated electrons for the reduction reaction to produce hydrogen, provide additional pathways for migration of electrons and thus facilitate charge-carrier separation, provide enhanced stability towards photocorrosion. Due to the above mentioned attractive features, mesoporous supports have been employed as catalysts for various applications.

The confinement of  $\text{TiO}_2$  crystallites on the silica support promises minimized agglomeration into bulk species and may permit the manipulation of the intrinsic band structure of  $\text{TiO}_2$  by shifting the flat band potential in order to achieve greater reduction potentials than bare  $\text{TiO}_2$ . Lanthanide-containing porous materials have found many applications in various fields. Zhang et al [7] have reported the preparation of lanthanum, gadolinium, and ytterbium doped mesoporous  $\text{TiO}_2$  with a series of dopant concentration via sol-gel method without structure-directing agent. Lanthanum-doped mesoporous  $\text{TiO}_2$  act as benzene adsorbents [8]. Incorporation of lanthanide ions into a  $\text{TiO}_2$  matrix could provide active sites to concentrate an organic pollutant at the semiconductor surface.

Moreover, the incorporation of a doping metal into a mesoporous TiO<sub>2</sub> framework can provide more active sites on the surface of the inside channel, and increase acidity, leading to different physico-chemical properties as well as improved catalytic behavior.

Lanthanide-containing porous materials have found many applications in various fields. Lanthanum-doped mesoporous TiO<sub>2</sub> act as benzene adsorbents and this property depends on two important factors, the doping content and adsorption temperature, on the absorptivity of benzene were investigated [8]. Incorporation of lanthanide ions into a TiO<sub>2</sub> matrix could provide active sites to concentrate an organic pollutant at the semiconductor surface. Moreover, the incorporation of a doping metal into a mesoporous TiO<sub>2</sub> framework can provide more active sites on the surface of the inside channel, and increase acidity, leading to different physico-chemical properties as well as improved catalytic behavior. There are few existing reports, however, focus on surface area effects only, and none to the best of our knowledge have investigated the role of varying lanthanide species on the textural properties of sol-gel derived TiO<sub>2</sub>- MCM 41.

Here we report a simple method for the preparation of lanthanide species such as lanthanum, terbium and europium modified TiO<sub>2</sub>- MCM 41 material through sol-gel synthesis. The physicochemical properties of the synthesized materials were investigated by powder X-ray diffraction, nitrogen physisorption analysis, transmission electron microscopy, UV-Vis diffuse reflectance spectroscopy, and Fourier transform infrared spectroscopy.

## **2. Materials methods**

### **2.1 Chemicals**

Cetyl trimethyl ammonium bromide (CTAB) (Labochemie), Titanium isopropoxide (Aldrich 98 %), Tetra ethyl ortho silicate (TEOS) (Aldrich), Aqueous ammonia(Nice chemicals), Isopropyl alcohol, (Nice chemicals), Distilled water.

### **2.2 Preparation of Ti-MCM 41**

0.75 g of CTAB was added to 15 Ml deionised water under vigorous stirring. After CTAB was completely dispersed, 17.5 mL aqueous NH<sub>3</sub> was poured into the clear solution. 22.8 mL of isopropyl

alcohol was added to the surfactant solution under vigorous stirring 30 minutes followed by the addition of 3 mL TEOS and stirring continued for further 10 minutes. The resultant mixture was further treated with 2 ml of titanium isopropoxide and stirred for 24 hours with 300 rpm. The resulting gel was kept for drying at room temperature. Followed by filtration and drying at room temperature calcination was done at 550°C in a static air environment. The obtained sample was labeled as Ti-MCM41

### **2.3 Preparation of lanthanide modified Ti-MCM-41**

0.75 g of CTAB was added to 15 mL deionized water under vigorous stirring. After CTAB was completely dispersed, 17.5 mL aqueous NH<sub>3</sub> was poured into the clear solution. 22.8 mL of isopropyl alcohol was added to the surfactant solution under vigorous stirring. After stirring for 30 minutes, 3 mL TEOS was added and stirring continued for further 10 minutes and added 2 mL of titanium isopropoxide solution to the resulting mixture. For the preparation of lanthanide modified Ti-MCM-41 0.03 g of Lanthanum (III) nitrate hexahydrate, Europium (III) nitrate pentahydrate and Terbium (III) nitrate pentahydrate were used as the precursor for lanthanide species. After the addition of lanthanides the stirring was adjusted to 300-600 rpm for 24 hours. The resulting gel was kept for drying at room temperature. Calcination was done at 550°C in a static air environment. The obtained samples were labeled as Eu-Ti-MCM-41, Ln-Ti-MCM-41 and Tb-Ti-MCM-41 respectively.

### **2.4 Characterization**

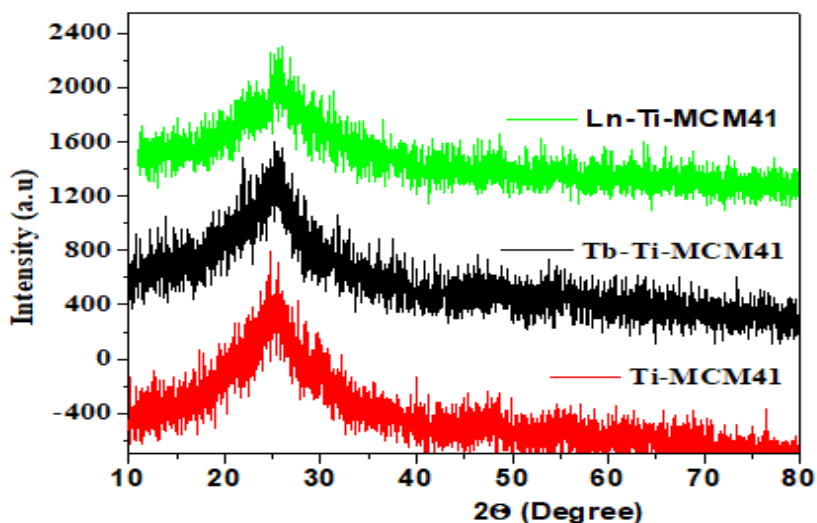
The XRD measurements were performed at room temperature using a Rigaku Ultima IV X-ray diffractometer with Cu K $\alpha$  radiation. The diffractometer was operated at 40 kV, and 44 mA, scanned with a step size of 0.02°, and a count time of 1°/min in the range of 2 $\theta$  angle 10 to 80. The FT-IR analysis were carried out using a Bruker ALPHA instrument with ATR Pt diamond holder and the spectra were acquired in the range 4000 cm<sup>-1</sup> to 500 cm<sup>-1</sup> with a resolution of 4 cm<sup>-1</sup>.

The TEM images were recorded on a HRTEM Jeol/JEM 2100 instrument operating at 200 kV. Prior to TEM analysis, the sample was dispersed in ethanol and the suspension was sonicated for 1 hour. For each material, one drop of suspension was placed on a copper grid coated with carbon film, and allowed to dry overnight. The textural properties, such as surface area and pore size distribution of the materials were analyzed by using N<sub>2</sub> physisorption measurements. After the samples are dried overnight at 70 °C and degas at 200 °C for at least 1 hour, N<sub>2</sub> isotherms are obtained at -196 °C using a BELSORP-max surface area and pore size analyzer. The surface areas of the synthesized materials were calculated by using the Brunauer-Emmett-Teller (BET) equation within a relative pressure range ( $P/P_0$ ) of 0.05–0.30. The pore volume was determined from the amount of N<sub>2</sub> adsorbed at the highest relative pressure of  $P/P_0 \approx 0.99$ . The pore diameter and pore size distribution plots are defined by applying the Barrett-Joyner-Halenda (BJH) model to the desorption isotherm. The UV-Vis diffuse spectra were recorded by a JascoV-550 UV-Visible spectrophotometer with Jasco model ISV 469 reflection accessory

### **3. Results and discussion**

#### **3.1 Powder XRD analysis**

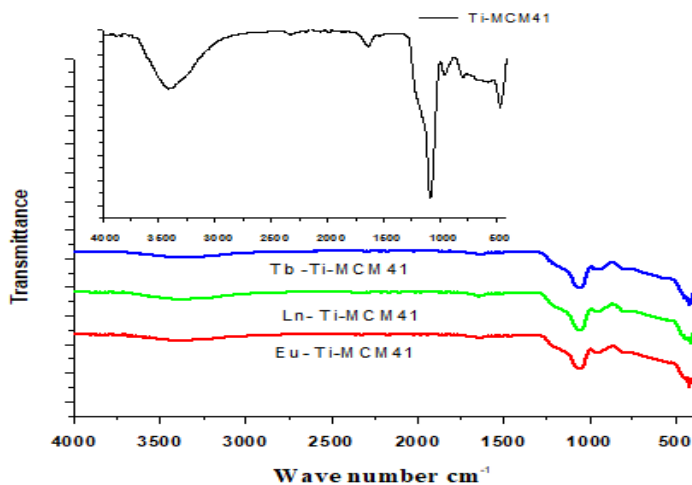
The XRD pattern of selected materials Ln-Ti-MCM41, Tb-Ti-MCM41 and Ti-MCM41 are shown in Fig 1. The X-Ray diffraction analysis indicates that the materials exhibit diffraction patterns of amorphous SiO<sub>2</sub> consists of small amount of TiO<sub>2</sub> anatase phase. The peak around 25° is due to the presence of  $d_{101}$  plane of anatase TiO<sub>2</sub>. The intensity of the  $d_{101}$  plane was reduced after the modification with lanthanides. This may be due to the lanthanide species blocking the crystal growth of TiO<sub>2</sub> anatase. The peak corresponding to lanthanides are not observed in the XRD pattern, which may be due to the high dispersion of lanthanide ions during sol – gel process.



**Fig. 1. XRD patterns of Ln-Ti MCM 41, Tb-Ti-MCM 41 and Ti-MCM 41**

### 3.2 FT-IR Analysis

In order to acquire information about the different functional groups, vibrational bands of the materials, we characterized the materials using FT-IR analysis. Fig. 2 showed the FT-IR spectra of Ti-MCM41, Ln-Ti-MCM-41, Eu-Ti-MCM-41 and Tb-Ti-MCM41.



**Fig. 2 FT-IR spectra of Ti-MCM41, Ln-Ti-MCM-41 , Eu-Ti-MCM-41 and Tb-Ti-MCM41**

FT-IR spectra of Ti-MCM-41 were shown in the inset of Fig. 2 exhibit a peak at  $3450\text{ cm}^{-1}$  corresponding to the presence of -OH group. A small peak at  $1623\text{ cm}^{-1}$  shows the presence of Ti-OH bond [9]. Indefinable peaks for Ti-MCM41 within the fingerprint region of the FT-IR spectra there exists a highly intense peak for Ti-MCM41 at  $1086\text{ cm}^{-1}$  together with another peak at  $483\text{ cm}^{-1}$  which indicates the presence of Ti-O-Si bond [10]. The band covered at the range of  $957\text{ to }905\text{ cm}^{-1}$  in the spectrum of Ti-MCM-41 can be ascribed to the stretching vibrations of Ti-O-Si.

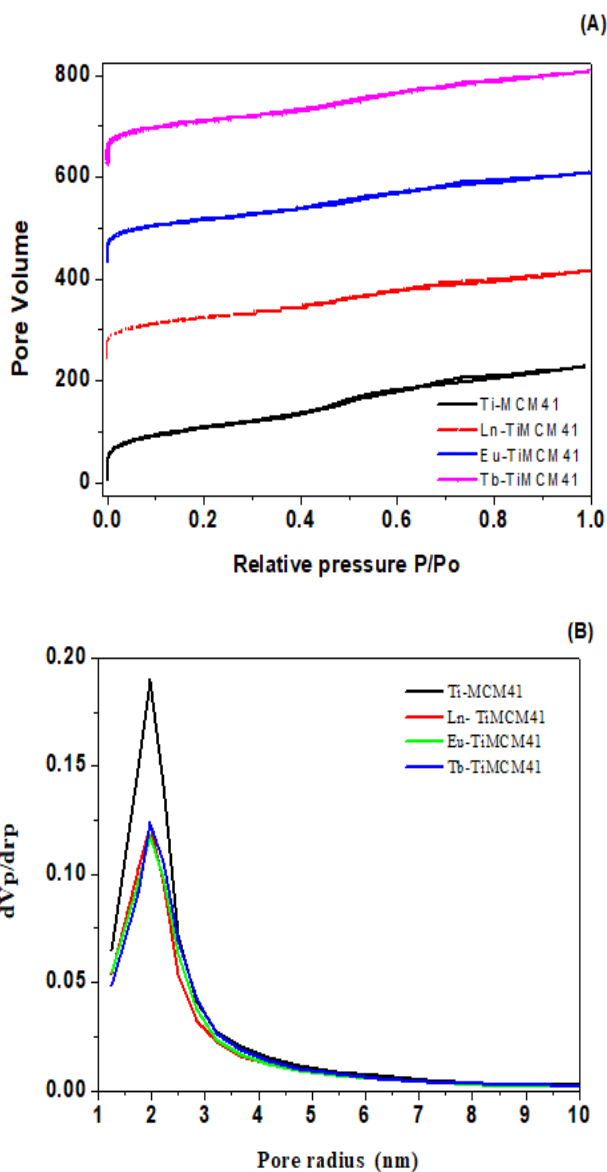
Upon modification with lanthanide ions the band at  $3450\text{ cm}^{-1}$  broadens. The OH<sup>-</sup> ions in the Ti-MCM-41 is partially removed by the lanthanide ions. As the amount of OH<sup>-</sup> ions is decreased the intensity of the peak also reduced.

### 3.3. Nitrogen physisorption studies

Nitrogen physisorption studies were carried out to investigate the surface areas and nature of porosities of the Ti-MCM41 and lanthanide modified Ti-MCM41. The textural properties, including specific surface area, pore volume, and average pore diameter obtained from nitrogen adsorption-desorption analysis, are shown in Table 1.

**Table 1: Textural properties of Ti-MCM41, LnTi-MCM-41, TbTi-MCM-41, EuTi-MCM-41**

Materials	$S_{\text{BET}}$ ( $\text{m}^2\text{g}^{-1}$ )	Pore volume ( $\text{cm}^3\text{g}^{-1}$ )	Average pore diameter (nm)
Ti-MCM-41	385	0.35	3.65
Ln-Ti-MCM-41	317	0.28	3.54
Eu-Ti-MCM-41	319	0.29	3.61
Tb-Ti-MCM-41	304	0.27	3.62



**Fig.3 N<sub>2</sub> Adsorption isotherms (A) and Pore size distribution (B) of Ti-MCM41, Ln-Ti-MCM-41, Eu-Ti-MCM-41, Tb-Ti-MCM-4**

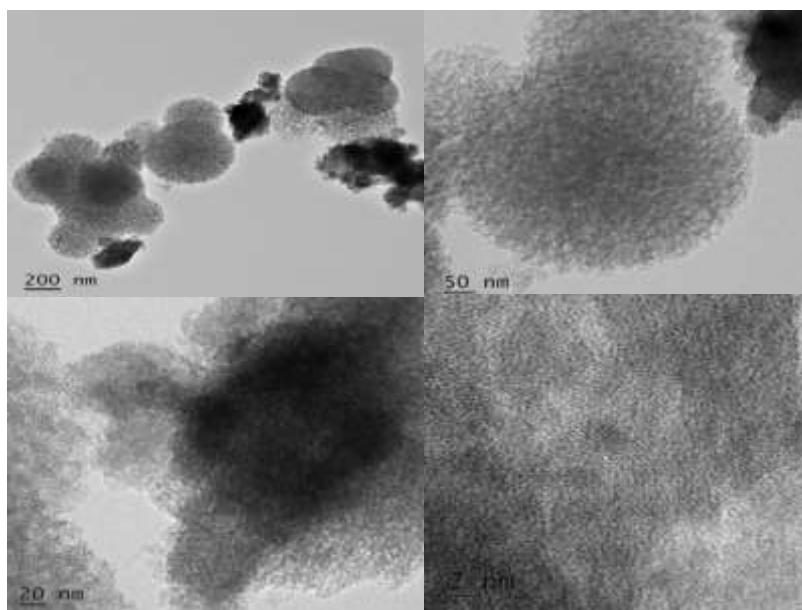
The nitrogen adsorption isotherms and the pore size distribution profiles of Ti-MCM41, Ln -Ti-MCM-41, Eu-Ti-MCM-41, Tb-Ti-MCM-41 are shown in Fig.3. The isotherm of Ti-MCM-41 exhibit a typical type IV behaviour with an H4-type hysteresis loop (Fig. 3), which is typical for

mesoporous materials with two-dimensional hexagonal structures [11]. The N<sub>2</sub> uptake at low relative pressure ( $P/P_0 < 0.1$ ) for all samples indicates the existence of micropores. The Ti-MCM-41 having the surface area 385 cm<sup>-1</sup> showing an average pore diameter of 3.65 nm and pore volume 0.35cm<sup>3</sup>g<sup>-1</sup> which is shown in Table 1.

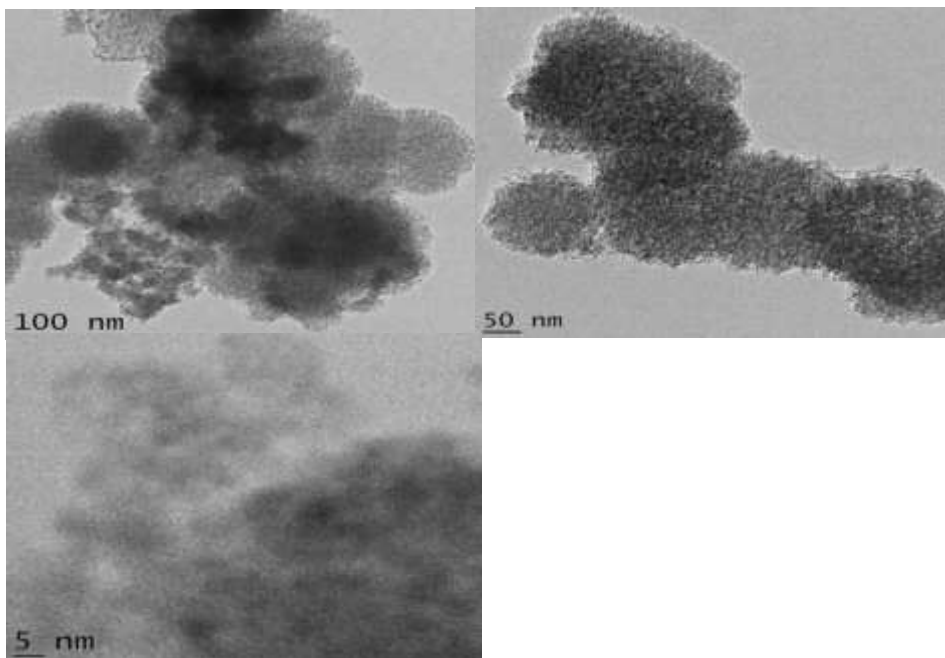
The lanthanide modified materials also exhibit a type IV behavior with an H4 type hysteresis loop. The pore volume and average pore diameter of the species is given in the Table 1. This study indicates that upon modification with the lanthanide ions the surface area of the Ti-MCM-41 has been reduced and is more prominent in Tb-Ti-MCM-41 with surface area 304 m<sup>2</sup>/g.

### 3.4 Transmission Electron Microscopic (TEM)

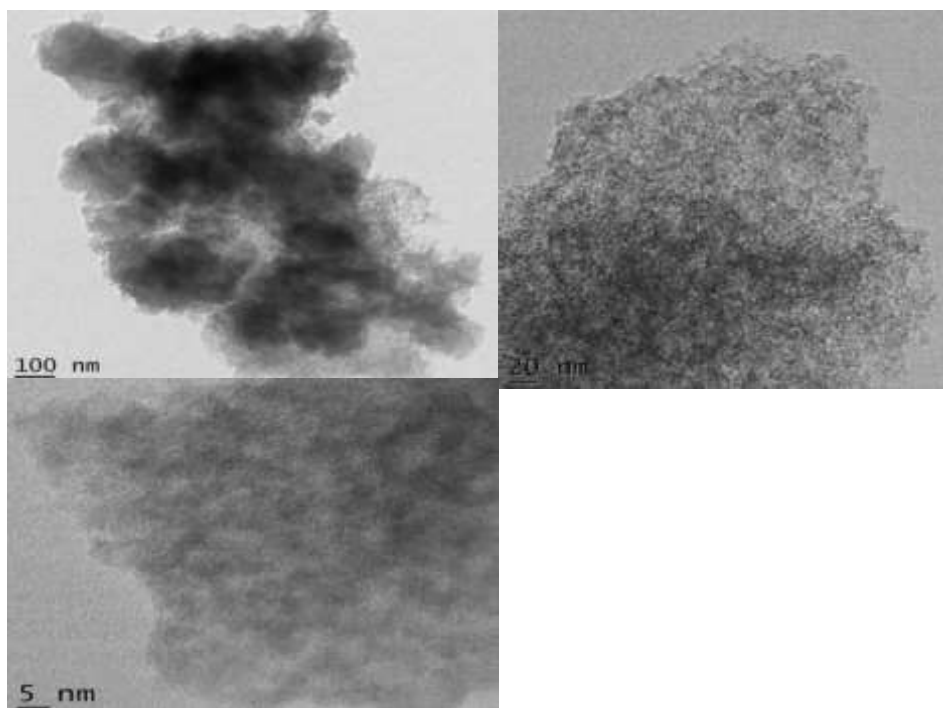
To investigate the internal microscopic structures of the sample, transmission electron microscope analysis were conducted. TEM provides various morphological aspects of mesoporous materials. Fig.4, Fig. 5 and Fig.6 displays various internal structures resulted from parallel and perpendicular penetration of electron beam in the hexagonally arrange channels of mesoporous silicate structures of Ti-MCM-41 , EuTi-MCM41 and LnTi-MCM-41.



**Fig .4. TEM images of Ti-MCM41**



**Fig. 5 TEM images of Eu-Ti-MCM41**



**Fig. 6 TEM images of Ln-Ti-MCM41**

## Conclusion

The Ti-MCM-41 and lanthanide modified Ti-MCM-41 materials were successfully synthesized by sol-gel method. Different characterization techniques such as XRD, FT-IR, BET, and TEM have been done for each sample and the effect of the lanthanides on Ti-MCM-41 has been studied. X-ray diffraction analysis indicates that the synthesized materials consist of anatase phase  $\text{TiO}_2$ . When the Ti-MCM-41 was modified by the lanthanide ions like europium, terbium, lanthanum there occurs a reduction in crystallinity and crystallite size of anatase  $\text{TiO}_2$ . In the FT-IR spectra several characteristic peaks of Ti-MCM-41 can be seen which shows the presence of Ti-OH, Ti-O-Si and Ti-O bonds. With the addition of lanthanides several vibrations of Ti-MCM-41 have been suppressed. The BET analysis gives information about the surface area of the materials. It is clear that the surface area of the Ti-MCM-41 has been reduced with the presence of lanthanides and is prominent in Tb-Ti-MCM-41. The internal structure of the sample is clearly investigated using TEM analysis. The incorporation of lanthanides in Ti-MCM-41 has greatly influenced its characteristics and hence this work provides great opportunity for further research.

## Acknowledgement

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## Zero Divisor Graph of a Commutative Ring

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### Abstract

This paper investigates the structural and combinatorial properties of zero divisor graphs associated with commutative rings. Specifically, we study the domination number, total domination number, and co-total domination number of zero divisor graphs and provide a detailed analysis of their algebraic implications. We derive properties such as the radius and center of zero divisor graphs, classify specific cases where the graph forms a star graph or a complete bipartite graph, and establish domination-related parameters for various classes of commutative rings, including  $Z_n$  and  $Z_p \times Z_q$  where  $n, p, q$  are integers or primes. These findings are supported with proofs and applications that extend existing research in this domain.

**Keywords:** Zero divisor graph, Domination number, Total domination number, Co-total domination number

### 1. Introduction

Let  $R$  be a commutative ring with unity, and let  $Z(R)$  denote its set of zero divisors. The zero divisor graph  $\Gamma(R)$  is a simple graph associated with  $R$  whose vertex set is  $Z(R)^* = Z(R) \setminus \{0\}$ , the set of all nonzero zero divisors of  $R$ . Two vertices  $x$  and  $y$  in  $Z(R)^*$  are adjacent if  $xy = 0$ . If  $\Gamma(R)$  is the empty graph,  $R$  is an integral domain.

The concept of the zero divisor graph was introduced by I. Beck in the context of graph colorings. This work was extended by D. D.

Anderson and M. Naseer. For all elements of  $R$ , we define  $\Gamma_0(R)$ , where vertices  $x$  and  $y$  are adjacent if  $xy = 0$ , including  $000$  as a universal vertex. Thus,  $\Gamma(R)$  is an induced subgraph of  $\Gamma_0(R)$ .

This study focuses on properties such as the center, radius, domination number, total domination number, and co-total domination number of zero divisor graphs and explores their algebraic implications.

## 2. Properties of Zero Divisor Graphs

### 2.1 Central Sets and Radius of $\Gamma(R) \setminus \text{Gamma}(R) \Gamma(R)$

For a connected graph  $G$ , let  $d(u, v)$  denote the distance between vertices  $u$  and  $v$ . The eccentricity  $e(v)$  of a vertex  $v$  is defined as the maximum distance from  $v$  to any other vertex. The radius of  $G$ ,  $rad(G)$ , is the minimum eccentricity among all vertices, and the set of vertices with minimal eccentricity forms the center of  $G$ .

- **Equation:**

$$rad(G) = \min_{v \in V(G)} e(v), \quad e(v) = \max_{u \in V(G)} d(u, v)$$

$$rad(G) = \min_{v \in V(G)} e(v), \quad e(v) = \max_{u \in V(G)} d(u, v).$$

- **Example:** The radius and center of  $\Gamma(\mathbb{Z}_n[i])$ , the graph of Gaussian integers modulo  $n$ , are analyzed.

### 2.2 Domination Number

The domination number of a graph  $\Gamma(R)$  is the minimum number of vertices in a set  $D \subseteq V(G)$  such that every vertex  $v \in V(G)$  is either in  $D$  or adjacent to some vertex in  $D$ .

- Definition:  $\gamma(G) = \min\{|D| : D \text{ is a dominating set}\}$

## 3. Results and Discussion

**3.1 Theorem:** Let  $R$  be a commutative ring (not necessarily finite). The graph  $\Gamma(R)$  is always connected, with diameter  $diam(\Gamma(R)) \leq 3$

**Proof:** Consider  $x, y \in \Gamma(R)$ , with  $x \neq y$ .

If  $xy = 0$ , then  $d(x, y) = 1$ .

If  $xy \neq 0$ :

- If  $x^2 = 0$  and  $y^2 = 0$ , then  $x - xy - y$  forms a path of length 2, so  $d(x, y) = 2$ .

- If  $x^2 = 0$  and  $y^2 \neq 0$ , there exists  $b \neq y$  such that  $by = 0$ . If  $bx = 0$ , then  $x - b - y$  forms a path of length 2. Otherwise,  $x - ab - y$  forms a path of length 3.

In all cases,  $d(x, y) \leq 3$ , hence  $\text{diam}(\Gamma(R)) \leq 3$ .

**3.2 Theorem:** If  $n = 2p$ , where  $p$  is an odd prime, the nonzero zero divisor graph is a star graph  $K_{1,p-1}$ , which is also a complete bipartite graph.

**Proof:** Let  $n = 2p$ , where  $p$  is an odd prime, and consider the commutative ring  $R = Z_n$ . The set of nonzero zero divisors of  $R$  is given by

$$Z(R)^* = \{x \in Z_n : x \neq 0 \text{ and } xy \equiv 0 \pmod{n} \text{ for some } y \neq 0\}$$

The vertex set of  $\Gamma(R)$  is:

$$V(\Gamma(R)) = Z(R)^* = \{2, 4, 6, \dots, 2(p-1), p\},$$

where  $\{2, 4, 6, \dots, 2(p-1), p\}$  are the even integers less than  $n$ , and  $p$  is the odd prime divisor of  $n$ .

The edge set is defined as:

$$E(\Gamma(R)) = \{(x, y) \in Z(R)^* \times Z(R)^* : xy \equiv 0 \pmod{n}\}.$$

The vertex  $p$  is adjacent to all even integers  $\{2, 4, 6, \dots, 2(p-1), p\}$  and no two even integers are adjacent to each other.

This structure forms a star graph, with  $p$  as the central vertex and  $\{2, 4, 6, \dots, 2(p-1), p\}$  as the leaves.

The graph can be partitioned into two subsets:

$$X = \{p\}, \quad Y = \{2, 4, 6, \dots, 2(p-1)\}.$$

Then the vertex  $p \in X$  is adjacent to every vertex in  $Y$  and there are no edges within  $X$  or  $Y$ .

Hence,  $\Gamma(R)$  is isomorphic to the complete bipartite graph  $K_{1,p-1}$ .

**3.3 Theorem:** If  $n = p^\alpha$ , where  $p$  is an odd prime and  $\alpha > 2$ , the domination number  $\gamma(\Gamma(Z_n)) = 1$

**Proof:** Here vertex set  $Z(R)^* = \{p, 2p, \dots, p^{\alpha-1}\}$  and vertex  $p^{\alpha-1}$  is adjacent to all other vertices of  $\Gamma(Z_n)$ . Hence,  $D = \{p^{\alpha-1}\}$  is a minimum dominating set. It is clear that  $\{p^{\alpha-1}\}$  is minimum dominating set with cardinality 1. Therefore, the domination number of nonzero zero divisor graph and hence  $\gamma(\Gamma(Z_n)) = 1$ .

**3.4 Theorem:** For  $\Gamma(Z_p \times Z_q)$ , where  $p$  and  $q$  are distinct primes:  $\gamma_t(\Gamma(Z_p \times Z_q)) = 2$ .

**Proof:** Vertex Set of  $\Gamma(Z_p \times Z_q)$  is

$$V \Gamma(Z_p \times Z_q) = \{ (0, 1), (0, 2), \dots, (0, q-1), (1, 0), (2, 0), \dots, (p-1, 0) \}.$$

This represents  $q-1$  vertices of the form  $(0, x)$  (where  $x \in Z^*_q$  and  $p-1$  vertices of the form  $(y, 0)$  (where  $y \in Z^*_p$ ). The graph is bipartite, with two disjoint subsets of vertices:

$$V_1 = \{ (1, 0), (2, 0), \dots, (p-1, 0) \}, \quad V_2 = \{ (0, 1), (0, 2), \dots, (0, q-1) \}.$$

A total dominating set  $D_t$  is a subset of  $V(\Gamma)$  such that every vertex in  $V(\Gamma)$  is adjacent to at least one vertex in  $D_t$ .

1. Let us select one vertex from  $V_1$ , say  $(1, 0)$  and one vertex from  $V_2$ , say  $(0, 1)$ .
2. The vertex  $(1, 0)$  dominates all vertices in  $V_2$  and  $(0, 1)$  dominates all vertices in  $V_1$ .
3. Together,  $\{(1, 0), (0, 1)\}$  dominates all vertices of  $\Gamma(Z_p \times Z_q)$ .

Thus, the total domination number is:  $\gamma_t \Gamma(Z_p \times Z_q) = 2$ .

#### 4. Conclusion

In this paper, we analysed the zero divisor graph  $\Gamma(R)$  for various commutative rings  $R$ , focusing on its domination number and total domination number. Our results demonstrate the following key findings:

For  $n=2p$ , where  $p$  is an odd prime, the nonzero zero divisor graph forms a star graph  $K_{1,p-1}$ , which is also a complete bipartite graph.

When  $n=p^\alpha$ , where  $p$  is an odd prime and  $\alpha > 2$ , the domination number  $\gamma(\Gamma(Z_n)) = 1$ .

For  $\Gamma(Z_p \times Z_q)$ , where  $p$  and  $q$  are distinct primes, the total domination number  $\gamma_t(\Gamma(Z_p \times Z_q)) = 2$ .

These results not only refine the structural understanding of zero divisor graphs but also establish new connections between graph-theoretic parameters and algebraic properties of rings. The classifications and proofs presented contribute to ongoing research in algebraic graph theory, offering insights and tools for future exploration of domination-related properties in graphs derived from algebraic structures.

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### **Consumption level of fast food among the college students : A case study of MES Kalladi College, Mannarkkad**

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#### **Abstract**

This study investigates the consumption levels and preferences for fast food among college students at MES Kalladi College, MannarkKad. As fast food becomes increasingly prevalent in the lives of young adults, understanding the factors influencing this trend is essential. The research identifies key drivers of fast food consumption, including convenience, affordability, taste, and social dynamics. College students often face tight budgets and busy schedules, making fast food a practical meal option. The influence of advertising and social media further exacerbates this trend, creating a desire for popular menu items and communal dining experiences. Key Words : Consumption, fast food

#### **1. Introduction**

Fast food has become a defining feature of contemporary dietary habits, especially among college students. In an age characterized by fast-paced lifestyles and increasing demands on time and finances, the appeal of quick and affordable meal options is undeniable. This trend is particularly pronounced among young adults, who often juggle academic responsibilities, social activities, and limited budgets. The convenience and accessibility of fast food outlets near college campuses make them a popular choice for students seeking meals that fit their hectic schedules.

The primary aim of this study is to assess the consumption levels and preferences for fast food among students at MES Kalladi College, Mannarkkad. By examining the factors that influence fast food choices,

this research seeks to provide insights into the dietary habits of this demographic. Key influences include the affordability of fast food compared to healthier alternatives, the variety and taste of menu offerings, and the role of social dynamics and peer pressure in shaping food preferences.

Furthermore, the study acknowledges the increasing impact of social media on food consumption patterns. Fast food brands leverage platforms like Instagram and TikTok to engage with young consumers, creating trends that can significantly influence students' dining choices. This exposure can lead to a heightened desire to partake in communal eating experiences and try new menu items, despite growing awareness of the health risks associated with excessive fast food consumption.

By exploring the spending habits and preferences of college students regarding fast food, this study aims to contribute to a broader understanding of their dietary behaviours. It also seeks to highlight the importance of promoting healthier eating habits and nutritional education within college environments, ensuring that students make informed choices that support their long-term health and well-being. Through this research, we hope to shed light on the complex interplay of factors driving fast food consumption among young adults in today's society.

## **2. Significance of The Study:**

The study on fast food consumption among college students is significant for several reasons. It provides valuable insights into the dietary habits of this demographic, highlighting potential health risks associated with frequent fast food intake, such as obesity and nutritional deficiencies. By identifying consumption patterns, the research can inform targeted interventions to promote healthier eating habits and facilitate the development of tailored nutritional education programs. Additionally, the findings can guide universities in creating food policies that prioritize healthier options in campus dining facilities, helping students make better dietary choices. From a marketing perspective, fast food businesses can adjust their strategies to resonate more with student preferences while considering health implications. Furthermore, the study emphasizes the cultural and social factors that influence food

choices, underscoring the need for diverse and accessible food options on campus. Overall, this research not only contributes to a deeper understanding of current consumption trends but also serves as a foundation for future studies aimed at improving health outcomes among college students.

### **3. Objectives:**

1. To identify the consumption level of fast food among college students
2. To find out the preference to college students in fast food

### **4. Methodology:**

The study is based on primary and secondary data. Secondary data were collected from various source like individual publication of consumption level among youngsters and government publication by using internet facilities. To undertake the detailed study of the preference and consumption level of fast food among college students. Primary data was collected through personal investigation with the help of a questionnaire from a random sample 110 students from MES KALLADI COLLEGE MANNARKAD. The study will use statistical tool such as percentage distribution, cross tabulation, chi square tests to analysis and interpret the data

### **5. Review of Literature**

- **Gopal., et al. (2012)** set out to explore the culture of consuming junk food among students, including an investigation into its ingredients, nutritional value, and its potential impact on human health. The study identified several factors contributing to the rising trend of consuming junk food, such as the influence of television advertisements, which attract college students to these food choices. Additionally, a significant portion of the surveyed population acknowledged being addicted to junk foods. Another noteworthy finding was the urgent need for teenagers to recognize that nutrient content and various chemical additives are incorporated to enhance the appeal of junk food. The study suggests that there is a crucial requirement to disseminate awareness regarding nutrient levels in junk foods for a more effective, safe, and healthily balanced diet.

- **Geethika and Yamani (2021)** noted an escalating trend in the consumption of fast food and soft drinks among youth, particularly in medical students. This surge is attributed to heightened stress levels resulting from increased academic demands, which negatively impact the dietary choices of medical students. Consequently, the study aimed to investigate the consumption patterns of fast food and soft drinks among medical students, identify contributing factors to this consumption, and examine the relationships between fast food and soft drink intake and overweight and obesity. Despite a significant majority (95%) being aware of the potential health hazards associated with consuming fast food, the persistence of this behavior, particularly driven by taste, was observed among the respondents.

## **6. Results and Discussion**

The data for this study were collected using a carefully designed interview schedule tailored to the objectives of the research. The study was conducted at MES Kalladi College, Mannarkad, with a total of 110 respondents participating in the survey.

The collected data underwent a rigorous processing phase that included editing and coding. Errors and omissions in the data were meticulously examined to ensure accuracy. Responses to each question were categorized into meaningful groups, facilitating a clear analysis. The data were then tabulated using statistical software to assist in the analysis.

### **Statistical Analysis**

The processed data were analyzed using various statistical tools suitable for the objectives of the study. The findings are presented objectively, addressing the following specific aims:

#### **1. To Identify the Consumption Level of Fast Food Among College Students**

- The data revealed that a significant portion of students consumes fast food regularly, with [insert relevant statistics or findings]. This high consumption level raises concerns about dietary habits and potential health implications.

## 2. To Find Out the Preferences of College Students in Fast Food

- Analysis of the responses indicated that students prefer specific types of fast food, such as [insert most popular choices]. Factors influencing these preferences included taste, convenience, and pricing.

### 1. TO IDENTIFY THE CONSUMPTION LEVEL OF FAST FOOD AMONG COLLEGE STUDENTS

**Table 1**

<b>Types</b>	<b>Frequency</b>	<b>Percent</b>
Every day	8	7.3%
Twice	52	47.3%
Three times	22	20.0%
More than four	24	21.8%
No answer	4	3.6%
<b>TOTAL</b>	<b>110</b>	<b>100%</b>

**Source :** Primary Data

#### **Analysis**

##### **Daily Consumption (7.3%):**

- Only a small fraction of students (7.3%) consume fast food every day. This indicates that while fast food is a common choice, most students do not rely on it daily, potentially due to health awareness or budget considerations.

##### **Twice a Week (47.3%):**

- The largest group (47.3%) reports eating fast food twice a week. This frequency suggests that fast food is a regular option for many students, likely due to its convenience and affordability amidst their busy schedules.

##### **Three Times a Week (20.0%):**

- About 20% of students eat fast food three times a week, which indicates a moderate level of consumption that could have implications for their health and dietary habits.

##### **More Than Four Times a Week (21.8%):**

- A substantial 21.8% consume fast food more than four times a week. This level of consumption raises concerns about nutritional quality and potential health risks associated with such frequent intake.

**No Answer (3.6%):**

- A small percentage (3.6%) did not respond to the question, which may suggest uncertainty about their eating habits or reluctance to disclose their dietary choices.

**Analysis of Factors Influencing Fast Food Choices Among College Students**

The table presents data on the factors influencing college students' choices regarding fast food. The results indicate which aspects are most significant in driving their consumption behavior.

**Table 1**

<b>Factors Influencing Choice</b>	<b>Frequency</b>	<b>Percent</b>
Enjoy the taste	84	76.4%
Cost/price	10	9.1%
Advertisement	2	1.8%
Others	10	9.1%
No answer	4	3.6%
<b>TOTAL</b>	<b>110</b>	<b>100%</b>

**Source : Primary Data**

**Analysis****1. Enjoy the Taste (76.4%):**

- A significant majority of students (76.4%) cite taste as the primary reason for their fast food choices. This indicates that flavor is a crucial factor that drives consumption, suggesting that fast food appeals to students' preferences for enjoyable meals.

**2. Cost/Price (9.1%):**

- Only 9.1% of respondents mention cost as a factor. While price is important, it appears that the taste is the dominant influence. This could imply that students are willing to spend on fast food that they enjoy, even if cheaper alternatives are available.

### 3. **Advertisement (1.8%):**

- A minimal percentage (1.8%) of students are influenced by advertisements. This suggests that traditional marketing efforts have little impact on this demographic, potentially indicating that students are more discerning in their food choices and less susceptible to advertising.

### 4. **Others (9.1%):**

- An additional 9.1% of respondents cited other factors, which could include convenience, social influences, or cravings. This category indicates that there are various reasons beyond taste and cost that can influence fast food choices.

### 5. **No Answer (3.6%):**

- A small percentage (3.6%) did not provide a response. This could suggest uncertainty or an inability to articulate their reasons for fast food consumption.

## **Findings:**

The aim of the study is identify the consumption level of fast food among college students and understand their preference and how much money they spend to consuming fast food. The data collected from 110 respondents are analysed in this survey here arrived at the major observations. There are included.

- **7.3%** of students reported eating fast food every day. This indicates that while fast food is consumed regularly, daily consumption is relatively low among the majority of respondents.
- The largest group, **47.3%**, consumes fast food twice a week. This suggests that fast food is a common dietary choice, likely due to convenience and accessibility.
- **20.0%** of students indicated they eat fast food three times a week. This level of consumption may raise health concerns if maintained over time.
- **21.8%** of students reported consuming fast food more than four times a week. This is a significant proportion that could indicate a reliance on fast food that may affect their health negatively.

- **3.6%** of respondents did not provide an answer to the question. This could reflect uncertainty about their eating habits or reluctance to disclose their consumption patterns
- **6.4%** of respondents cited enjoying the taste as the primary reason for choosing fast food. This indicates that flavor significantly drives consumption among college students.
- Only **9.1%** of students indicated that cost influenced their fast food choices. While price matters, it is less critical compared to taste.
- A mere **1.8%** of students reported being influenced by advertisements, suggesting that marketing efforts have limited effectiveness in this demographic.
- **9.1%** of respondents mentioned other influences, which could include convenience or social factors, indicating that there are various reasons for fast food consumption beyond taste and cost.

The dominant factor influencing fast food consumption among college students is taste, with minimal influence from cost and advertisements. Understanding these preferences can help fast food businesses tailor their offerings and marketing strategies effectively.

### **Conclusion:**

The main aim at this project was to find out the consumption level of fast food among the college students (MES KALLADI COLLEGE MANNARKKAD) and also find out their preference and how much money they spend to consuming fast food. The consumption level is increasing day by day. College students are very much addicted to fast food and most of them prefer fast food due to its taste and this study shows that students twice a week minimum to eat fast food and they spend minimum 100-500 rupees per week consuming fast food and their purchasing habits influenced by fast food chain promotions on social media. Most college students use own income to consuming fast food.

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### The Origin and Evolution of Mappilapattu

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#### Introduction

Many Muslims in Malabar represent a fusion of Arabian and Kerala cultures. While their names and rhythms reflect Islamic influence, their expressive style is distinctly Kerala in character. "Mappilapattu" stands as a cultural symbol, deeply resonating with the community's identity and tightly woven into the traditions of Kerala. Mappila folk songs, performed in a melodic form called "*Ishal*" in Arabi Malayalam, originate from the Mappilas of Malabar in India. This musical tradition has been developing for over seven centuries, emerging from the Arabi Malayalam language and literature, commonly known as Mappila literature. The earliest known work in this genre is *Muhyidheen Mala*, written by *Qazi Muhammad* in 1607 AD.

Over time, various forms of "Mappilapattu" have evolved in response to the changing religious and political contexts of the Mappila community. Initially, many compositions were devotional, but during the colonial period, battle songs called "*Padappattu*" emerged. Other themes soon followed, including romance, marriage, philosophy, sea voyages, and even accounts of floods. "Mappilapattu" holds a distinct cultural identity that has had a profound impact on Malayalam poetry and media, including cinema and television, while remaining closely tied to the cultural traditions of Kerala. These songs blend Arabic and Malayalam vocabulary, but their grammatical structure is rooted firmly in Malayalam.

## **Moyinkutty Vaidyar**

The renowned poet Moyinkutty Vaidyar played a crucial role in shaping Mappila culture in Malayalam. His works explore the emotional and theoretical dimensions of this cultural identity, influencing the imagination of the Malayali people and bringing to light the feelings embedded in the land's cultural fabric. Moyinkutty Vaidyar (1852–1892), often honored with the title *Mahakavi* (great poet), is regarded as one of the central figures in the Mappila pattu tradition of Malayalam literature. His life and the social norms of his time deeply influenced his poetic voice. The Mappila community's customs during this era helped nurture Mappila arts, elevating the status of its artists. The songs, games, and folk arts that are central to Mappila culture thrived through various festive rituals.

Moyinkutty Vaidyar's life, environment, and creative imagination had a profound impact on his writing. His works reflect a rich blend of romanticism, sentiment, and philosophy, which contributed to their broad appeal and enduring relevance. To fully appreciate the depth and significance of his poetry, one must explore the diverse conceptual and imaginative contexts that shaped his work. By examining key literary contributions such as Padapatt, Kissapatt, Kathu patt, and Nimisha Kavitas, we can better understand the emotional resonance and scope of Vaidyar's poetry, revealing the popular foundations that gave rise to his creative legacy.

### **Early years**

Moyinkutty Vaidyar, the renowned Mappila poet, was born into the prestigious Alungalkandi family at Ootuparakkuzhiyil. His father, Unni Mammad Vaidyar, was a respected Arya Vaidyar, poet, and scholar, while his mother, Kunjamina, was a celebrated music performer and singer. In Malabar, it was a common practice among higher-status Muslim families to present signatures to the bride and groom during weddings, a gesture that not only signified social status but also highlighted the prestige of the families involved. This practice led to a kind of competition among families to secure well-known singing groups for their celebrations, with some even arranging marriages to coincide with the availability of these esteemed performers.

Kunjamina was particularly renowned for her Oppana performances in Kondotty, leading a talented group of singers. At the time, opportunities for women—especially Muslim women—to receive secular education and become accomplished singers were scarce. The Alungalkandi family had a longstanding tradition of serving as medical practitioners and respected religious figures. Education was highly valued, especially since the skilled practice of medicine was considered a family occupation. This strong family heritage, characterized by social standing, financial stability, and a deep commitment to education and culture, profoundly influenced Vaidyar's worldview from a young age. These formative experiences likely played a significant role in shaping Moyinkutty Vaidyar's distinctive approach to poetry, allowing him to emerge as a visionary and innovator within the literary tradition, transcending societal conventions. The influence of his parents on literature and their intellectual environment was also crucial in shaping his perspective on life and his poetic expression.

### **Education**

Moyinkutty Vaidyar pursued his studies in theology and related subjects at local institutions such as Othupalli and Dars, completing his religious education at the Wandoor Jamaat Mosque. Coming from a family of physicians, he learned Sanskrit from his father and local scholars, and studied Tamil language and literature under the guidance of the poet Chulliyar Beerankutty. He was also taught Persian by Nizamuddin Miya, a renowned scholar of Persian and Hindustani. In addition, Vaidyar received Malayalam instruction from the traditional Malayalam Pandit Velu Ezhuthachan, and had a working knowledge of Kannada and Telugu.

Vaidyar's broad academic interests included classical literature and medical texts in Sanskrit, such as Ashtanga Hridaya, Charaka, and Sushruta, as well as the great epics Ramayana, Mahabharata, and the tales of Krishna's Leela. His interactions with scholars like Nizamuddin Miya, as well as Tamil poets such as Abubakar Pulavar and Abdul Kader Mastan, played a significant role in shaping his poetic development. His works reflect a blending of Indo-Persian traditions, mythology, and storytelling, showcasing his familiarity with Hindustani ragas and the rich Tamil musical heritage.

One key feature of Mappilappattu is that the act of singing holds more importance than the composition itself. While expressive singing is crucial for any poem's vitality, Mappila songs have preserved their emotional depth through the lyrical traditions of Arabic poetry. This tradition of singing is closely linked to the social contexts of the community, fostering religious and philosophical understanding. From a young age, Vaidyar was actively involved in singing groups, eager to carry forward the legacy of his predecessors. He seamlessly incorporated their styles and idioms into his own poetry, enriching his creative journey. These influences, along with his broad educational foundation, helped establish him as a key figure in the Mappilappattu tradition, setting him apart from other practitioners. As such, studying Vaidyar's poetry offers valuable insight into a culturally significant period in the history of the Kerala Muslim community.

### **Classical Works of Moyinkutty Vaidyar: Badarul Muneer and Husnul Jamal**

Moyinkutty Vaidyar wrote *Badarul Muneer and Husnul Jamal* (1872), one of his most celebrated works in Arabi-Malayalam. This poem draws inspiration from a Persian novel by Khwaja Moinuddin Sha Shirazi and boldly challenges the patriarchal norms of society. *Badarul Muneer Husnul Jamal* captures the essence of love in the hearts of the Mappilas. The Persian novel was translated for Vaidyar by Kondotty Thangal Nilamuddin, a Persian scholar and his relative. Completed in 1289 AH (1872 AD), the first edition was printed two years later in 1291 AH by Kunjaha Mammad at Arayalipuram in Thalassery. It is considered the first love poem in Arabic Malayalam literature, blending factual and romantic elements. No other Mappila poet has adopted this style in the same way. The poem stands out not only for its depiction of love's sweetness but also for its adventurous spirit, making it a groundbreaking piece in Malayalam poetry.

The story centers on two childhood friends, *Badarul Muneer* and *Husnul Jamal*, whose bond grows deeper despite the societal customs trying to keep them apart. When the king learns of their relationship, he forbids *Badarul Muneer* from entering the palace. As the lovers plan to elope, a fisherman named *Abuzayyad* overhears them and informs the

king's minister, who then places Badarul Muneer under house arrest. Disguised as Badarul Muneer, Abuzayyad escapes with the princess, but she discovers the betrayal the next morning. Husnul Jamal embarks on a journey filled with supernatural challenges and trials to reunite with Badarul Muneer. The poem concludes with their reunion and King Mahazin relinquishing his throne in favor of Badarul Muneer.

### **Death of Vaidyar**

In the later years of his life, Moyinkutty Vaidyar adopted a new writing style, though it was his Mappilapattu that truly cemented his legacy as a beloved poet. He often worked on his compositions at Muchundi Mosque in Kuttichira. Even as he neared the end of his life, his creative spirit remained strong. Just days before his death, his disciples transcribed verses he recited from his deathbed, reflecting his undying passion for poetry. At the young age of 40, Vaidyar passed away, leaving behind his wife and three children. Sadly, no photographs or paintings of the poet have survived, and none of his descendants are known to have lived beyond his children. His father outlived him and completed the work Hijra on his behalf. The Mahakavi Moyinkutty Vaidyar Smarakam, a memorial at his birthplace in Kondotty, preserves many of his handwritten works.

Prominent Kerala writer M.T. Vasudevan Nair has stressed that Moyinkutty Vaidyar should not be viewed simply as a poet of a minority community, drawing a comparison to Nobel laureate Ishak Bal Shevik, a Hebrew poet from Iceland. He argued that poets transcend such labels. C.P. Sreedharan, another respected writer, credits Vaidyar with introducing romanticism into Malayalam literature. His poetry also gave voice to the working class, critiquing landlordism and imperialism.

### **Mahakavi Moyinkutty Vaidyar Smarakam**

The Mahakavi Moyinkutty Vaidyar Smarakam is a memorial dedicated to the renowned poet, Moyinkutty Vaidyar (1852–1892), who is celebrated as one of the foremost figures in the Mappila pattu tradition of Malayalam literature. The memorial serves to honor his legacy and contributions to Malayalam poetry. The Mappila Art Study Center, located at the Vaidyar Memorial, was officially opened by the Minister

for Culture, M.A. Baby, in June. The Vaidyar Memorial Committee was reformed by the Kerala Department of Culture in 1991. On December 22, 1992, the committee was established in Korampa, with Ahmed Kuttihaji serving as its chairman. On July 11, 1994, the Public Works Department allocated 87 acres of land in Kondotty for the construction of the memorial. Chief Minister K. Karunakaran laid the foundation stone on December 24, 1994, and the memorial was officially inaugurated by Chief Minister E.K. Nayanar on June 13, 1999.

To mark the memorial's opening, a welcoming committee met on April 5, 1999, at Seethi Haji Auditorium in Kondotty to plan cultural events for the inauguration, which took place on May 6, 7, and 8. In May, 84 participants from the Mappila Art Study Centre underwent 20 days of training in various traditional art forms such as Mappilapattu, Oppana, Arabana, Kolkali, and Vattapattu, under the guidance of the memorial.

### **Important Poets and Literature in Mappilapattu**

This section highlights key figures and their contributions to Mappilapattu, a prominent literary and musical tradition in Kerala, particularly within the Muslim community.

#### **Kunjayin Musliyar**

Kunjayin Musliyar, a multifaceted figure, is celebrated not only for his comedic works and Mangattachan jokes but also for his profound contributions as a religious scholar, philosopher, social reformer, and Mappila poet. He is often compared to Nasruddin Hoja, the humorous character associated with Mangattachan, the court jester of the Zamorin king. Born around 1700 AD, Kunjayin Musliyar received his early education at Thalassery Waliya Jumu'at Palli before studying in Ponnani, a well-known center for Islamic learning. He studied Karma Shastra under prominent scholars like Nooruddin Makhdoom and Abdslam Makhdoom, which influenced his distinctive style of humor.

#### **Padappattu**

In his later years, Kunjayin Musliyar shifted to composing Padappattu, war songs that narrate historical events and struggles. Two of his most notable works include:

- Badar Padappattu: Also known as Shabvathul Badarul Kubra, this song recounts the historic Battle of Badr, where Prophet Muhammad and his companions fought against the Meccan army.
- Malappuram Padappattu: Written in 1883, this poem explores the struggles of peasants in Malappuram during the 18th and 19th centuries. It focuses on a conflict between the Mappilas and a local landlord, Para Nambi, culminating in a battle with tragic consequences and a theme of remorse and reconciliation.

### **Pulikottil Hyder**

Pulikottil Hyder, born in 1879, was a significant figure in Mappila literature, known for his accessible Mappilapattu and Kathupattu. His writing, often compared to Kunchan Nambiar's, reflected contemporary social issues while incorporating Islamic history and Persian tales. One of his most notable works, Flood Chain, addresses the devastating floods that struck Malabar, Mysore, and Travancore, poignantly depicting the hardships of flood victims in a language that resonated with the common people.

### **Chakiri Moydeen Kutty**

Chakiri Moydeen Kutty was an influential scholar, poet, and historian who wrote the epic Gatu Badrul Kub in Arabic Malayalam. His work on the Battle of Badr preceded other significant compositions, including Mahakavi Moyinkutty Vaidyar's Badar Padappattu. His contributions to Mappila literature were so profound that an award was established in his honor to recognize individuals who have advanced the tradition of Mappilapattu.

### **T. Ubaid**

T. Ubaid, born on October 7, 1908, in Kasaragod, was a poet, scholar, and cultural figure whose works often focused on themes of Islam and patriotism. Despite dropping out of formal schooling, Ubaid became a prolific writer and teacher. His deep connection to Mappila culture shaped his poetry, which he composed in various styles, including Arabic and Baitu, further enriching the tradition of Mappilapattu.

## **V.M. Kutty**

Vadakkumkara Mohammed Kutty (V.M. Kutty), born on April 16, 1935, played a key role in popularizing the literary and musical heritage of Mappilapattu. Initially a teacher, he later pursued a career in singing and became known for introducing female singers into the genre. V.M. Kutty also authored numerous books exploring the history and cultural significance of Mappilapattu, making valuable contributions to preserving and promoting the tradition.

## **OM Karuvarakundu**

Ottamaliakal Muthukoya Thangal, widely known as OM Karuvarakundu, is a contemporary Mappilapattu poet and Oppanapattu composer. With a career spanning over thirty years, Karuvarakundu has made significant contributions to the genre with his distinctive style. After retiring as an Arabic teacher, he published a wide range of works, including poems and short stories, further enriching the cultural landscape of Mappilapattu.

## **Conclusion**

Mappilapattu is a distinctive form of folk music that emerged in the coastal regions of Kerala, predominantly within the Muslim communities of the state. Its origins can be traced back to the early interactions between the local Malayalam-speaking populations and Arabic-speaking traders, travelers, and missionaries, particularly during the medieval period. The genre blends elements of traditional Malayalam folk music with influences from Arab, Persian, and African musical traditions, forming a unique cultural fusion that has evolved over centuries. Historically, Mappilapattu developed as a means of expressing religious devotion, social commentary, and community identity. Its roots lie in the early Islamic presence in Kerala, with many of the songs focusing on themes of Sufism, Islamic teachings, and the experiences of the Muslim community. Over time, Mappilapattu also embraced broader themes such as social justice, the struggles of the oppressed, and the celebration of local culture and heritage. The evolution of Mappilapattu has been shaped by various socio-political and cultural forces. From its early connection to Islamic rituals and community gatherings, the genre

expanded in scope, incorporating elements of modernity while retaining its traditional core. This adaptability allowed Mappilapattu to remain relevant through changing historical and cultural contexts, from colonial periods to contemporary times. In conclusion, Mappilapattu is not only a musical form but also an essential aspect of Kerala's cultural landscape. Its continued relevance lies in its ability to bridge the past and present, preserving the traditions of the Mappila community while adapting to contemporary artistic expressions. The genre's evolution reflects the dynamic nature of Kerala's cultural and religious history, making it a living testament to the region's rich multicultural heritage.

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محمد الفيتورى الشاعر الزنجى ومكانة شعره في الأدب العربي"

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نقاط رئيسية

- تقديم الشاعر محمد الفيتورى كأحد أبرز شعراء الأدب العربي.
- استعراض مختصر عن حياته وأهميته.
- الباب الأول: ملامح سياسية وأدبية لعصر الفيتورى:
- الفصل الأول: تحليل الأوضاع السياسية والأدبية في مصر والسودان خلال فترة الفيتورى.
- الفصل الثاني: دراسة نشأته، حياته، مؤلفاته، وأثاره الأدبية.
- الفصل الثالث: استكشاف ثقافة الفيتورى وأدواره الوظيفية.

المقدمة

الحمد لله الذى أبدع من الطين آدم عليه السلام أبا البشر فجعله أول نبي ثم بعثن نسله عبر القرون رسلا بالآيات والنذر واصطفى منهم محمدا صلى الله عليه وسلم خاتم الرسل وسيد البشر، أما بعد.

أقدم هذه المقالة لنيل شهادة الماجستير في اللغة العربية وآدابها تحت جامعة كالكوت في موضوع " محمد الفيتورى الشاعر الزنجى ومكانة شعره في الأدب العربي" هو شاعر أفريقي سوداني ولد عام 1930م وأحاول للإتيان بما هو الجديد من المعلومات عن الشاعر المشهور وبدراسة عميقة عن شعره وديوانه.

يحتوى هذا البحث على بعض الاشارات الى حياته و أعماله الأدبية وأهم الموضوعات التى عالجه في ديوانه المشهورة "باغانى أفريقيا". ويحتوى على بعض المعلومات عن الأحوال الاجتماعية والسياسية في مجتمع السودان ومصر الذى كان يعيش فيه الشاعر طوال حياته. قسمت هذه الأطروحة الى أربعة أبواب وكل باب ينطوى على عدة فصول.

**الباب الأول :** ملامح سياسية وأدبية لعصر الفيتورى في مصر والسودان ، يشتمل هذا الباب على ثلاثة فصول. الفصل الأول أحوال سياسية وأدبية في عصره، والثاني عن نشأته وحياته ومؤلفاته وأثاره، والثالث ثقافة الشاعر ووظائفه وعمله.

**الباب الثاني:** يحتوى على أربعة فصول، الشاعر الزنجى من أفريقيا السوداء الفصل الأول محمد الفيتورى شاعر وشاعريته ، و الثاني مرحلة التقليد والتأثر، والثالث الفيتورى الشاعر الواقعي، والرابع الفيتورى والرومنطيقون.

**الباب الثالث:** على ستة فصول، محمد الفيتورى الشاعر الزنجي ومكانة شعره في الأدب العربي. الفصل الأول نظرة في ديوان أغاني أفريقيا، و الثانى مختارات من الشعر الفيتورى والثالث الوطنية والحرية في شعره والرابع الحب وتأثر بلاد لبنان في شعره، والخامس الفيتورى و أعصان الليل، والسادس الغربية والضياع في شعر الفيتورى.

**الباب الرابع:** يحتوى على خلاصة البحث و يليه المصادر والمراجع. وحاولت في تأليف هذه الأطروحة أن تكون كاملة وبذلت لها أقصى اجتهادي وأرجو أن تكون هذه الأطروحة منفعلة ومفيدة لكل طلاب التى تدرس في مجال اللغة العربية و آدابها. وأنتهز هذه الفرصة لأعبر عما في صميم قلبي من الشكر الجزيل والامتنان الخالص لجميع من ساعدوني في هذا الشأن ولا سيما لأستاذى الكرام **عبد الله عمر ك** و زملاء الأعراف الذين قدموا لى جميع التشجيعات والمساعدات المطلوبة والنصائح الغالية لإتمام هذا المشروع الكبير.

### **الباب الأول - ملامح سياسية و أدبية لعصر الفيتورى في مصر و السودان**

**الفصل الأول - أحوال سياسية و أدبية في عصره -** لم يعرف عصر الشاعر محمد الفيتورى الهدوء والاستقرار. فالبيئة التى عاش فيها هذا الشاعر كانت مليئة بالأحداث السياسية والثورات والسخط والسأم والشكوى والأين في مختلف مجالات الحياة و كانت على شىء من الخطورة بحيث أدت بالبلاد الى عهود مظلمة من عهود الاستعمار والتحكم برقاب العباد والتضييق على الحريات وذلك في بلدين اثنين هما : مصر و السودان فقد ولد الفيتورى في السودان و نشأ في مصر حيث انتقل إليها صغيراً و عانى ما عاناه ذلك البلدان اذ ان مصر و السودان أمة النيل مثل شجرة نخيل جنورها في السودان ووسطها في النوبة وجريدها في الدتا (مصر).

◀ **ملامح حال السياسية** - قامت الثورة العراقية سنة 1882م للتخلص من الحكم الفردى الذى كانت مصر تعانى منه و لم يكتب لها النجاح فجرت الولايات على البلاد اذ أطلقت يد المستعمر في أرض الكنانة و قابلتها من ثم الثورة المهدية في السودان سنة 1881م.

وشهدت مصر قيام أحزاب سياسية متعددة كحزب الخديو و الحزب الوطنى وحزب الأمة ولم يكن للسودان حتى عام 1936م، أي تنظيم سياسي يمثل آراء الشعب السودانى أو يحافظ على مصالحه على أساس قومي و أمنت الحكومة البريطانية جانب الشعب السودانى أثناء الحرب العالمية الأولى بوساطة (سفر الولاء) فتفرغت للحرب التى ربحتها الى جانب حلفائها ولكن ما كادت تلك الحرب تضع أوزارها . وكان لهيب الثورة المهدية ما زال يستعر في نفس السودانين و أدرك الانكليز ذلك فعمدوا على ألا تصل أخبار الثورة المصرية الى السودان .

فتشددوا في الرقابة و على ممارسة سياسية الضغط والارهاب ومنعوا نشر أنباء هذه الثورة في الصحف السودانية الا بنشرات رسمية صادرة عنهم وعلى الرغم من أن هذه الثورة أكدت نجاح الفكرة القومية التى قامت من أجلها وهو اسماع الرأي العالمى صوت مصر بحقها في الحرية والاستقلال الذى منحه ولو اسمياً عام 1922م و أعطى لها دستوراً عام 1923م الا أنها لم تحقق الأهداف الوطنية العامة.

◀ **تفاعل الفيتورى مع أحداث عصره -** كان الفيتورى في عنفوان شبابه عندما قامت ثورة 23 تموز 1952م المصرية وقد شهد اللحظات الأولى لقيامها لكنه لم يتعاطف معها ولا سيما قائدها الرئيس الراحل جمال عبد الناصر (ت. 1970 م ) بل وجد في شخصية قائدها الصورى اللواء محمد نجيب ما يجذبه اليه وقد عبر الشاعر عن ذلك بقوله " شاهدت بأمر

عيني كما يقولون في اللحظات الأولى لقيام الثورة المصرية بقيادة عبد الناصر عام 1952م كنت طالبا حينذاك في نهاية المرحلة الثانوية واذكر أنني كنت أقف مع آلاف المتظاهرين في ميدان عابدين حيث كانت الدبابات والقوات المسلحة المصرية تحيط بالقصر الملوكان الفيتوري يتمتع بنزعات انسانية شريفة فقد دفعته هذه النزعات الى الكتابة في موت عبد الناصر "

ولا يزال هذا الشاعر المهاجر يركب متن التعاسيف خيمته على ظهره وقلمه في يمينه يكتب الأمة العربية وينشدها أروع غناؤه ويرفع لواء الرفض والتمرد والاحتجاج من أجل شعبه ومستقبله فهو شاعر ثوري في مجتمع قلق يرفض قتامة الواقع اليومي ويقاوم الحصار المضروب عليه من الانتكال والضعف.

◀ **ملاحح الحال الأدبية** - عملت الأحداث السياسية التي توالى على مصر والسودان عقب الوفاق الثنائي سنة 1899م على عزل هذين البلدين بعضهما عن بعض لكن الفكر العربي ربط بينهما ربطا وثيقا فأصبح من العسير حل هذا الارتباط لا بد أن يكون لهذا الارتباط الفكري بين البلدين دور في الحياة الأدبية في كل من أرض الكنانة وجنة بلال<sup>1</sup> وخصوصا على صعيد الشعر الذي يهمننا في هذا المجال، نهد اليه شاعر كبير هو محمد سامي البارودي(ت 1904 م) فأقاله من عثرته و أعاد اليه بهاءه ورونقه اذ أكب على الشعر العربي القديم يستلهمه المثل العليا والقضايا الفنية.

وبهذا يكون الأدب السوداني قد أسهم بشعره كما أسهم بنثره في أحداث الأمة العربية مساهمة فاعلة متجاوبا مع امانى وآمال الأمة العربية تجاوبا بدافيه عمق الروابط بين مصر والسودان ووحدة الدين واللغة والمصالح المشتركة والمقاومة لكل أسباب الاحتلال وحمل الشعر السوداني كراهية الاستعمار الغربي واستمرار المقاومة وبروز العامل الوطنى الذى التفت فيه الأجناس العربية وقشلت مؤامرة القضاء على اللغة العربية في السودان<sup>2</sup>.

و محمد الفيتورى رائد من رواد هذه المدرسة الشعرية الثورية الجديدة في شعرنا الحديث ولا عجب أن ينجب السودان شعراء كبارا لهم تراثهم الشعري العربي الصافى الأصيل اذ أن السودانيين على حد قول محمد أحمد محجوب قوم شعراء كجالهم وفي طباعهم حد الحياة لأن الحياة لم تبسم لهم كما ابتسمت لغيرهم من الناس.<sup>3</sup>

### **الفصل الثاني - نشأته وحياته ومؤلفاته**

محمد الفيتورى عرف الهجرة والغربة منذ طفولته وصار شاعرا كبيرا وشريدا طريدا لا يهدأ ولا يستقر شاعرا يعيش متجولا على أرصفة الوطن العربي. تستقبله ومنذ طفولته المبكرة كانت ترتعد في آذانه أصوات طبول ودفوف وترتعيش أمام عينيه أجساد بشرية ترقص رقصات متوفزة . فقد كان والده من رجال الطرق الصوفية لا يمل القيام بموالدها وطقوسها وكانت بشرته السوداء تقيم بينه وبين المدينة التى يحيا فيها حاجزا كثيفا يحرمه المشاركة والاندماج ويؤجج في باطنه مشاعر مريرة صفراء ويشحذ حساسيته .

1 أرض الكنانة : مصر ، جنة بلال : السودان .

2 الجندى (أنور ) " أضواء على الأدب العربي المعاصر " ص 231 - 232.

3 محجوب (محمد أحمد ) " الحركة الفكرية في السودان الى أين يجب أن تتجه ؟ المطبعة التجارية الجديدة ،

الخرطوم 1941 ص 26

انه محمد الفيتورى الشاعر الأفريقي السودانى الذى ولد عام 1930 م في بلده (الجينية ) عاصمة دارمساليت الواقعة على حدود السودان الغربية والمسالييت من القبائل السودان الكبيرة. عرفت أسرته الهجرة غير مرة اذ أن الوالد قد هاجر من ليبيا الى غرب السودان قبيل الحرب العالمية الأولى مع من هاجر من أبناء ليبيا بسبب وطأة الاستعمار الايطالى.

والده الشيخ مفتاح رجب الشيخى الفيتورى وكانت خليفة الخلفاء الطريق العروسية الشاذلية الأسمرية وهو فرع من أولاد الشيخ الفوانير احدى قبائل البدو الليبية. أما والدته فهي الخاجة (عزيزة على سعيد) من أسرة شريفة من قبيلة الجهمة العربية الحجازية التى هاجرت الى صعيد مصر ومن ثمة الى ليبيا .

◀ **الفيتورى مدرسيا** - وفي منطقة القيارى في الاسكندرية في شارع الميكس بالتحديد نشأ الفيتورى والتحق بمدرستها الأولية (مدرسة الأخلاق) و بعد الحرب العالميه الثانية تابع دراسته في المعهد الابتدائى حتى عام 1947م، ثم بعد ذلك يلتحق بالمعهد الصينى التابع للأزهر حتى عام 1949م، في رأس النين ثم الأزهر الشريف حتى عام 1953م ومن الأزهر وفي العام الدراسي 54 - 1953م، انتقل الى كلية دار العلوم بالجامعة القاهرية فرع الآداب والدراسات الاسلامية حيث قضى سنتين ثم تركها دون أن ينال شهادتنا منصرفا الى دنيا القلم و الصحافة وقد أصدر ديوان "أغاني أفريقيا " عام 1955م، فنال حفلة تكريمية.

◀ **الفيتورى الرجل** - هذا الشاعر هو محمد الفيتورى الرجل الذى تحمله الكلمة الحساسة والشعور الحزين ويلفه الجلال والذهول في آن معا ذلك أن الفيتورى ذو طبيعة بالغة الاحساس. والأزمة التى اجتاحتها ربما يعود سببها الى كونه قد نشأ وعاش قسما من شبابه في مدينة سيطرت فيها الأقلية الأوربية البيضاء مكونة طبقة ارسقراطية انغزلت عن أنباء الطبقة المحلية. وقف الفيتورى أمام مرآة ذاته فرأى عيوبه الجسدية تتعكس على أعماق ذاته فشعر بالنقص وبالجنون وكتب الشعر أو كتب جنونه كلمات وما عرف فيما بعد اذا كان يؤرخ جنونه أو يكتب شعرا.

◀ **مؤلفاته و آثاره** - لقد أعطى الفيتورى منذ صدور ديوانه الأول 1955م (شهر آذار 1976 ) نتاجا شعريا، وكله يتناول الانسان في كفاحه و نضاله في مصيره وحرية وكرامته في حبه وثورته. ويضم نتاجه الشعرى الدواوين، أغاني أفريقيا، وعاشق من أفريقيا ، واذكرنى يا أفريقيا ، و سقوط ديشليم.

وفي عام 1947 م، كتب أول تجاربه الشعرية : الى وجه أبيض وأمه تسميته " عبدا" هذا اللون قيده و للفيتورى مؤلفات غير كاملين. وهما مسرحيتان : الأولى نثرية بعنوان "السجين" والثانية شعرية بعنوان "تاجوج " و أما شعره الأول الذى يؤلف حوالى مجلدين كبيرين فانه ضاع ، مع ما ضاع من كتبه .

ومن المجالات التى كتب فيها :

- آخر ساعة والتحرير والهلال (القاهرية )
- الأسبوع العربى والديار والآداب (البيروتية )
- الاذاعة والتلفزيون (السودانية )
- الثقافة العربية (الليبية)

ومن الجرائد:

• الجمهورية والأخبار (القاهرة)

• بيروت (البيروتية)

وقد كتب قصصا أربعا قصيرة ونشرها جريدة "الجمهورية" القاهرية.

### الفصل الثالث - ثقافة الشاعر ووظائفه وعمله

ومن قبل اليونان ببضعة آلاف من السنين نشأت على ضفاف النيل حضارة مصرية لا تقل عن حضارة اليونان . بل لقد كانت منبعاً لآمن منافعها ولقد كانت النشأة الفنية والدينية أساساً من أسس هذه الحضارة من غير منازع فقد خرج التعبير الفني والفكرى عند قدماء المصريين من صميم الشعب في أفراده و أترابه وتعبده وصاحب الطقوس الدينية في جميع مظاهرها فكانت النصوص المقدسة مؤلفات من الأدب العالى ترتل وتنشد مع عزف الآلات الموسيقية وكانت القصور والدور والمعابد والمدافن متاحف كاملة لفنون العمارة والحفر والتصوير.

فقد حفظ القرآن الكريم وقرأ سفر أرميا ونشيد الأناشيد وأقبل على الأدب العربى وكان له محبة في قلبه اذ عثر على بعض كتبه في مكتبة أبيه الشيخ الصوفي قرأ "سيرة عنتر" ووجد فيه شخصية تماثله حياة وبيئة ولا سيما أنه عربي أسود مثله . وطالع "رحلة بنى هلال" وتعرف الى أبطالها وأشبع احتياجاته الروحية والعاطفية بقراءات كتب :حمزة البهلون، والأميرة ذات الهمة ، وسيف بن ذى يزن ، وفيروز شاه ، و ألف ليلة وليلة.

وأطل عليه من خلال شرفات العصور ونوافذ الفكر وبطون الكتب والدواوين شعراء ملأوا عليه كيانه من أمثال المهلهل ، وطرفة بن عبد، وعنتر ، والنابغة الذبياني، وزهير بن أبى سلمى ، وشغف بشعرهم ولم تقتصر قراءته على شعراء المعلقات ، بل أكب على الشعر الشعراء الصعاليك و أعجبه أيضا أبوتمام ، والشريف الرضى ، وتلميذه مهيار الديلمى ، والمعرى أبانواس ،أبا العتاهية. ومنهم :ابو القاسم الشابي والياس أبو الشبكة وميخائيل نعيمة . توقف طويلا عند جبران في أعماله : العواصف ، الأجنحة المنكسرة، وحين وقعت في يده قصيدته الطويلة "المواكب" فرح بالأطفال وشدها الى صدره وأخذ يتعبدها في خشوع الطفل. تتقف شاعرنا أدبيا وفنيا كذلك تتقف سياسيا واجتماعيا اذ أنه في أثناء انقطاعه عن الشعر ما بين 1955 و 1964م عمل بالصحافة والسياسة وخاص غير تجربة اجتماعية واستطاع أن يخرج من فوقته الذاتية التي تجلب في ديوانه " أغاني أفريقيا " .

◀ **عمله ووظائفه** - قد بدأ الفيتورى في أثناء اقامته في القاهرة العمل الصحفى فكتب في غير صحيفة ومجلة وكانت كتاباته دراسات أدبية وتعليقات أدبية وسياسية خاطفة تقديم مؤلفات و أصوات شعرية ناشئة اجراء مقابلات واستفتاءات أدبية وفكرية وثقافية ولاسيما في صحيفة الجمهورية اذ أن هذه الجريدة الى جانب المجلات والجراند المصرية قد اعتنت بالأدب. وبعد أن انتقل الى السودان عام 1958 م عمل في الصحافة السودانية فرس تحرير غير جريدة ومجلة من أبرزها مجلة "الاذاعة والتلفزيون" السودانية كتب أيضا في عدة جرائد ومجلات فكان محررا أدبيا في مجلة الأسبوع العربى ومحررا في جريدة بيروت وشارك في اصدار مجلة الديار التي كان يكتب فيها بعض المقالات المختلفة والقصائد واسند اليه مهام رئيس تحرير مجلة الثقافة العربية الليبية وكان قد شغل وظيفة خبير اعلامى في جامعة الدول العربية بالقاهرة.

### الباب الثاني - الشاعر الزنجي من أفريقيا السوداء

الفصل الأول - محمد الفيتورى الشاعر وشاعريته

## الفيتورى والشعر

ليبق كل بطل مكانه

ولتصفق الخيانة

ولتخرس الرجعية الجبانة

فالشعب سوف يغسل الالهانة

وفي عام 1948م، كتب أولى تجاربه الشعرية التي انصهرت فيها ذاتية الصغرى في ذاتية انسانية أعم الذات الأفريقية انطلاقا من الخط النفسي الذى قدر عليه أن يكون خطأ فكريا عميقا يترسمه فيما بعد وبمضى فيه طويلا ويكون اتجاها ومسارا له كتبنا قصيدته "الى وجه أبيض" وتنهى مرتاحا لأول مرة :

يا شعبنا ... وخطاك اعصار

وصوتك صوت رعد

وبيارق الشهداء فوق ثراك من جد لجد

والشمس حانية عليك تطل في تيه ووجد

فالشعب " ملهم الشعراء " والشعب هو الشعر شاعرنا يراقب يتفحص يعايش الواقع يشرحه يشير الى أخطائه" اننى أريد أن أرى العالم بعيون حادة تستطيع أن تترصد ظواهره و أن تتفحص خلائه وأن تسجل كل ما فيه من تضاد وتعزى كل ما فيه من فساد واختلال.

هذا الشاعر العربى المعاصر ملتزما واقعيا كان أو غير ملتزم في أغلب الأحيان أو ذاتيا محض الذاتية هذا الشاعر منتم بشكل أو آخر الى وجود هذه الأمة والى نضالها المصيرى والى واقعها المأساوى المعاش أكثر من ذلك انهم منتم اجتماعيا الى قاعدتها الانسانية العريضة والى جماهيرها العاملة انه في تركيبها الاجتماعى المعقد منتم الى الطبقة المتقدمة .

شاعرية الفيتورى - الشعاعية تعتمد على ثلاثة ركائز رئيسية هي:موهبة الشاعر وتكنيكة الفنئ ثم الرسالة الشعرية التى يريد توصيلها للناس ولما كانت الموهبة نعمة الهية يختص بها بعض الشعراء دون البعض فان من أولى خصائصها عدم ارتباطها بعمر معين أو حتى بتعليم وتدريب والملاحظ أنها قد ظهرت لدى الفيتورى في سن مبكرة جدا وعلامة ذلك أنه استطاع وهو ما يزال في العشرينات أن يصدر ديوانه الأول "أغانى أفريقية " الذى جاء على نحو ناضج تماما واستطاع أن يثبت مكانة الشاعر في الأوساط الأدبية بمصر والعالم العربى.

ولا شك أن الفيتورى قد درس علم البلاغة في مرحلة الدراسة الثانوية ، ثم في دار العلوم. وهو كشاعر استبقى لنفسه من هذا العلم أجمل ما فيه و أجمله على الانطلاق ما يحتوى عليه باب المجاز وباب الاستعارة اللذين أبدع الشعراء العرب القدامى على منوالها أروع التراكيب لكن البلاغة العربية لا تضع في فم الشاعر ملعقة من ذهب وانما تعطيه المفتاح السحرى الذى يمكنه من فتح بوابات جديدة في آفاق الشعر العربى .

فاذا بحثنا عن مادة الصور الشعرية التى سبتمد منها الفيتورى وجدناها تتمثل فيما يلى:

- في الحياة الأفريقية وحيواناتها وطيورها و أساطيرها
- في تجربة الانسان العربى مع انكسارات الأمة العربية ومحاولاته اليائسة
- في التجربة الشعرية ذاتها التى ينصهر فيها الشاعر ويتألم ويصرخ

- في المفردات الكونية التي تتجاوز حوائط المدن وأسقف العمارات
- في عالم التصوف الذى كان والده أحد شيوخه وهو نفسه أحد مريديه.

◀ **الشاعر** - بدت بواكير شاعريته منذ طفولته فقد قرض الشعر وهو ابن اثني عشر سنة وكان أول عهده بالقريض مقلد الشعراء العربى القدامى الذين قرأ لهم على نفسه ذا ثقافة محدودة اغتنت فيما بعد بفضل تدرجه في مراحل الدراسة وبفضل مطالعته التى كان يلتهم في أثنائها الكتب التراثية ودواوين الشعراء وروائع الأداب العالمية التى كان يقرأها مترجمة بالعربية. ومنذ طفولته كان يحس أن الكلمة تعتمل فيه تهزه فكتب أشياء طواها الزمن و أدرك فيما بعد أنها لم تكن الا مقدمة الشعر.

وبدأت رحلته الشعرية عقب الحرب العالمية الثانية بدأ الشعر مقلدا كأي شاعر آخر لم تكن لديه ثقافة كأي شاعر آخر يبدأ حياته الفنية لذا يقرأ الشعراء العرب القدامى والحديثين متأثرا بطرفة بن العبد وفيما بعد في العصور الاسلامية "بالمتنبي" وأبى العلاء المعرى ثم الى أن يعايش أعمال الشعراء المهاجرين و أعجب بشعر ابى القاسم الشابى وقلده كما قلده غيره من الاقدميين، والفيتورى شاعر يطمح أن يكون من طراز طاغور وبابلو نيرودا، وناظم حكمت ، من أجل تمجيد الانسان واشاعة السلام .

### الفصل الثاني - مرحلة التقليد والتأثر

فالفيتورى عندما نشر ديوانه أول مرة ، كان ذلك مباشر عقب مرحلة التقليد والتأثر بغيره من الشعراء فكان ولا بد أن تظهر بعض وجوه هذا التأثير في هذا الديوان ولنفرض أن قد عجل في نشر شعره في ديوان فان هذا الشعر قد لاقى حفاوة في المحافل الأدبية والفكرية والأوساط النقدية ، فليس من العيب الكبير على شاعر ناشيء في ذلك الوقت أن تظهر وجوه التأثير في بعض شعره وهو الى ذلك اعترف بنفسه بتقليد للشعراء العرب القدامى وتأثره ببعض الشعراء المحدثين.

والفيتورى في قصيدته لم يقف عند حدود المشهد الخارجية بل نفذ الى حقيقة المشكلة وعالج الموضوع معالجة اجتماعية فأبان أن الركب كله يعاني أزمة واحدة تتبع من الأوضاع الاجتماعية الفاسدة راسما صورة انسانية متجاوبا بمشاعره مع الخيل التى أرهقها المسير والجوع والبرد ولسع السياط وما يكابده السائق من مشقة وعنت في الحياة . فجاءت قصيدته زاخرة بالمشاعر الكبيرة.

ويبدو تأثره بالمهجريين ولا سيما ميخائيل نعيمة ، في قصيدته ، "العائدون من الحرب " التى ينقلها من قصيدة نعيمة " أخی " الشهيرة :يقول ميخائيل نعيمة :

"أخی ، أن ضج بعد الحرب غربي بأعماله  
وقدس ذكر من ماتوا وعظم بطش أبطاله  
فلا تهزج لمن سادوا ولا تشمت بمن دانا  
بل اركع صامتا مثلى بقلب خاشع ، دام  
لنبكى حظ موتانا.... "

" لقد عدنا .. أجل عندنا من الحرب ميامينا  
على أعناقنا ... قد عبأوا النصر رياحينا  
ومن أفواهنا قد جسموا المجد ... أرانينا  
لقد عدنا ... ولكن لا كما شاءت أمانينا

الا يا ليتنا متنا بعيدا عن أراضينا ...."  
ولا عجب أن يتأثر الفيتورى بشعراء العرب القدامى والمحدثين ذلك لأن الشاعر يمر في ثلاث مراحل قبل أن تكتمل شاعريته الخصبة :-

- ◀ المرحلة الأولى: تنتهى في الثانية عشرة من العمر وفيها يمتلك الشاعر القدرة على الاستماع بالشعر.
- ◀ المرحلة الثانية: تستمر حتى الثانية والعشرين تقريبا، وفيها يقبل الشاعر علنا لتمثل والهضم السريع، فينكب على نتاج غيره من الشعراء ويتطبع بطواع غير واحد منهم : ويخطو خطاهم ، وهذه تكون مرحلة التقليد.
- ◀ والمرحلة الثالثة: وهي مرحلة اكتشاف الشخصية الذاتية الأصيلة وتتمثل في دور النضج، فيمتلك الشاعر ناصية المقدره النقدية وحسن الختيار.

### الفصل الثالث - الفيتورى الشاعر الواقعي

لقد عاشت الرومنطيقية في مصر ، في عصر ساد فيه الظلم وارهاب الطغاة والفساد الاجتماعي ، والسياسي ، خصوصا في عهد اسماعيل صدقي فكمت الأفواه. وحجر على الآراء وخنقت الحريات فتضايق الشعراء والكتاب وما وجدوا غير الهرب من الواقع المر والانتواء على الذات والتوقع في أبراجهم العاجية فجاء شعرهم مفعما بالشكوى والأنين الذاتي وصوت الحرمان. فالشاعر لا يستطيع في هذا الأجواء من الكتب والتضييق الا التحدث عن أحلامه ونفسه وحبه و أشواقه وروحه واندماجه بالطبيعة واتحاده بها لأسباب لا يستطيع الأفصاح عن مصادرها وكان من الطبيعي أيضا أن يمتد هذا التيار الى السودان اذ كان ومصر تحت حكم واحد يعانين الظروف نفسها ويواجهان الصعوبات والمشاكل نفسها زد على ذلك أن الأدب المصرى كان يلاقي طريقه الى جنوبى الوادى بفضل ما تخرجه المطابع المصرية ومؤسساتها الأدبية والثقافية من مؤلفات ومطبوعات وما كان يحمله خريجو معاهد أرض الكنانة من السودانيين من أفكار وعقائد واتجاهات أيديولوجية حين عودتهم الى بلادهم.

وأخذ بعض الشعراء والكتاب يهاجمون أتباع المدرسة الرومنطيقية و أنصارها على أنها مدرسة الأبراج العاجية و أدب المرافقة ووجد شعر الماركسيين طريقه الى الشعب متمثلا في شعر كمال عبد الحليم وعبد الرحمن الشراوى وكانت مأساة فلسطين 1948 عاملا آخر عجل في تدهور الرومنطيقية وقيام الواقعية .

إذ أن الشعراء والكتاب خجلوا من الهرب هذه المرة ورأوا لزاما عليهم معالجة الوضع القومى العام فكان من نتيجة ذلك قيام الثورة المصرية (23 تموز 1952) م على الأصعدة السياسية والاجتماعية والاقتصادية وتلتها ثورة العراق 1958 التى أطاحت الملكية فالانتفاضة اللبنانية 1958م الى الانقلابات السورية المتعددة.

وأصبحت قضايا الشعب تتبع من القلب الجماهير وبات لزاما على الأديب التزام جانب هذه الجماهير معبرا عن حقائق أوضاعهما وآمالها وتطلعاتهما فانتشرت الواقعية الاشتراكية في صفوف الأغلبية الكبيرة من الشعراء والكتاب العرب ولم تعد مقصورة على الماركسيين منهم ... فتجلت في نتاج الشعراء الشباب أمثال : صلاح عبد الصبور ، وأحمد عبد المعطى الحجازى المصريين ومحمد الفيتورى.

وان الأدب الواقعي هو أدب الحياة كلها ، أدب الانسان والانسانية في عذاباتنا و أفراحنا و  
الأمهات أدب خلجات جميع القلوب وكل اضطراباتنا وكما أنه يعبر عن الجوانب المظلمة في هذه الحياة  
كذلك يعبر الجوانب المشرقة المتحفزة المنطلقة في كل ايجابياتنا المحققة للخير والعدل والحرية.

## الباب الثالث - محمد الفيتوري الشاعر الزجي ومكانة شعره في الأدب

### العربي

#### الفصل الأول - نظرة في

#### ديوان أغاني أفريقيا

ان الفيتوري التزم مذهباً معيناً جعله محور شعره. فشعره يدور حول شيء واحد هو أفريقيا  
تلك العذراء التي ظلت عبر قرون طويلة من الزمان أمة للمستعمرين ثم ها هي تتفص عن كاهلها  
رداء الذل والخنوع وتفتح صدرها للحرية والحياة. والفيتوري كغيره من شعراء المدرسة الحديثة أراد  
أن يضع فنه في خدمة ما يؤمن به أو ما يراه من قيم وأفكار. والفيتوري الذي يمت الى الزوج بصلة  
الدم والذي يعيش في أرض لها من الزنجية حظ كبير لا يمكن أن يقفل عينيه عن هذا الواقع ولا يمكن  
أن يعيش في عالم خيالي مع لميس ومي وغيرهما ولذلك فكان من الطبيعي أن يبرز واقعه الحياتي في  
شعره ولما كانت قضية أفريقيا هي قضية الفكرية كان من المحتم أن يلتزم بواقع حياته.

◀ **أغاني أفريقيا : القصيدة القضية -** أفريقيا وطن الحلم ليست فقط ، وطن الفيتوري الحلم  
انها داخلة في صميم الشعراء السودانيين في شعرهم في كيانهم فهي داخلة في صميم الشعراء  
وجودهم؛ وهي تعاني مما يعانون ولقد كانت قضية "الون" تعذب الكثير منهم حين يحتكون  
بالعلم الخارجي لهذا رأينا ما يمكن أن يسمى عند بعضهم " بالرؤيا الأفريقية " وأفريقيا عند  
الكثير فردوس المفقود.

قضية أفريقيا اذن قضية الحنين الى الحرية والثورة على الظلم فتكلم الشاعر عن الألم وقضية  
الحنين الى الوطن الأم قضية حنين الشاعر السوداني. فالشاعر السوداني يألف المكان الذي يعيش فيه  
ويحزن أعماق الحزن على فراقه والملاحظ أنه يعرف "الغربة ولا يعرف الاغتراب" وأنه يحس  
بالمكان أكثر من الزمان وهذا دليل على ارتباطه الأصيل بالوطن.

ان الغربة كلمة يعرفها الفيتوري تماماً يعرفها منذ أن قرأ له والده طالعه في كفه ثلاث مرات  
الأولى عندما كان في الحادية عشرة والثانية عندما كان في السابعة عشرة والثالثة قبل وفاة والده بشهر  
واحد عام 1969م . ومن قوله :

"من يا ترى تكون؟

تسكب الدهشة في عيونى رؤيتك

تجذبني هيئتك المظربة

عيونك الصغيرة المدببة

الناس يولدون أغراباً.

خرج الفيتوري من أزمته الشخصية وتعاطف عدد من الشبان وقد عاشوا جميعاً في  
الخمسينات وتعاطفو مع الواقعية الاشتراكية. نري في ابياته :

لقد أخرج الفيتوري ألامه

وانصهر في الواقع الواسع

صار أفريقيا

صارت أفريقيا هو

وراح ينادى وبأعلى صوته دعوة عامة شاملة:

يا أخي في الشرق في كل سكن

يا أخي في الأرض في كل وطن

أنا أدعوك

فهل تعرفني ؟

يا اخا أعرفه رغم المحن

اننى مزقت أكفان الدجي

اننى هدمت جدران الوهن .

والشاعر كما أغلب الشعراء السودانيين يكره الجمود والثبات والموت. انه شاعر ينبغي با

لحياة بحكم تكوينه انه شاعر تنبض كلماته كما حركاته بالابواق.

ها هنا واريت أجدادى ...هنا

وهم اختار و ثراها كفنا

وسأقضي أنا من بعد أبي

وسيقضي أبي من بعدنا

وستبقى أرض أفريقيا لنا

فهي ما كانت لقوم غيرنا

انه التواصل البشرى ، التسلسل ،الأجداد ، الآباء ،الأبناء ، الأحفاد ، كلهم أبناء الأرض

منهم من أختارها كفنا وامتزاج بها ومنهم من ينظر هذا الشرق والقضية الوطن الحرية تستحق أن

يرفع الصوت من أجلها.

نحن أهرقها عليها دمنا

ومزجنا بثراها عظما

وشققناها بحارا وربي

وزرعناها سيوفا وقنا

وركزنا فوقها أعلامنا .

واتخذ رحلته من الشعر مركبا لها واستهلته سبيلها متخذة حمولتها من هذه الأجواء جميعا

حصيلة. من الضياء والغربة والاحساس البالغ بالدمامة والمهانة وفي البداية كانت وجهته سماء فسيحة

لا جدود لها هي اللامكان.

يا ليتنى فراش نحل جناحاه على هيكله شعلتان

يا ليت قلبي قلبه ويدي جناحه وموطنى اللامكان

فرارا من تلك المدينة الكبيرة التى يعيش فيها ومن كافة المدن الأخرى التى انتقل اليها فيما

بعد. فهكذا كان يخاطب الصفاة وهو في طريقه :وقد صور الشاعر هذه الأحاسيس التى أشار اليها

:

وأنت مثلي في فرار نفسي

من صخب المدينة المثير

لكننى أقتات بانفعالي

من زحمة المجتمع الشرير  
وكان يسير في طريقه أقرب الي الموت منه الي الحياة ؛  
وكنت أمشى متخما بالردى  
كدودة تزحف بين القبور  
مستشعرا بشرته السوداء في مرارة بالغة ؛  
فقير أجل ودميم دميم  
بلون الشتاء بلون الغيوم  
يسير فتسخر منه الوجوه  
وتسخر حتى وجوه الهموم

كانت أفريقيا وطننا بعيدا نائيا كانت طريقا وهدفا فأخذ يلونها بلون مشاعره ويوحد تاريخه وتاريخها  
ويخلع عليها مأساته الخاصة ويبصر من خلالها بخلاصية المنشود :

لنتنفض جثة تاريخنا  
لينتصب تمثال أحقادنا  
أن لهذا الأسود المنزوى  
المتوارى عن عيون السنى  
أن له أن يتحدى الورى

ولم تعد المعركة افريقيا وحدها لم تعد معركة لونية بيت أبيض وأسود بل أصبحت معركة  
قيم انسانية معركة بين استعمار وشعوب بين طغاة وأحرار ثائرين.

ذات يوم طرقت الباب ومرو داخلين  
من أنتم؟ ماذا تريدون؟  
وماذا تحملون؟

لكنهم ألقوا الي قرب الجدار جثته  
وحدقت في وجوه الذكريات الميتة  
وجففت من امعى دموع الآخرين

ومع الحركة الدائبة لهذه الرحلة الشعرية كانت لغة الشاعر وتعبيره وصوره تتطور بتطور  
مراحلهِ وانتصاراته وقيمة الجديدة. وفي بداية الرحلة كانت الغنائية هي الطابع المميز للكلمة والتعبير  
وكانت تثب أحيانا الي حد الخطابة وكانت قدرة الشاعر الخارجية علي التجسيد وابرار القسمات لا  
تتعدى حدود الصور.

<p>ماضيها: &lt; ما ضيك ... لسقطت اعياء أطارده وفي عينيّ جرح من رؤاه فضّى طلاسمه اهتكى أسراره ورمزوه حتى أراه و أراك أنت به .</p>	<p>&lt; أعرف أنك كنت ستأتين أن أحبك كانت عيون من الدم تسطع في الساحة النبوية أن تنبت الزهرة المستحيلة ثانية في صحارى الحرلثق والملاح.. أن تولدى أنت فيّ و أولد فيك .</p>
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<p>السقوط &lt; وقال بيدبا: سألتني عن السقوط مرة فان تكن لازلت مصغيا اليّ أيها الملك ها أنذا أقول لك يسقط بعضهم لأنه يرى ولا يرى ويسقط البعض لأنه يسير القهقري</p>	<p>&lt; الى الأخطل الصغير قف خشوعا...واخفض الرأس فقد أشعل الموتى القناديل و قاموا.... والذي تبصره عيناك في ذلك الضوء الرمادي زحام والذي يسقط في أقدامهم هيكل رث البقايا وحطام عادت المعجزة الكبرى.</p>
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## الفصل الثاني - مختارات من شعر الفيتوري

< لفيتوري في نظر الأدباء - فقال زكريا الحجاوي : هذا الديوان شيء جديد في شعرنا القومي لا لأنه كما يحسب البعض أول ديوان اكتملت فيه شاعرية أحد أبناء الجلدة الأفريقية وانما لأنه أول ديوان شعر اكتملت فيه عناصر الفن القومي "لا بناء جلدة الفرزدق هذا

الكتاب هو أوجاع للقلب وكان يمكن أن يسمى "مراثي أفريقيا" لو أن المؤلف لا يبكي ولكنه يغضب هو نبع جديد من الأفكار والاحساسات<sup>4</sup>.

وقال أنيس منصور : ديوان أغاني أفريقيا مجموعة من الأغاني... بل انه أغنيه واحدة تعددت أسماؤها وأوزانها حتى قصائد الرثاء والحب كلها حلقات من هذه الملحمة الشعرية الداوية... ان الفنان الشاب لم يقل كلمته كلها وانما نشر منها حرفا واحدا انه اصبع صغيرة تشير الى فنان كبير<sup>5</sup>

أن ديوان أغاني أفريقيا كان زهرة غريبة التكوين في حقل الشعر العربي ذلك لأنه تحدث عن "عالم غريب" لم تكن بدأنا تهتم به ولم تكن له ملامح متشابهة في الشعر العربي أغاني أفريقيا يعبر عن ذاته تعبيرا مباشرا حادا يشبه الخطابة أحيانا ويشبه الأنين أحيانا أخرى ولكنه في جميع حالاته تعبير واضح تمام والضح.

وجاء في المجلة "المصور" الجديد في هذا الديوان (أغاني أفريقيا) أنه أول صرخة انسانية أفريقية تتخذ من الشعر العربي أسلوبا لها وتعبر من خلاله عن قضايا ومشاكل أفريقيا<sup>6</sup>. وقال مصطفى عبد اللطيف السحرتي كان شعر الفيتوري في ديوانه الأول "أغاني أفريقيا" فتحا جديدا في الشعر الجديد فقد تغنت به مواكب كثيرة<sup>7</sup>.

ولا يزال هذا الديوان موضع اهتمام الدارسين حتى اليوم وان كل من يقدم على دراسة شعر الفيتوري يتوقف أمام "أغاني أفريقيا" الديوان القضية ولا يتعداه اذ أن الذي ميزه وأثار حوله هذه الضجة هو الطابع المتمرد العنيف التائر الغاضب وقضية الصراع بين الأبيض والأسود في عالم أفريقية التي تحررت اليوم من قيود الاستعمار . والفيتوري عندما نشر ديوانه هذا كان يعيش أزمة نفسية قوية نهشت قلبه و مشاعره فجعلته يصب شعره غضبا و نقمة على الرجل الأبيض الذي كان في تصور شاعرنا سببا في شقاء أفريقية وتأخرها مستغلا ثرواتها أكلا خيرا قاتلا أبناءها مستعبدا شعوبها.

◀ أسباب الأثرارة على "أغاني أفريقيا" - أثارت "أغاني أفريقيا" هذه العاصفة من النقد و الدفاع وجعلت النقاد و الدارسين يقفون في خطين متقابلين فلعدة أسباب .

**أولا :** الاتجاه السياسي الجديد الذي اتجه اليه الشاعر في هذه المجموعة. اذ لأول مرة ينصب شاعر عربي نفسه مدافعا عن قضية خارج الوطن العربي ضد ظروف الاستعباد وما يخلقه في القارة الافريقية. وأن من الظواهر التاريخية أن يحمل الشعراء رسالة معينة وهي هنا تكثيف المأساة أو نوع من التوجيه اللا شعوري الذي يشبه الايحاء<sup>8</sup>.

**ثانيا :** القيم القديمة فهي تراث الشاعر الزنجي وموقفه تجاه الأبيض والقيم الجديدة هي ما يحاول أن يحققه وجوده في هذه المنطقة من العالم و من هنا تفسر وقفة محمود أمين العالم تجاه الفيتوري في قصائده الأولى<sup>9</sup>.

4 جريدة " الأخبار " 1955 ، العدد 1052 ، تشرين الثاني (نوفمبر ) ص 10 .

5 جريدة " الأخبار " 1955 ، العدد 1057 ، تشرين الثاني (نوفمبر ) ص 10.

6 المصور 1969 ، المجلد العدد 232 ، آذار (مارس ) ص 38.

7 السحرتي ( مصطفى عبد اللطيف ) : "دراسات نقدية" الهيئة المصرية العامة للكتاب ، القاهرة ، 1973 ، ص 169.

8 أعلا الفكر العربي ، دار المعارف بيروت ص 14 .

9 من حديث شافهني به الشاعر نفسه ، يوم 23 / 1 / 1975 ، في دمشق .

**ثالثا :** أن الفيتورى دعا الي القومية السودانية الخالصة بينما دعا هو الي القومية الافريقية محدثا انشقاقا جديدا في صفوف المجتمع السودانى المتصدع و خصوصا بعد ثورة 1924م السودانية و أفريقية علي حد تعبير نجيب سرور "بريئة من أغانيه" أفريقيا التي عثرت علي ذاتها و بدأت تمشي متضامنة مع قارات العالم الي الخلاص.<sup>10</sup>

و مهما يكن من أمر ديوان "أغاني أفريقيا" و مهما يكن موقف النقاد منه و تفسيرهم له فانه سيبقى محطة أدبية بارزة في حياة الفيتورى الشعرية .

### الفصل الثالث - الوطنية والحرية في شعره

في زنجيته و غربته ، كان الفيتورى ضائعا بلا هوية ، بلا وطن، كان يستشعر اللامكان وطنا له.و كان هائما فسحته السماء البعيدة و حدوده فوق الزمان كان يقول :

يا ليتنى فراش نحل  
جناحاه علي هيكله شعلتان  
يعيش في منعطفات الشذى  
فوق حدود الوهم ... فوق الزمان  
يا ليت قلبي قلبه ... و يدي جناحه  
و موطنى اللامكان ...!!!

ولم يكن يستشعر انتسابا حقيقيا الي وطن .. كان لونه حدا فاصلا بينه و بين العالم و الدماء التي تجرى في عروقه تشده الي غير صقع و قطر فهو عربي ليبي و سودانى مصرى و هو الزنجي ربيب الغابات و حقول الكاكاو.<sup>11</sup> و يستمر في صراخه لأفريقيا و هتافه:

أفريقيا...  
أفريقيا الناحية  
يا وطنى ... يا أرض أجداديه  
انى أناديك  
ألم تسمعى صراخ ألامى و أحقاديه.

و يشعر بوهن وطنه، انه وهنه هو . ولا يستطيع أن يخفف من آلام شعبه بل الآمه فيعود محذرا ان هي لم تستجب لنداءاته انه يريد لها الحرية يريد لشعبها الخلاص فيحثها علي الثورة. و كان من الطبيعي وقد شعر الفيتورى بانتمائه الي أرض أفريقية أن يتعاطف مع شعوبها التي طالما ناداها وحثها على النضال و الثورة فنراه يشيد بالحركات التحررية الثورية التي عرفتها تلك القارة و يتخذ من زعماء هذه الحركات و الثورات أبطالاً وزعماء.ولا ينسى الشاعر أكبر ثورة فوق أرض أفريقية ثورة الجزائر التي افتدت ثورتها بمليون شهيد فهي اساس الثورات الأفريقية و الجزائر هي أيضا وطن جميلة التي يحييها الفيتورى برسالة يكبر فيها نضالها و كفاحها. و يخاطب القدس المدينة الضائعة والتي هي دائما في البال لأنها تضم أقدس ما تصبو اليه عيون المسيحيين و المسلمين هذه المدينة التي تهفو اليها قلوب المؤمنين تتعرض كل يوم الى هجمات جديدة من المهاجرين اليهود :-

أنا الذئامومتقتولا

<sup>10</sup> نجيلة ( حسن ) "ملاحم من المجتمع السوداني" دار مكتبة الحياة بيروت 1964 - ص 26.  
<sup>11</sup> هو نوع من الشجرة ، المورد - معجم ، عربي - عزي ، 1997 دار العلم الملايين.

على بابك كل مرة  
حين يجيء السادة القراصنة  
على سفينة غريبة  
فيقسقون في كنيسة .  
والشاعر المقاتل بالكلمة المسؤولة والملتزمة يعرف أنه يواكب الأبطال الفدائيين في قتالهم  
فيخاطب فلسطين بلسان الفدائي:-  
كنت أعرف.  
وأنا احتضن الراية  
من منفي لمنفي  
أنهم ان قتلوني  
مرة واحدة  
أولد في عينيك ألفا  
ألبسي

هذا الشاعر الذي لا هاجس له اليوم الا مستقبل الأمة العربية بأسرها بتفاؤله الثورى يثق في المستقبل  
القريب وبالتحرير المرتقب ولن يعود الا:

كنت في حلمى لا أرجع الا  
ونجوم الوطن المحتل في صدرى  
لأنه سيعبر الى معشوقته والمعشوقة عنده هاهنا هي الوطن هي الأرض المحتلة هي سيناء  
و الجولان و الضفة الغربية وسيبقى من أجلها جنديا مقاتلا بالكلمة و الشعر  
وهكذا نرى الفيتورى يؤرخ في شعره الوطنى للأحداث القومية والوطنية الكبرى بصدق  
وعفوية وتعاطف كلى محب مخلص بدءا من مرحلة الوطنية الأفريقية مرورا بسودانياته انتهاء  
بعربياته و عربوته اذ أنه في مجد أمته ويمتد ويغني وفي كبريائها المقاتلة ورايتها المقاتلة وثورتها  
المقاتلة يتبرك ويكبر.

### الخاتمة

الحمد لله الذي وفقني لإتمام هذه الأطروحة بعونه الوهاب عن هذا الشاعر القدير على عنوان  
"محمد الفيتورى الشاعر الزنجي ومكانة شعره في الأدب العربي". انه أحد رواد حركة الشعر العربى  
المعاصر . له مكانة فاخرة وقدرة فائقة في شعرنا المعاصر لتضعه فيما بعد فوق قمة الشعر العالمى.  
فشعره قد ترجم إلى عدة لغات عالمية.انه معروف في أرض السودان وقد اشتهرت بديوانه  
القيمة تحت عنوان "أغانى أفريقيا". وهو عرف الهجرة والغربة منذ طفولته. وكان شاعرا يتجول  
على أرصفة الوطن العربى.

فهذه مقالتي عن الشاعر السودانى محمد مفتاح الفيتورى حاولت فيه بكل أمانة وصدق  
وإخلاص لأنتي بذلت جهودى للقراءة وللمطالعة الكتب التي تتعلق به.و أحسبني استطعت أن أصح  
بعض المعلومات عنه مؤملا أن أضع لبنة في دراسة شعر الفيتورى وفي الدراسة الأدبية المعاصرة.  
أختتم هذه المقالة متواضعا وشاكرا لكل من ساعدوني في هذه المحاولة. والله الحمد والشكر  
وهو الذى وفقنى لهذا الانشاء وهو المستعان .

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