

**Comparitive Phytochemical Analysis of leaves and bark of *Cinnamomum verum*
Presl, Prir. Rostl. and *Cinnamomum malabattrum* (Burm. f.) Blume, Bijdr.**

**DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF BACHELOR OF SCIENCE IN
BOTANY**

BY
V RATNA
REG NO: AB19BOT045



DEPARTMENT OF BOTANY
ST. TERESA'S COLLEGE (AUTONOMOUS)
ERNAKULAM – KERALA
2019-2021

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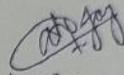
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CERTIFICATE

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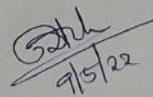
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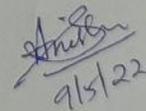
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Examiners



1) 
9/5/22

-Anila N

2) 
9/5/22

Place : Ernakulam

Date : 9-05-2022

CERTIFICATE

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DECLARATION

I, V.Ratna hereby declare that this dissertation titled '**Comparative Phytochemical Analysis of leaves and bark of Cinnamomum verum Presl, Prir. Rostl. and Cinnamomum malabattrum (Burm. f.) Blume, Bijdr.**' submitted to St Teresas College (Autonomous), Ernakulam, Affiliated to Mahatma Gandhi University, Kottayam in partial fulfillment of the requirements for the award of the degree of Bachelor of Science in Botany is a record of original dissertation work done by me under the guidance of Ms.Anu joy of Department of Botany and Centre for research, St.Teresas College (Autonomous), Ernakulam.

V RATNA

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CONTENTS

- 1. INTRODUCTION** **1**
- 2. REVIEW OF LITERATURE**
- 3. MATERIALS AND METHODS**
- 4. RESULTS**
- 5. DISCUSSION**
- 6. CONCLUSION**
- 7. BIBLIOGRAPHY**

1. INTRODUCTION

Phytochemistry is the study of phytochemicals, which are chemicals derived from plants. Phytochemicals are chemical compounds produced by plants, generally to help them resist fungi, bacteria and plant virus infections, and also consumption by insects and other animals. Some phytochemicals have been used as poisons and others as traditional medicine. As a term, phytochemicals is generally used to describe plant compounds that are under research with unestablished effects on health and are not scientifically defined as essential nutrients. The compounds found in plants are of many kinds, but most can be grouped into four major biosynthetic classes: alkaloids, phenyl propanoids, polyketides, and terpenoids.

Phytochemists strive to describe the structures of the large number of secondary metabolites found in plants, the functions of these compounds in human and plant biology, and the biosynthesis of these compounds. Phytochemists study phytochemicals by first extracting and isolating compounds from the origin plant, followed by defining their structure or testing in laboratory model systems, such as cell cultures, *in vitro* experiments, or *in vivo* studies using laboratory animals. It include isolating specific compounds and determining their structures, which are often complex, and identifying what specific phytochemical is primarily responsible for any given biological activity.

Phytochemicals, naturally present in the plants shows biological significance by playing an essential role in the plants to defend themselves against various pathogenic microbes by showing the antimicrobial activity by inhibition or killing mechanisms. The secretion of these compounds is varying from plant to plant some produce more and some produce in minimal quantity. Sometimes they can be harmful and sometimes they can be very helpful. There is evidence from laboratory studies that phytochemicals in fruits and vegetables may reduce the risk of cancer, possibly due to dietary fibers, polyphenol antioxidants and anti-inflammatory effects (Tariq A.L *et al*, 2012).

1.1 *Cinnamomum verum* Presl, Prir. Rostl.

Cinnamomum verum Presl, Prir. Rostl., (Syn. *Cinnamomum zeylanicum* Blume, Bijdr.) commonly called true cinnamon tree or Ceylon cinnamon tree, a small evergreen tree belongs to the family Lauraceae and is local to Sri Lanka. The local natural surroundings of *C. verum* in basically tropical rainforest, yet it can likewise be found particularly as a present obtrusive, in different woodlands, especially wet optional backwoods, timberland holes, rock outcrops and riparian zones.

Cinnamomum verum is adjusted to a wide scope of climatic conditions. It requires a warm and moist environment with a very much disseminated yearly precipitation of around 2000-2500 mm, and normal temperatures of around 27°C. It develops best at low elevations, and is generally developed without concealment, yet being basically a woodland tree, light shade is endured. It develops well on various soils in the jungles, yet soil type pronouncedly affects bark quality. Fine sandy and lateritic gravelly soils rather than rough and stony substrates are best in Sri Lanka and India, yet in the Seychelles and Madagascar more loamy soils are liked. The species shows its distribution up to an elevation of 2000 m height on all around depleted slope soils of low richness and pH 4-6. There are several different cultivars of *Cinnamomum verum* based on the taste of bark (Ravindran, 2017).

1.1.1 Systematic Position (Bentham and Hooker's system of classification, 1862-1883)

Kingdom : Plantae
Class : Dicotyledonae
Sub class : Monochlamydeae
Series : Daphnales
Family : Lauraceae
Genus : *Cinnamomum*
Species : *verum*

1.1.2. Taxonomic description

Trees to 20 m high, bark 8-10 mm thick, brown, rough, cracks vertical; branchlets glabrous. Leaves simple, opposite or subopposite, 9.5-14 x 3.5-5.5 cm, ovate, elliptic ovate or elliptic-lanceolate, apex acute to acuminate, base acute, margin entire, glabrous, coriaceous, 3-ribbed from base, prominent, glabrous; lateral nerves 3-6 pairs, obscure, pinnate, intercostae reticulate; petiole 8-20 mm, stout, glabrous, slightly grooved above. Flowers bisexual, in terminal and axillary, pedicel 7 mm long, pale yellow, 5 mm long, 6 mm across; perianth 8 mm, silky, tube campanulate, lobes 6, 3 mm long, oblong-lanceolate. Stamens 9 perfect, those of first and second rows opposite the perianth lobes, introrse and eglandular, those of third row opposite the first row, lateral, bearing 2 large glands at the base; staminodes 3, of the fourth row opposite the second row, cordate and stipitate. Ovary half inferior, sessile. Fruit a berry, 1-2 cm, ellipsoid to oblong-ovoid, dark purple, surrounded by the enlarged perianth.(Leela *et al*,2006).

1.1.3 Uses

The internal bark of the branches is stripped off to pieces. These pieces of bark are then dried for a few days in the shade and marketed as a costly spice known as ‘Cinnamon’. Cinnamon primarily contains vital oils and other chemical constituents like cinnamaldehyde, cinnamic acid, cinnamate etc. *Cinnamomum verum* yields principally leaf and bark oils that are utilized in perfumery and enhancing. The significant part of the leaf oil is eugenol while that of bark oil is cinnamaldehyde. (Leela *et al.*, 2006). *Cinnamomum* are said to be among the oldest spices Cinnamomum has fragrant, sweet and warm taste. Commercial essential oil production industry used several aromatic plant species for extracting high quality essential oil. Cinnamon is a highly valued spice whose bark is widely used as a spice. It is mainly used in cookery as a spice and by various industries for foodstuff, flavouring agent for fragrance and essence perfumes, and medicinal products. *Cinnamomum* stands out of all spices in its “warmth” and ranks as second to pepper. As spices, cinnamon is considered one of the finest sweet spices.(Kumar *et al.*, 2019).

Cinnamomum verum has a wide range of applications. It has long been used to flavour food and in pharmaceutical preparations to treat a variety of ailments. For commercial purposes, it is commonly used as candies, chewing gums, mouthwash, and toothpaste in the current period. Many volatile oils, primarily cinnamaldehyde, cinnamic acid, and cinnamate, are abundant in the plant. Eugenol is the active principal ingredient linked to a variety of biological functions. This

herb is found in almost every pharmacological system on the planet. Each of these features is essential for human health development. Antimicrobial, wound healing, antidiabetic, anti-HIV, anti-anxiety, and anti-Parkinson's among of the plant's key medical characteristics. The major components of the *Cinnamomum verum* plant include eugenol, cinnamaldehyde, cinnamyl acetate, copane, and camphor. (Rashmi Pathak *et al*, 2021)

1.2. *Cinnamomum malabattrum* (Burm. f.) Blume, Bijdr.

Cinnamomum malabattrum (Burm. f.) Blume, Bijdr., also called 'wild cinnamon', 'country cinnamon', 'malabattrum', belongs to the family Lauraceae is endemic to Western Ghats of India. Malabar is traditionally used to denote the west coast of southern India forming the present day state of Kerala and adjoining areas. The word mala of Malaya means a mountain in the languages Tamil and Malayalam and Sanskrit. The word 'malabattrum' is thought to have been derived from the Sanskrit, 'tamalapattram', literally means 'dark tree leaves'. They are commonly found in the tropical and the subtropical Himalayas, U.P, Eastern Bengal, Khasia and Jaintia Hills, Burma and Western Ghats in South India. (Tirumala Duguta *et al.*, 2020).

1.2.1 Systematic Position (Bentham and Hooker's system of classification, 1862-1883)

Kingdom : Plantae
Class : Dicotyledonae
Sub class : Monochlamydeae
Series : Daphnales
Family : Lauraceae
Genus : *Cinnamomum*
Species : *malabattrum*

1.2.2. Taxonomic description

The thick, leathery leaves are dark green, lauroid type. Laurophyll or lauroid leaves are characterized by a generous layer of wax, making them glossy in appearance, and narrow, pointed oval in shape with an 'apical mucro', or 'drip tip', which permits the leaves to shed water despite the humidity, allowing respiration from plant. Mostly, the plants present a distinct odor. Their alternate leaves are ovate-elliptic, with margins entire or occasionally repand, with acute

apices and broadly cuneate to subrounded bases. Upper leaf surfaces are shiny green to yellowish-green, while the undersides are opaque and lighter in color. Mature leaves are dark green. Young leaves are reddish brown to yellowish-red. The leaves are glabrous on both surfaces or sparsely puberulent beneath only when young; the leaves are mostly triplinerved or sometimes inconspicuously five-nerved, with conspicuous midrib on both surfaces. The axils of lateral nerves and veins are conspicuously bullate above and dome-shaped. Terminal buds are perulate.

The axillary panicle is 3.5–7 cm long. It is a genus of monoecious species, with hermaphrodite flowers, greenish white, white to yellow are glabrous or downy and pale to yellowish brown. Mostly the flowers are small. The perianth is glabrous or puberulent outside and densely pubescent inside. The purplish-black fruit is an ovate, ellipsoidal or subglobose drupe. The perianth-cup in fruit is cupuliform. (Ravindran.P.N, 2003)

1.2.3. Uses

It has aromatic leaves used for culinary and medicinal purpose. It is thought to have been one of the major sources of the medicinal plant leaves known in classical and medieval times as ‘malabattrum’. In addition to being employed as a spice and flavoring agent, it is additionally used to flavor chewing gums due to its mouth refreshing effects and has the ability to eliminate bad breath. It can improve the health of the colon thereby reducing the prospect of carcinoma. The leaves are carminative and are used in the treatment of colic and rheumatism.

The plant has been traditionally used as an astringent, carminative, deobstruent, diaphoretic, galactagogue, haemostatic and stimulant. It is used for treating wounds, fevers, intestinal worms, headaches and menstrual problems. The plant is also used for treatment of some tumours. The bark is used in the treatment of gastro-intestinal complaints such as dyspepsia, flatulence, diarrhoea and vomiting. The dried buds are used with various combinations in the treatment of cough and urinary disease. It is also used in the treatment of scabies, anal and rectal disease, tridosha, piles and heart troubles. Besides the essential oil obtained from the leaves has been shown to be antibacterial and antifungal (Tirumala Duguta *et al.*, 2020).

1.3. Objectives of the study

- To find out the phytochemical constituents of aqueous extracts of leaves and bark of *Cinnamomum verum* and *Cinnamomum malabattrum*.
- To carry out a comparative study between the phytochemical constituents of leaves and bark of *Cinnamomum verum* and *Cinnamomum malabattrum*.

2. REVIEW OF LITERATURE

Leela *et al.* (2008) studied that the constituents of the rejuvenating ointments of leaf, petiole, shoot and terminal shoot of *Cinnamomum malabattrum* were controlled by GC and GC–MS. Significant constituents of the leaf oil were (E)- caryophyllene (28.6%), (E)- cinnamyl acetic acid derivation (15.1%), bicyclogermacrene (14.4%) and benzyl benzoate (8.5%).

Bimali *et al.*(2010) in their study used superheated water extraction in *Cinnamomum zeylanicum* bark and leaves to estimate the efficiency of yield of essential oil.

Aravind *et al.* (2012) studied the extracted fresh leaves of *Cinnamomum malabattrum* and calculated the percentage yield of N-hexane extract as 0.42 %, Alcoholic extract as 8.25 % and the Aqueous extract as 3.4%. These three extracts were carried out by preliminary phytochemical screening and showed the presence of phenolics and flavonoids in large amount. He studied the antioxidant activity of *Cinnamomum malabattrum* by Nitric oxide radical inhibition assay, Hydrogen peroxide radical scavenging assay and Beta carotene linoleic acid emulsion method.

Kumar *et al.* (2012) evaluated chemical identity of *C. malabattrum* and established a comparison with the official drug. Leaves of *C. malabattrum* showed marked distinction in physico-chemical and volatile oil composition which will serve as markers to differentiate it from *C. tamala*; the official source of tamalpatra.

Sorabh *et al.* (2013) reported the anticancer effect of *Cinnamomum malabattrum* on Dalton's Lymphoma Ascites (DLA) cell lines. Aqueous and alcoholic extracts (625 mg/kg and 500 mg/kg b wt) were tested in DLA induced albino male rats.

Dhanalaxmi *et al.* (2014) studied the phytochemical studies of ethanolic, methanolic and aqueous leaf extracts of *Cinnamomum verum*. The phytochemical screening showed the presence of all the phenolic compounds in leaf extracts.

Darfour *et al.* (2014) studied that the sun dried samples of *Cinnamomum verum* had the total phenolic and total flavonoid been degraded compared to the fresh samples of *Cinnamomum verum*. DPPH radical scavenging activity and the flavonoid and phenolic contents were significantly expressed in different amounts in the seed, leaf, stem and root. Phytochemical contents which were influenced by drying are the major contribution to the radical scavenging activity of the *Cinnamomum verum*.

Anubhav *et al.* (2015) found that the leaves of *Cinnamomum verum* upon hydro-distillation yielded 1.5% of essential oil which were colourless. The major components present in the colourless essential oil were eugenol, linalool and benzyl benzoate.

R Aravind *et al.* (2015) studied the *Cinnamomum malabattrum* and found the presence of alkaloids, glycosides, phenols, proteins, tannins and terpenoids in phytochemical screening.

Raghu *et al.* (2020) found that *Cinnamomum zeylanicum* has antimicrobial, cancer prevention agents, and mitigating properties. The antibacterial property was tried against *Escherichia coli* (gram-negative), *Enterococcus faecalis* (gram-positive) and *Salmonella typhi* (gram-positive) by agar dissemination strategy.

Gaber *et al.* (2020) assessed the inhibitory impact of acetic concentrate of *C. verum* (AECV) and ethyl acetic acid derivation concentrate of *C. verum* (EAECV) against piroplasm parasites *in vitro* and *in vivo*. Subjective phytochemical assessment uncovered that AECV and EAECV contain numerous bioactive constituents in particular alkaloids, tannins, saponins, terpenoids and amazing measures of polyphenols and flavonoids.

Liliane *et al.* (2021) estimated the antimicrobial capability of rough concentrate from leaves *Cinnamomum verum* and their enhanced portions were examined. Phytochemical examinations were performed by TLC and HPLC and the cancer prevention agent limit was confirmed by DPPH and ABTS.

3. MATERIALS AND METHODS

3.1 Sample collection and preparation:-

Cinnamomum verum bark and leaf samples used in this study were collected from Kaloor, Ernakulam district, Kerala in the month of December 2021. *Cinnamomum malabattrum* bark and leaf samples in the present study were collected from Edappally, Ernakulam district, Kerala in the month of December 2021.

Both of these plant samples were cleaned, washed and shade dried for two days. Then the dried sample was crushed into appropriate size and kept in labelled air tight box for further studies. About 2 g of each crude extract was dissolved in 20 mL of distilled water and the resulted solution was used for phytochemical screening tests.

3.2 Phytochemical screening:-

1) Test for Alkaloids (Mayer's and Wagner's tests)

About 2 mL of the test solutions were transferred into three test tubes; a few drops of Mayer's and Wagner's reagents were then added into the tubes. The presence of alkaloids was indicated by the presence of precipitates in the tubes that contained the tested solutions.

2) Test for Coumarins (Alkaline reagent test)

In a test tube, 2 mL of NaOH solution was added to 2 mL of the test solution in each case. Development of a greenish yellow or blue fluorescence indicates the presence of Coumarins.

3) Test for Flavonoids

Flavonoids were tested by adding drops of Lead acetate solution (10%) to a 1 mL of test solution. Formation of a yellow precipitate indicates the presence of flavonoids.

4) Test for Tannins

About 2 mL of test solution was added to 2 mL of water followed by drops of dilute ferric chloride solution (0.1%). A green to blue-green (catechic tannins) or a blue-black (gallic tannins) coloration indicates the presence of tannins.

5) Test for Saponins (Frothing test)

About 2 mL of test solution were introduced in a test tube containing 2 mL of distilled water. The test tube was shaken vigorously for about 15 seconds and allowed to stand for 15 min. A persistent frothing indicated the presence of saponins.

6) Test for Glycosides

About 2ml of test solution was dissolved in 4ml of glacial acetic acid containing one drop of 5% ferric chloride solution which was under laid with 1 ml of concentrated Sulphuric acid. A brown ring obtained at the interface indicates the presence of glycosides.

7) Test for Anthocyanins

About 2 mL of mixture containing HCl (2M, 1 mL) and ammonia (4M, 1mL) were added to 1 mL of test solution. The color changes from pink-red to blue-violet indicates the presence of anthocyanin.

8) Test for Terpenoids (Chloroform test)

About 2 mL of chloroform was mixed with 2 mL of the test solutions. To this mixture, 2 mL of concentrated Sulphuric acid was added and heated for 120 seconds in a water bath ($\approx 65^{\circ}\text{C}$). A reddish brown colour that developed at the interface indicates the presence of terpenoids.

9) Test for Phenols

About 1 mL of test solution was treated with drops of ferric chloride (5%) and observed for the formation of deep blue or black colour.

4. RESULTS

The present study was based on the phytochemical screening of the aqueous extracts of leaf and bark samples of *Cinnamomum verum* and *Cinnamomum malabatum*. The screening tests were used to check the presence of nine phytochemicals namely, alkaloids, coumarins, flavonoids, tannins, saponins, glycosides, anthocyanins, terpenoids and phenolics. The results obtained were represented in the Table 1.

The aqueous leaf extracts of *Cinnamomum verum* showed the presence of flavonoids, tannins, glycosides and terpenoids (Plate 01). The aqueous extracts of bark of *Cinnamomum verum* bark showed the presence of coumarins, flavonoids, tannins, saponins, glycosides, terpenoids and phenols (Plate 02).

The phytochemical screening tests for *Cinnamomum malabatum* leaf showed the presence of flavanoids, tannins, saponins, glycosides terpenoids and phenols from its aqueous extraction (Plate 03). *Cinnamomum malabatum* bark showed the presence of flavanoids, tannins, saponins, glycosides, terpenoids and phenols from its aqueous extraction (Plate 04).

From the study, it was noticed that phyto constituents such as Flavanoids, Glycosides and Terpenoids were present in the leaf and bark samples of both *Cinnamomum verum* and *Cinnamomum malabatum*. The bark and leaf extracts of both plants marked the absence of alkaloids and phenolics. Tannins were absent in the leaf extract of *Cinnamomum verum* but was present in *Cinnamomum malabatum*. Phenols were absent leaf extracts of *Cinnamomum verum* and *Cinnamomum malabatum* but were present in the bark of both plants. Coumarin was present only in the bark extract of *Cinnamomum verum*.

Out of the nine phytochemical tests conducted in *C.verum* showed the presence of seven phytochemicals such as coumarins, flavonoids, tannins, saponins, glycosides, anthocyanins and

terpenoids. Compared to the bark extracts of *C.verum* and *C. malabatum*, the leaf extracts showed least presence of phytochemicals.

PLATE 01- A. *Cinnamomum verum*- Habit B. *Cinnamomum verum*- Leaves C. *Cinnamomum verum*-Bark



PLATE 02- A. *Cinnamomum malabtrum*- Habit B. *Cinnamomum malabatum*- Leaves C. *Cinnamomum malabatum*-Bark



Table 1. Results of phytochemical screening of Aqueous Extracts of Leaf and Bark of *Cinnamomum verum* and *Cinnamomum malabatum*.

(+ indicates Presence and – indicates Absence)

Phytochemicals	<i>C. verum</i> - Leaf Extract	<i>C. verum</i> – Bark Extract	<i>C. malabatum</i> - Leaf Extract	<i>C. malabatum</i> - Bark Extract
Alkaloids	-	-	-	-
Coumarins	-	+	-	-
Flavonoids	+	+	+	+
Tannins	-	+	+	+
Saponins	+	+	-	+
Glycosides	+	+	+	+
Anthocyanins	-	-	-	-
Terpenoids	+	+	+	+
Phenols	-	+	-	+

Fig 1. Graphical representation of the phytochemical tests conducted in the aqueous leaf and bark extracts of two *Cinnamomum* species

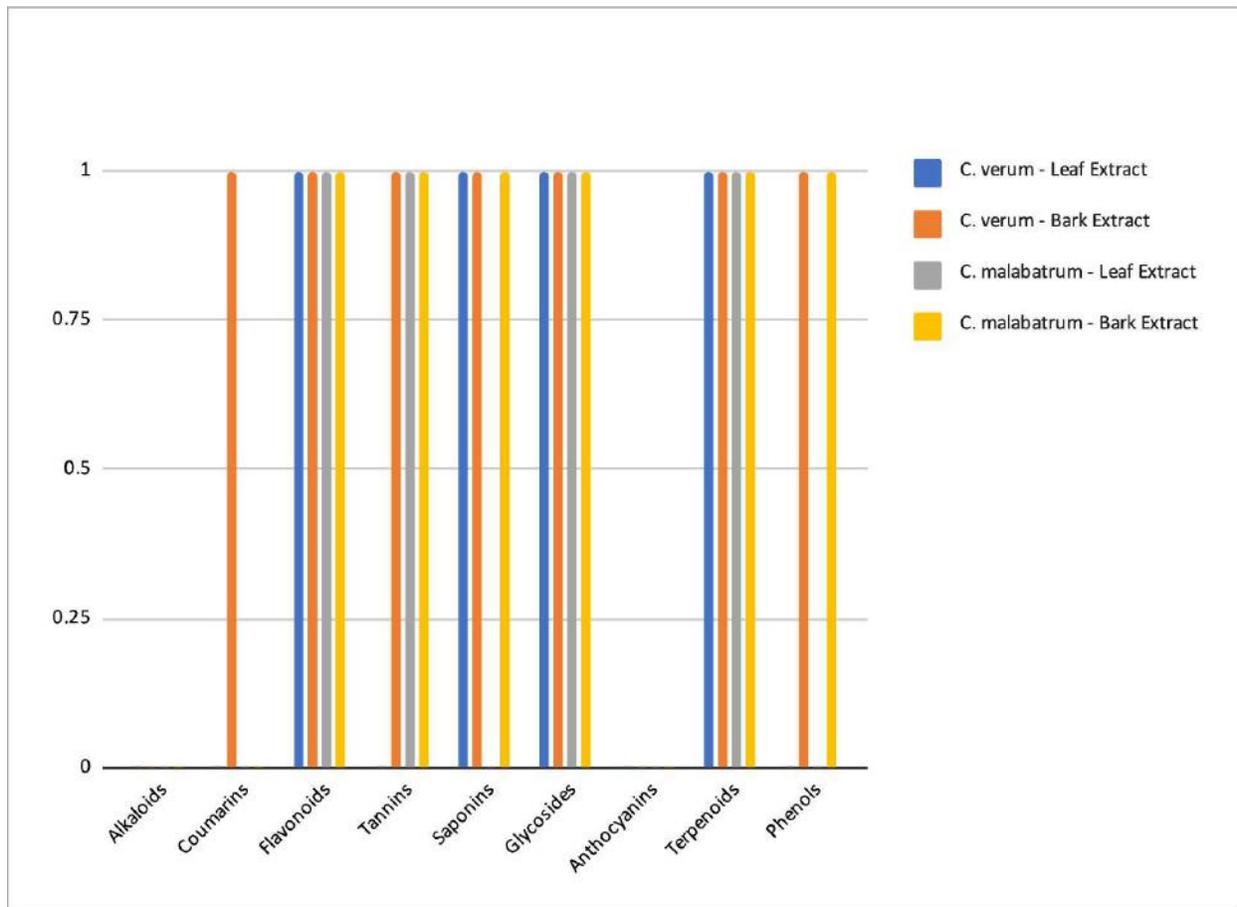


PLATE 03- *Cinnamomum verum* leaf powder



PLATE 04- Phytochemical Screening of Leaf Extract of *Cinnamomum verum*



A

B

C

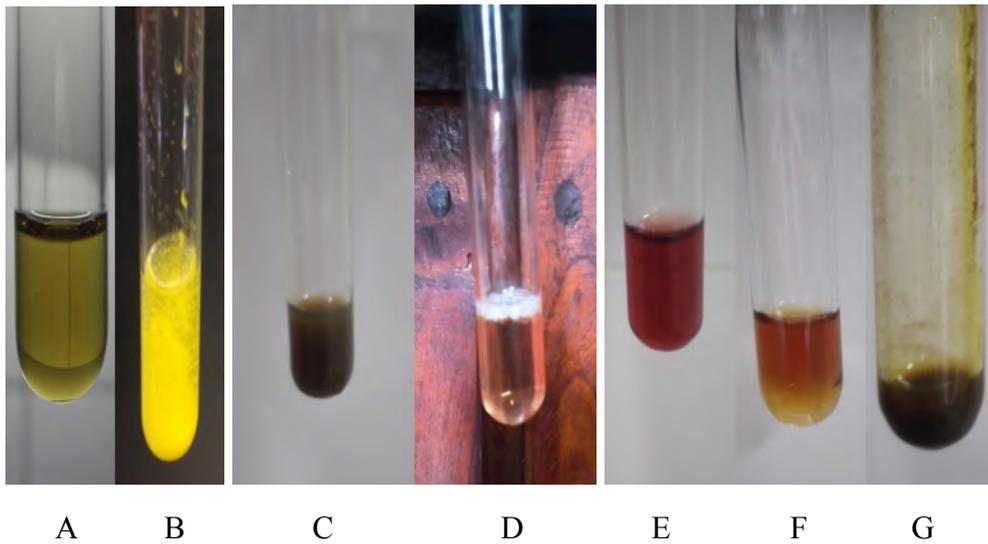
D

(A-Flavonoids, B-Saponins, C-Glycosides, D-Terpenoids)

PLATE 05- *Cinnamomum verum* bark powder



PLATE 06- Phytochemical Screening of Bark Extract of *Cinnamomum verum*

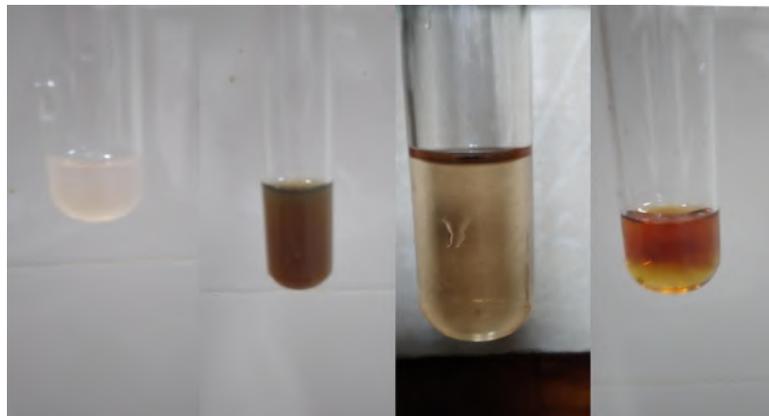


(A-Coumarins, B-Flavonoids, C-Tanins, D-Saponins, E-Glycosides, F-Terpenoids, G-Phenols)

PLATE 07- *Cinnamomum malabatum* leaf powder



Plate 08- Phytochemical Screening of Leaf Extract of *Cinnamomum malabatum*



A

B

C

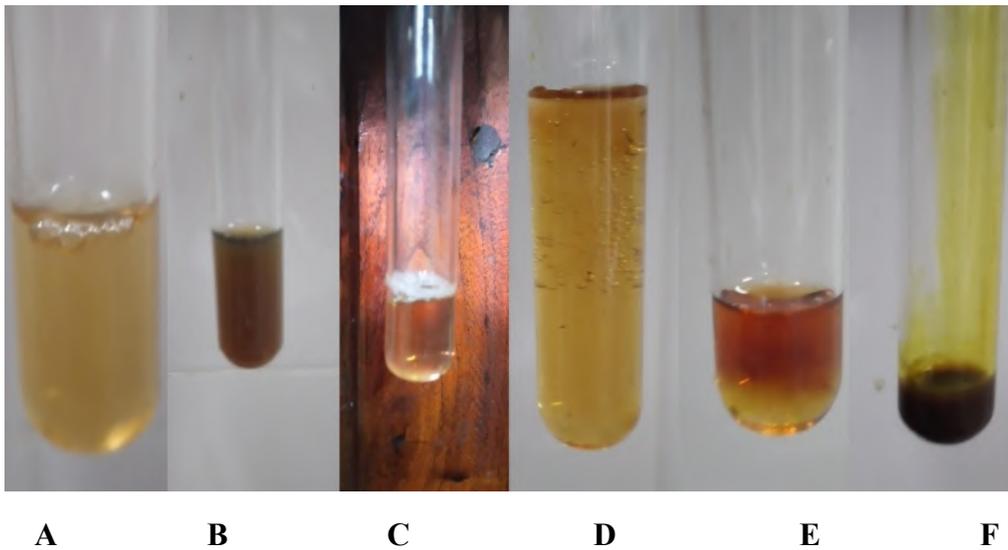
D

(A-Flavonoids, B-Tannins, C-Glycosides, D-Terpenoids)

PLATE 09- *Cinnamomum malabratrum* bark powder



Plate 04- Phytochemical Screening of Bark Extract of *Cinnamomum mmalabratrum*



(A-Flavonoids, B-tannins, C-Saponins, D-glycosides, E-terpenoids, F-Phenols)

5. DISCUSSION

The importance of herbal drugs research is now broadly realized and recognized across the globe. All herbs have some potential medicinal value. The history of herbal medicine in India is as old as our civilization. The herbal research mainly focus on various aspects of crude drug evaluation which includes physico-chemical standardization, histological studies, extraction, phytochemical studies and biological evaluation. Such research provides a genuine interest in the isolation and characterization of phyto constituents. The subject of phytochemistry has developed in recent years as a discipline, somewhere in between natural product organic chemistry and plant biochemistry and is closely related to both. The advancement in the field of phytochemistry with the introduction of many sophisticated instruments and the successful exploitation of known techniques leads to success in the field of modern herbal medicine. (Aravind R *et al*, 2014)

The current study undertaken to know the presence of various phytochemicals in two plants, namely, *Cinnamomum verum* and *Cinnamomum malabattrum* and gives a comparative analysis of the phytochemicals present in these two species of Cinnamon which is commonly used in Kerala for mainly for culinary purposes. The results study makes it evident on the presence of relevant phytochemicals in their leaf and bark extracts. Essential oils are volatile, natural, complex compounds characterized by a strong odour and are formed by aromatic plants as secondary metabolites. Essential oils contain a variety of volatile molecules such as terpenes and terpenoids, phenol, derived aromatic compounds and aliphatic compounds. This study shows the presence of majority number of phytochemicals in the bark extract of *C.verum*.(Aneesh TP *et al*,2012).

Cinnamon has been in use from ancient times with multiple culinary usages to improve the taste of food. It is a spice commonly used worldwide and it is shown to be effective in improving health due to its functional properties. The medicinal beneficial uses of cinnamon and its isolated compounds, including polyphenols, are attributed to their antioxidant activities and properties (Maria Leonar *et al.*, 2019).

The use of cinnamon as a spice and flavouring agent is widespread throughout the world. Many different species of plants are commonly referred to as 'cinnamon'. 'True cinnamon' refers to the dried inner bark of cinnamon species. Other 'cinnamon' species, *C. cassia*, commonly known as cassia, are also marketed as cinnamon. Since there is a prevalence of these various types of cinnamons' on the market, there is a need to develop a rapid technique that can readily differentiate between true cinnamon and other commonly marketed species. In the present study, coumarin and other marker compounds indicative of 'cinnamon' were analysed in various samples of cinnamon. This method involved the use of several samples for quality and to discriminate 'true cinnamon' from other *Cinnamomum* species using the accurate mass capabilities. (Bharathi Avula *et al.*, 2015)

Cinnamon is a common spice obtained from the bark of the cinnamon tree. It has been used for culinary, as well as medicinal, purposes since ancient times in various countries. Apart from substantial amounts of several nutrients, including carbohydrates, proteins, choline, vitamins and minerals, several biological active compounds are present in the extract of oil, which contribute to immunomodulatory, antioxidant, antiviral, lowering blood cholesterol, antimicrobial, lipid-lowering, antihypertension, anti-inflammatory, antitumor, gastroprotective, antidiabetic, neuroprotective and blood purifying properties.(M Saeed *et al.*,2018).

The traditional medicine involves the use of different plant extracts or the bioactive constituents. This type of study provides the health application at affordable cost. Secondary metabolites are responsible for medicinal activity of plants. Hence the phytochemical screening of some important medicinal plants was carried out. Qualitative phytochemical analysis of these plants confirm the presence of various phytochemicals like saponins, terpenoids, steroids, anthocyanins, coumarins, fatty acids, tannins, leucoanthocyanins and emodins. The results suggest that the phytochemical properties for curing various ailments and possess potential antioxidant and leads to the isolation of new and novel compounds (N Savithramma *et al.*,2011).

Drug discovery using natural products is a challenging task for designing new leads. It describe the bioactive compounds derived from natural resources, its phytochemical analysis, characterization and pharmacological investigation. It focuses on the success of these resources in the process of finding and discovering new and effective drug compounds that can be useful for human resources. From many years, natural products have been acting as a source of

therapeutic agents and have shown beneficial uses. Only natural product drug discovery plays an important role to develop the scientific evidence of these natural resources (Akshada Amit Koparde *et al*,2019).

Phytochemicals as lead compounds for new drug discovery presents complete coverage of the recent advances in the discovery of phytochemicals from medicinal plants as models to the development of new drugs and chemical entities. Functional bioactive compounds of plant origin have been an invaluable source for many human therapeutic drugs and have played a major role in the treatment of diseases around the world. These compounds possess enormous structural and chemical diversity and have led to many important discoveries. Phytochemicals as Lead Compounds for New Drug Discovery is an ideal resource for drug developers, phytochemists, plant biochemists, food and medicinal chemists, nutritionists and toxicologists, chemical ecologists, taxonomists, analytical chemists, and other researchers in those fields. Drug discovery focuses on the discovery of new drugs and potential druggable targets for the treatment of chronic diseases of world importance.(Sashank Kumar *et al*,2019).

6. CONCLUSION

Phytochemistry is the study of the chemicals produced by plants, particularly the secondary metabolites, synthesized as a primary measure for self-defence. Phytochemicals are bioactive constituents that sustain or promote health and occur at the intersection of food and pharmaceutical industries. Such substances may range from isolated nutrients, dietary supplements and specific diets to genetically engineered designer foods, herbal products, processed foods and beverages. They have tremendous impact on the health care system and may provide medical health benefits including the prevention and/or treatment of diseases and physiological disorders. They play specific pharmacological effects in human health as anti-inflammatory, anti-allergic, antioxidants, antibacterial, antifungal, antispasmodic, chemopreventive, hepato-protective, hypolipidemic, neuroprotective, hypotensive, antiaging, diabetes, osteoporosis, DNA damage, cancer and heart diseases, induce apoptosis, diuretic, CNS stimulant, analgesic, protects from UVB-induced carcinogenesis, immuno-modulator and carminative.(Chan Prakash *et al*,2012). The phytochemical screening seems to be the first steps towards the synthesis of the active ingredient and is thus essential if they are to be of prophylactic or therapeutic value in human subjects.(Brijesh K Tiwari *et al*,2015).

The present study was carried out to find out the preliminary phytochemical screening of the aqueous extracts of two *Cinnamomum* species, namely, *Cinnamomum verum* and *Cinnamomum malabattrum*. The leaf extract of *Cinnamomum verum* revealed the presence of flavanoids, saponins, glycosides and terpenoids and the bark extract of the same plant has shown the presence of coumarins, flavanoids, tannins, saponins, glycosides, terpenoids and phenols. The aqueous extracts of leaf of *Cinnamomum malabattrum* showed the presence of flavanoids, tannins, glycosides and terpenoids and the bark of the same showed the presence of flavanoids, tannins, saponins, glycosides, terpenoids and phenols.

This study showed the presence of phytochemicals variedly present in the leaf and bark of the two plants. From this study it was evident that phytochemicals and their chemical composition may also vary considerably among the plants of same genus and can be used for the

identification purpose. Further studies has to be conducted to find out its applications in different aspects that would be beneficial for the mankind.

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A study on
WOMEN ENTREPRENEURS AMONG COLLEGE STUDENTS WITH REFERENCE
TO ST.TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM DISTRICT.

Project Report

Submitted by

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VARSHA VISWANATHAN: (SB19ACOM049)

Under the guidance of

MRS.LEKSHMI C

In partial fulfillment of the requirement for the Degree of
BACHELOR OF COMMERCE



ST. TERESA'S COLLEGE ESTD 1925

ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM

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March-2022

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CERTIFICATE

This is to certify that the project titled "A STUDY ON WOMEN ENTREPRENEURS AMONG COLLEGE STUDENTS (with reference to St.Teresa's College)" submitted to Mahatma Gandhi University in partial fulfillment of the requirement for the award of Degree of Bachelor in Commerce is a record of the original work done by Ms.Vaishna P C, Ms.Mary Vinitha KS, Ms.Varsha Viswanathan, under my supervision and guidance during the academic year 2019-22.



Project Guide

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Assistant Professor

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Viva Voce Examination held on....



Smt. Jini Justin D'Costa

(Head of the Department)

Department of Commerce (SF)





External Examiner(s)

DECLARATION

We, Vaishna P C, Mary Vinitha KS and Varsha Viswanathan, final year B.Com students, Department of Commerce (SF), St. Teresa's College (Autonomous) do hereby declare that the project report entitled STUDY ON WOMEN ENTREPRENEURS AMONG COLLEGE STUDENTS WITH REFERENCE TO ST.TERESA'S COLLEGE, ERNAKULAM submitted to Mahatma Gandhi University is a bonafide record of the work done under the supervision and guidance of Mrs.Lekshmi C, Assistant Professor of Department of Commerce (SF), St. Teresa's College (Autonomous) and this work has not previously formed the basis for the award of any academic qualification, fellowship, or other similar title of any other university or board.

PLACE: ERNAKULAM

DATE: 29.04.22

VAISHNA P C

MARY VINITHA K S

VARSHA VISWANATHAN

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Vaishna P C

Mary Vinitha K S

Varsha Viswanathan

CONTENTS

Chapters	Content	Page Number
Chapter 1	Introduction	1
Chapter 2	Theoretical Framework Literature Review	4
Chapter 3	Data Analysis & Interpretation	14
Chapter 4	Findings, Suggestions & Conclusion	27
	Bibliography	
	Annexure	

LIST OF TABLES

Sl.No.	Contents	Page No.
3.1	Age of the respondents	15
3.2	Educational qualification	16
3.3	Women entrepreneurs	17
3.4	Reason for not being an entrepreneur	18
3.5	Type of business engaged by respondents	19
3.6	Objectives of starting a business	20
3.7	Education Vs. Women entrepreneurs	21
3.8	Awareness about government schemes	22
3.9	Initial source of investment	23
3.10	Hurdles to start business	24
3.11	Benefits given by college	25
3.12	Innovative steps	26

LIST OF FIGURES

Sl.No.	Contents	Page No.
3.1	Age of the respondents	15
3.2	Educational qualification	16
3.3	Women entrepreneurs	17
3.4	Reason for not being an entrepreneur	18
3.5	Type of business engaged by respondents	19
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3.7	Education Vs. Women entrepreneurs	21
3.8	Awareness about government schemes	22
3.9	Initial source of investment	23
3.10	Hurdles to start business	24
3.11	Benefits given by college	25
3.12	Innovative steps	26

CHAPTER 1
INTRODUCTION OF
STUDY

INTRODUCTION

In a developing economy entrepreneurial development is of immense importance. Entrepreneurship refers to the function performed by entrepreneurs in establishing an enterprise. Thus, entrepreneurship is the act of being an entrepreneur. Entrepreneurship is entirely based upon innovative ideas, risk, grabbing various opportunities which generally come in the way of one's business. Entrepreneurship is a purposeful task to attain a specified objective.

Women entrepreneurs are those women who think of a business enterprise, initiate it, organise and combine factors of production, operate the enterprise and undertake risks and handle economic uncertainty involved in running it. Women entrepreneurs may be defined as a woman or a group of women who initiate, organise and run a business concern. According to Government of India, "A Woman enterprise is the one owned and controlled by a woman having minimum financial interest of 51% of the capital and giving at least minimum 51% of generated employment to women".

Women entrepreneurship in India has come a long way from papads and pickles to engineering and electronics. Nowadays elite women in cities are making a mark in non-conventional fields such as consultancy, garments exporting, interior designing, textile printing, food processing, chemicals, pharmaceuticals etc ...

It is the responsibility of the education system and the parents to motivate young aspirants to become entrepreneurs. Entrepreneurship must be made a part of education just as science, mathematics, technology and language form a part of education. Entrepreneurship is a way of thinking and it is an approach that identifies new opportunities and solves problems. It is vital for students to develop entrepreneurial thinking skills right from their schools.

Entrepreneurship allows students to learn more than just their chosen field of study, and creates an interdisciplinary environment to work and develop in. The networks and friendships which develop help students to become better connected once they leave university, and help prepare them for long term success. Entrepreneurship can be quite stressful, but starting at university allows a student to gain the necessary life skills and confidence to make it in the "real" world, by gaining hands-on experience with entrepreneurial tutors and lecturers, and by taking advantage of free resources for university members.

University students have never had it so good when it comes to entrepreneurship. Universities are increasingly understanding how entrepreneurship can add value to the students education, and are creating more opportunities for students to become entrepreneurs.

SIGNIFICANCE OF THE STUDY

Now a days women entrepreneurship become an important tool for women empowerment. Large number of female college students have set up their own enterprises and have been in business successfully. The study helps the college in identifying the emerging entrepreneurs among students. It also analyses the impact entrepreneurship educations on students. The study also focuses on the problems faced by the students and their initial source of capital.

OBJECTIVES OF THE STUDY

- To identify the woman entrepreneurs among college students.
- To evaluate the impact of entrepreneurship education on students.
- To study the opportunities and challenges faced by the female college students.
- To identify their initial source of capital

RESEARCH METHODOLOGY

1. **Sampling:** For the purpose of the study convenience sampling was employed for the collection of data.
2. **Size of sample:** The survey is conducted among 51 students.
3. **Collection of data:** Data is collected from both primary and secondary sources.
4. **Tools for data collection:** A survey was conducted for collecting relevant information from students.
5. **Data analysis:** For better analysis data tables and graphs are used with percentage analysis.

LIMITATIONS

- The study is mainly intended to only 51 respondents of different age groups, since smaller sample size. so accuracy is limited
- The study is restricted to St. Teresa's college only.
- Students were hesitant to disclose the true facts.
- Chances of some bias could not be eliminated.

CHAPTER 2
REVIEW OF
LITERATURE
AND
THEORETICAL
FRAMEWORK

LITERATURE REVIEW

1. V Krishnamoorthy and R Balasubramani (April 2014), identified the important women entrepreneurial motivation factors and its impact on entrepreneurial success. The study identified ambition, skills and knowledge, family support, market opportunities, independence, government subsidy and satisfaction are the important entrepreneurial motivational factors. The study also concluded that ‘_ambition’, ‘_knowledge and skill’, ‘_independence’ dimensions of entrepreneurial motivational has significant impact on entrepreneurial success.
2. G. Palaniappan, C. S. Ramanigopal, A. Mani (19 March 2012) in their article analyzed that women have been successful in breaking their barriers within the limits of their homes by entering into varied kinds of professionals and services. Skill, knowledge and adaptability in business are the main reasons for women to emerge into business ventures. This study had also been carried out to analyze the motivational factors and other factors that influence women to become entrepreneurs, the major strength and weakness of women entrepreneurs and the environmental opportunities and threats which promote the entrepreneurship, and to offer suggestions to promote women entrepreneurship of selected districts in Tamilnadu. This study concluded that due to lack of training and education they are not able to survive in the market. Finance is also the major problem for women entrepreneurs.
3. Anita TripathyLal’s(November 15, 2012)main objective of this research was to study the significant rise of Women Entrepreneurs in India and how it has evolved since the pre-independence days (before 1947), during the British colonial days. The study also analyzed the reasons that have prompted the women entrepreneurs to unleash their entrepreneurial energies into start-ups. Based on both qualitative and quantitative analyses the growth of women entrepreneurship in India have been studied into four different periods - Pre-Independence Period (before 1947), Post-Independence Period (after 1947), Post-Liberalization Period (after 1991) and Post -Global Recession period (2008 onwards). The study finally concluded to what extent the various support systems in India can further foster a conducive ecosystem for the Women Entrepreneurs in India.
4. Cohoon, Wadhwa and Mitchell (2010) presented a detailed exploration of men & women entrepreneur’s motivations, background and experiences. This study identified top five financial and psychological factors motivating women to become entrepreneurs. These are desire to build the wealth, the wish to capitalize own business ideas they had, the appeal of startup culture, a long standing desire to own their own company and working with someone else did not appeal them. The study concluded that the women are very much concerned about protecting intellectual capital than their counterpart. Mentoring is very important to women, which provides encouragement & financial support of business partners, experiences & well developed professional network.
5. Dr. Sunil Deshpande& Ms. SunitaSethi, Shodh, SamikshaaurMulyankan(Oct.-Nov.-2009) in their research paper exhibits the encouraging and discouraging factors in an enterprise and to provide solutions to the various problems faced by the women entrepreneur group. For the betterment of women entrepreneur emphasize should be on

educating women strata of population, spreading awareness and consciousness amongst women to outshine in the enterprise field, making them realize their strengths, and important position in the society and the great contribution they can make for their industry as well as the entire economy.

6. Veena S. Samani, (2008) in her thesis threw light on a specific section of working class – the women engaged in food processing. The study shows that majority of women in Gujarat have expertise and unique skill of preparing and processing food. The food processing may be of different types and quantity, but these enterprises have been found to be great success whether attached with home or not. The present study also throws light on their knowledge, attitude and practices and problems. Stress was the major problem faced by all the selected women. The researcher found that, most of the women entrepreneur were Hindus, around 65% of women belonged to nuclear families and small number of women had obtained formal training.
7. Singh, Surinder Pal, (2008) in this study identifies the reasons and influencing factors behind entry of women in entrepreneurship. He mentioned the obstacles in the growth of women entrepreneurship are mainly lack of interaction with successful entrepreneurs, social un-acceptance as women entrepreneurs, family responsibility, gender discrimination, missing network, low priority given by bankers to provide loan to women entrepreneurs. He suggested the remedial measures like promoting micro enterprises, unlocking institutional frame work, projecting and pulling to grow and support the winners etc.
8. Lall, Madhurima, and SahaiShikha (2008) identified Psychographic variables like, degree of commitment, entrepreneurial challenges & future plan for expansion, based on demographic variables. The study identified business owner's characteristics as self-perception self-esteem, Entrepreneurial intensity & operational problem for future plans for growth & expansion. The study suggested that though, there has been considerable growth in number of women opting to work in family owned business but they still have lower status and face more operational challenges in running business.
9. Binitha. V. Thampi (January 2007) in his thesis attempts to understand the association between women's work and children's well-being in a specific social setting. It also tries to explain the causal relationship of women's work status on child well-being. It was found that as the number of activities on the work front increases, the amount of time that mothers spend on childcare decreases. This study shows that though maternal employment does not result in child morbidity outcomes, it certainly constrains women in finding alternate care arrangements as well as compelling them to perform most of the work in the childcare regime.
10. SairabellKurbah, Martin Luther(2007) in their article investigated the multi-factorial nature of women's role in economic development in the East Khasi Hills area of Meghalaya state, to determine the enabling and constraining factors associated with successful entrepreneurship in terms of personal, social, cultural, political and economic characteristics. Despite average education and humble family backgrounds, the Khasi women have been equal to men in being quite enterprising and successful, through hard work, patience, and good public relations. Khasiculture is in fact a strong influence in promoting such enduring traits among women, who have been able to build an economic base strong enough to provide their children with a good

starting point in life. A higher level of education and employable skills for women entrepreneurs can help in improving their levels of productivity, and promote risk-taking and innovativeness.

11. Purnamita Dasgupta (2005) revealed that women's labour force participation rate in rural India was negatively influenced by education, ownership of land, age and number of young (below 5 years) in household. Monthly per capita expenditure negatively affected the decision to participate in the labour force and was of greater significance for BPL households. Also, wage rate had a negative effect on women's labour force participation, but was only significant for BPL households.
12. P.K. Bardhan's (1979) analysed the determinants of women's labour force participation rate in rural West Bengal (Indian state). He empirically proved that women's labour force participation rate in rural West Bengal was negatively influenced by increase in number of dependents in the household, number of adult males in the household, the village unemployment rate and standard of living for the household. Women's labor force participation rate was positively affected by the harvesting-transplanting season (July-September). He also found out that low caste and tribal women participate more in the labour force than higher caste women even in rural areas.
13. Jacob Mincer's (1962) laid emphasis on determining factors affecting of women's (particularly married) decision to participate in the labour force. Mincer proved that wives were more likely to participate in the labour force if husbands' earnings were lower than permanent earnings. Moreover, if the education level of family head was high, changes in permanent and transitory income weakly affected participation rate. It was also noted that unemployment and presence of young children in households had discouraging effects on labour force participation that could be later studied for different groups (non-married or divorced women).
14. GurendraNathBhardwaj, Swati Parashar, Dr. BabitaPandey and PuspamitaSahu in this study revealed the major hurdles that the women face during starting and running a company generally come from financing and balancing of life. The other hindering external factors include gender discrimination, inaccessibility to information, training opportunities, infrastructure etc. Some internal factors like risk aversion by women, lack of confidence, lack of vision of strategic leader etc. can also create obstacles for the women entrepreneurship development. This study suggested that government should set some priorities for women entrepreneurs for allocation of industrial plots, sheds and other amenities, and precautionary measures should be undertaken to avoid the misuse of such facility by the men in the name of the women.
15. S. Vargheese Antony Jesurajan and S. VargheesPrabhu in their empirical investigation, revealed the expectations of women entrepreneurs in Tirunelveli district. The finding depicts many factors like finance, training, support and schemes are the major expectations among the women entrepreneurs in Tirunelveli district. The study concludes that the women entrepreneurship must be moulded properly with entrepreneurial traits and skills to meet the changes in trends, challenges global markets and also be competent enough to sustain and strive for excellence in the entrepreneurial arena.

THEORETICAL FRAMEWORK

The emergence of woman entrepreneurs and their contribution the national economy is quite visible in India. The number of women entrepreneurs has grown over a period of time, especially in the 2000s. women entrepreneurs need to be lauded for their increased utilization of modern technology, increased investment, finding a niche in the expect market, creating a sizable employment for others and setting the trend for other women entrepreneurs in the organized sector.

The entrepreneurs sustain the world. The theoretical framework is presented in the early section of a dissertation and provides the rationale for conducting your research to investigate a particular research problem.

It provides the background that supports your investigation and offers the reader a justification for your study of a particular research problem. It includes the variables you intend to measure and the relationships you seek to understand. Essentially, this is where you develop a “theory” and build your case for investigating that theory. The theoretical framework is your presentation of a theory that explains a particular problem. The theoretical framework is a summary of your theory regarding a particular problem that is developed through a review of previously tested knowledge of the variables involved. It identifies a plan for investigation and interpretation of the findings. The theoretical framework involves a well-supported rationale and is organized in a manner that helps the reader understand and assess your perspective. The purpose is to demonstrate that the relationships you propose are not based on your personal instincts or guesses, but rather formed from facts obtained from authors of previous research.

Women are not only involved in business activities for their survival. They want to satisfy their inner urge of creativity and skill. For this purpose they have been formulating strategies and building a base. Their numbers in education, politics, self-employment, profession etc., are increasing at a greater speed also. Women education is the reason for social transformation. This will be seen from the entry of women into areas traditionally dominate by men.

The development of the theoretical framework helps to clarify your implicit theory in a manner that is more clearly defined. It helps you to consider other possible frameworks and to reduce biases that may sway your interpretation. As you develop your theoretical framework you will consider alternative theories that might challenge your perspective. You will also consider the limitations associated with your theory, and quite possibly, that your problem could be better understood by other theoretical frameworks. The theoretical framework is how you conceptualize the nature of your research problem, its basis and the analysis you will choose to investigate that problem. This framework determines how you perceive, make sense of, and interpret your data. Explanation of the theoretical framework helps the reader understand your perspective and context.

The theoretical framework is developed from and connected to your review of the knowledge on the topic (the literature review). This knowledge is likely how you initially formulated your research problem. You reviewed the literature and found gaps in the explanation of some phenomenon. The theoretical framework allows you to present the research problem in light of a summary of the literature.

Your description of the variables of interest in context of the literature review allows the reader to understand the theorized relationships. You should begin by describing what is known about your variables, what is known about their relationship, and what can be explained thus far. You will investigate other researchers' theories behind these relationships and identify a theory (or combination of theories) that explains your major research problem. Essentially, your goal is to convey to the reader because you think your variables are related and the inclusion of previous research and theories that support your belief are essential to defending your rationale. You apply the theory to your problem, and state your hypotheses or predictions regarding potential relationships. You tell the reader what you expect to find in your research. There is a link between theoretical framework and quantitative research design. The choice of research design is based on the goals of the study and a solid review of the literature. Quantitative research design utilizes deductive reasoning, which begins with identifying the theoretical framework that will provide structure and guide the research project. The theoretical framework is presented in the early sections of a quantitative research proposal to establish the grounds for the study.

The theoretical framework will direct the research methods you choose to employ. Most of the women entrepreneurs have to face serious contest from structured industries. They have to face many tough competitions.

Most female business owners who have attended networking events can relate to this scenario: You walk into a crowded seminar and can count the number of women there on one hand. When women entrepreneurs talk business with primarily male executives, it can be unnerving. Finance is regarded as "life-blood" for any enterprise, be it big or small. However, women entrepreneurs suffer from shortage of finance on two counts.

Most of the women enterprises are plagued by the scarcity of raw material and necessary inputs. Added to this are the high prices of raw material, on the one hand, and getting raw material at the minimum of discount, on the other.

The theoretical framework defines the key concepts in your research, proposes relations between them, and discusses relevant theories based on a literature review.

A strong theoretical framework gives your research direction, allowing you to convincingly interpret, explain and generalize from your findings.

St. Teresa's College envisions a life-oriented education that empowers women through a humanizing and iterative process, to be agents of transformation and development at different levels of life. They are empowered to respond actively to concerns and conflicts inherent in today's world. Successful women entrepreneur is positive in their power. She is prepared to learn from others, explore for help from experts that add value to her goals. Her eminent vitality levels prompt her to contribute vastly towards demonstrating and asserting a booming business.

A woman entrepreneur devises realistic affordable forecasting and provides a price-efficient superior service to her customers. The women appreciate collaboration and dedication. They are exquisite at exerting connections and they communicate apparently and expeditiously. The women appreciate collaboration and dedication.

Women entrepreneurs engage in business due to push and pull factors which give confidence to women to have a self-sufficient occupation and stands on their feet. Logic towards independent decision- making on their life and career is the motivational factor behind this insists on "Women Entrepreneur" is a person who accepts challenging role to meet her personal

desires and turn out to be economically independent. A strong desire to do enormous positive is an integral quality of entrepreneurial women, who is competent of contributing values in both family and social life. With the introduction of media, women are conscious of their own qualities, rights and the work situations. The glass ceilings are shattered, and women are found indulged in every line of business from achier to telecommunication. Right efforts in all areas are vital in the development of women entrepreneurs and their greater involvement in the entrepreneurial activities.

Indian women is changing and they are fast emerging as potential entrepreneurs. Role modeling of women in non-traditional business sectors to break through traditional views on men's and women's sectors. Women companies are fast-growing economies in almost all countries. The latent entrepreneurial potential of women have changed little by little by the growing awareness of the role and status of economic society. Skills, knowledge and adaptability of the economy led to a major reason for women in business. Women are coming forth to the business arena with ideas to start small and medium enterprises. They are willing to be inspired by role models- the experience of other women in the business arena.

In modern days, women entrepreneurs are playing a very important role in business, trade or industry. Their entry into business is of recent origin. Women have already shown their vital role in other spheres like politics, administration, medical and engineering, technical and technological, social and educational services. This is true in advanced countries and now in recent years, they have been entering into these fields in our country. Their entry into business is a recent phenomenon in India. It is an extension of kitchen activities.

In certain businesses, women entrepreneurs are doing exceedingly well and even they have exceeded their male counterparts. Women are successful not only in law, science, medical, aeronautics and space exploration and even in police and military services, but now they are showing their might even in business and industry. They have proved that they are no less than men in the efficiency, hardwork, or intelligence, provided they are given proper scope.

The role or importance of women entrepreneurs may be ascertained from the study of the functions they perform. These functions are as under:

- a) Exploring the prospects of starting new enterprises.
- b) Undertaking risks and handling economic uncertainties.
- c) Introducing innovations.
- d) Co-ordinating administration and control.
- e) Routine supervision.

This is a dynamic world and it is changing at a greater speed. Changes have accrued in all spheres of human activity including in their profession and vocation. Liberalisation has further accelerated the pace of changes. The results of change are tangible and apparent. It has contributed to the emergence of various classes of entrepreneurs including women whose entry was insignificant and difficult once upon a time. This is a boon for sustained economic development and social progress. Due to social transformation, spread of higher education, pro-women legislations, spurting awareness, urbanisation, family support etc., have contributed to the emergence of women entrepreneurs in large numbers. In former days, for various reasons, the entry of women into business field was almost restricted.

During these years women are taking more professional education to cope up with market need and are flourishing in various areas. Important among them are – fashion designing, interior decoration, exporting, publishing, garment manufacturing, beauty parlors, basket weaving, consultancies, content writing, event planning, resume writing etc.

Women entrepreneurs explore the prospects of starting a new venture. They willing to assume risk, introduce innovations, coordinate administration and control business by their skill and knowledge. Many women succeeded in their missions and emerged as successful entrepreneurs. Women entrepreneurship has been recognized as an important, untapped source of economic growth during the last decade. With the spread of education and awareness, Indian women have shifted from the extended kitchen, handicrafts, and traditional cottage industries to non traditional, higher level of activities. In the new industrial policy, the government has laid special emphasis on the need of conducting special entrepreneurial training programs for women to enable them to start their own ventures. Financial banks and institutions have also set up special cells to assist women entrepreneurs. This has helped the women a lot in taking up the entrepreneurial activity in India.

One of the biggest reasons women entrepreneurs are now in the forefront is their desire to blend career and life ambitions. Their personal goals are oftentimes meshed with career goals. They put their passions into practice and it shines through in entrepreneurial endeavors. For them it's not just a job, it's a significant part of who they are. Women entrepreneurs face technology obsolescence due to non-adoption or slow adoption to changing technology which is a major factor of high cost of production. Women in India are by nature weak, shy and mild. They cannot bear the amount of risk which is essential for running an enterprise.

promoting women entrepreneurship is an important activity that any society should promote. Involvement of women has its inherent benefits for the industry as well as society. Professionally, the women entrepreneurs setting up their own firms help in create new employment opportunities and per capita income of the nation is increased. Socially, they become independent, provide a better and brighter future for the next generation as well as family, better education and awareness levels, more confident about themselves and are in a better position to manage family businesses in case of loss of the earning member. The major reason that attracts women to begin as an entrepreneur is that they have innovative ideas and ability to do something creative which helps their individual identity to be recognized at not only local or national but at a larger also global level.

It has been experienced that the female population in developed countries are more educated as compared to their counterparts in developing countries. In India, the situation is that the 56% of female population is literate with majority of them not even having education beyond school. This leads to a scenario where the women entrepreneurs are not adequately equipped to the latest developments in technology or market, let alone being aware about new business opportunities. Thus, women entrepreneurs run into a number of problems while setting up and operating their businesses due to this deficiency. The Financial problem of businesses is related to shortage of adequate finance, difficulties in obtaining credit from banks, Low risk-bearing capacity, problem in capital for expansion, unaware about appropriate finance sources, lack of collateral, complex and lengthy loan procedures, etc. In India, women entrepreneurs always suffer from inadequate and inappropriate finance resources. They are unable to acquire finance from external sources such as formal financial institutions due to low

creditworthiness and absence of accurate collateral as women have very less property and bank balance in their name. Research done by Robert in non-OECD and developing economies reveals that 59 percent of the respondents have mentioned financial problem as crucial problem followed by 41% having difficulty in obtaining a loan.

where they were limited only to the domestic jobs. The participation of women in the entrepreneurial activity makes them not only self - confident but also self - dependant. Thus, it provides them an opportunity of not only contributing to the economic development of the nation, but also enables them to give a better life to their family. The women make up for almost 50% of the population in India, however, only 10% of the firms in the MSME sector are owned by them. Hence, if supported, the women entrepreneurs can provide a much – needed boost to the economy by creating new employment opportunities.

Entrepreneurship is global concept which contributes in the social and economic development of any country. It establishes positive relationship with the economic prosperity. In India, traditionally, the role of women is only confined to the family. Women were responsible for all household chores and responsibilities. But due to urbanization, technical up gradation, industrialisation, and education, women move from traditional image and enter into the zone of working environment. For the upliftment of society and family, women realize the need of earning money. Men and women both play an important part in development of economic condition of a country. Women contribute in the field of entrepreneurship because of flexibility between work and domestic responsibilities. Several push and pull factors have encouraged women to become entrepreneur. Desire of personal improvement, recognition, self esteem, pulled her to become entrepreneur and need of financial stability pushed her to get involved in this field for their economic and social development. Government, non government organizations, self help groups, and financial institutions have also emphasized on the promotion of women in this field. Factors such as gender stereotypes, lack of awareness about training programs, bank perception, and inadequacy of finance generate the problems in the growth of women. This paper conceptually explains the problems and prospects of women entrepreneurs and provides some recommendations to policymakers, researchers, and academicians for this field.

women cover a long journey to become independent as the traditional concept of our country is male dominated one. Due to the education, women do not want to stay in home. In 1970's, the women get involved in work force. They work outside for the better life of family. In corporate world, women faced many problems due to gender related issues and glass ceiling effect. Because of this, the performance of women gets affected in workplace as well as in family. For the betterment of family, children, women moved to working environment and now maintain the balance between the work and personal life she lead the way of entrepreneurship. Women entrepreneur is the one who are able to take all kinds of risks identify the market opportunities and with their skill provide the products to serve the customers or society.

Women entrepreneurs are given a similar type of training by the EDPs, irrespective of the firm being a start-up or old. This results into severe lack of knowledge for running a business. Second - generation women entrepreneurs already have an exposure to business and therefore, need guidance and advisory to manage the unpredictable situation, which may arise, due to unexpected events, economic or political. One such example is of demonetisation where the cash was not at disposal and hence the purchasing power of individuals has dropped.

Also, a number of agencies have business development programmes for start-up phase, but once the business is established, the women entrepreneurs are left on their own to compete in an environment that does not provide a level playing field. The women entrepreneurs severely lack on the experience of operating a business and hence counseling, guidance, mentoring and advisory services can help them overcome the barriers faced by them while operating a business that was set-up with a lot of hard work and make it successful.

Women are important part of human resource and also for country. As we do not imagine the family without women, the development of economy is incomplete without the contribution of women. The traditional mindset, lack of development programmes, education, entrepreneurial knowledge, negative attitude of financial institutions, lack of knowledge of market, work life balance issues creates the hindrance in the path of women entrepreneurs. By giving the proper education, training programmes, support from financial institutions, government and family, we encourage the participation of women in the field of entrepreneurship.

Entrepreneurship is an emergent field and globally important to every country. The participation of women in this field is globally accepted and important for development of any country. A women entrepreneur by her successful entrepreneurial activities proves her recognition and identity in society.

Women left the job and participated in business activities, still they facing the problem of flexibility. Sometime the family members do not support her and all the domestic work is fall one her. Due to this work inflexibility, the performance of work and family suffered. Today's women are educated but they are not well furnished in entrepreneurial education. This specific education is essential for different perspective of doing business. How the business plan educated? How the advertisement taken place? What are the measures to promote their business? These are some question which handled properly with the help of proper professional education and training programmes.

In this scenario, women are gain education and rights equal to men. But still they have lack of confidence for doing the entrepreneurial activities. They have suffered from fear to do the business related activities outside the region and due to this, for outside work, they depend on family male member. This dependency shows their lack of self confidence.

Women left the job and participated in business activities, still they facing the problem of flexibility. Sometime the family members do not support her and all the domestic work is fall one her. Due to this work inflexibility, the performance of work and family suffered.

Today's women are educated but they are not well furnished in entrepreneurial education. This specific education is essential for different perspective of doing business. How the business plan educated? How the advertisement taken place? What are the measures to promote their business? These are some question which handled properly with the help of proper professional education and training programmes.

In the changing global context and in view of the stress on women entrepreneurship development, the things are getting changed and women have come forward to take up innovations and enterprising projects.

CHAPTER 3
DATA ANALYSIS
AND
INTERPRETATION

AGE OF THE RESPONDENTS

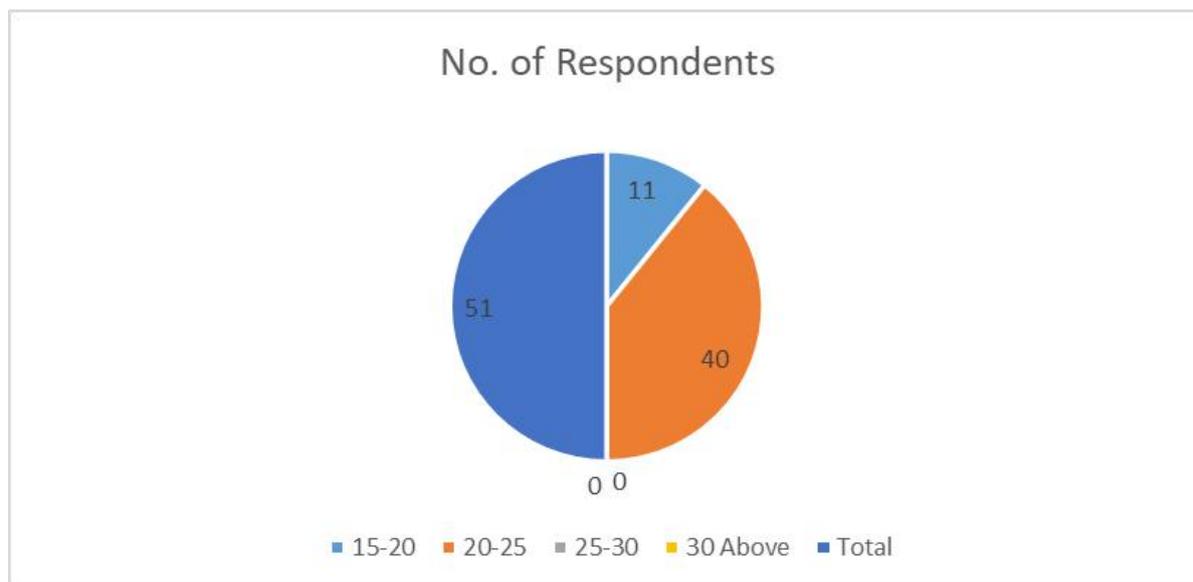
TABLE 3.1 Age

AGE	RESPONDENTS	PERCENTAGE
25-20	11	21.56%
20-25	40	78.43%
25-30	0	0%
30 Above	0	0%
Total	51	100

Source: Primary Data

AGE OF THE RESPONDENTS

FIGURE 3.1 Age



It is found from the table and graph that most of the respondents that is, 78.43% of respondents are between the age group of 20-25 years whereas 21.56% of respondents are lie between the age group of 15-20 years.

EDUCATIONAL QUALIFICATION OF RESPONDENTS

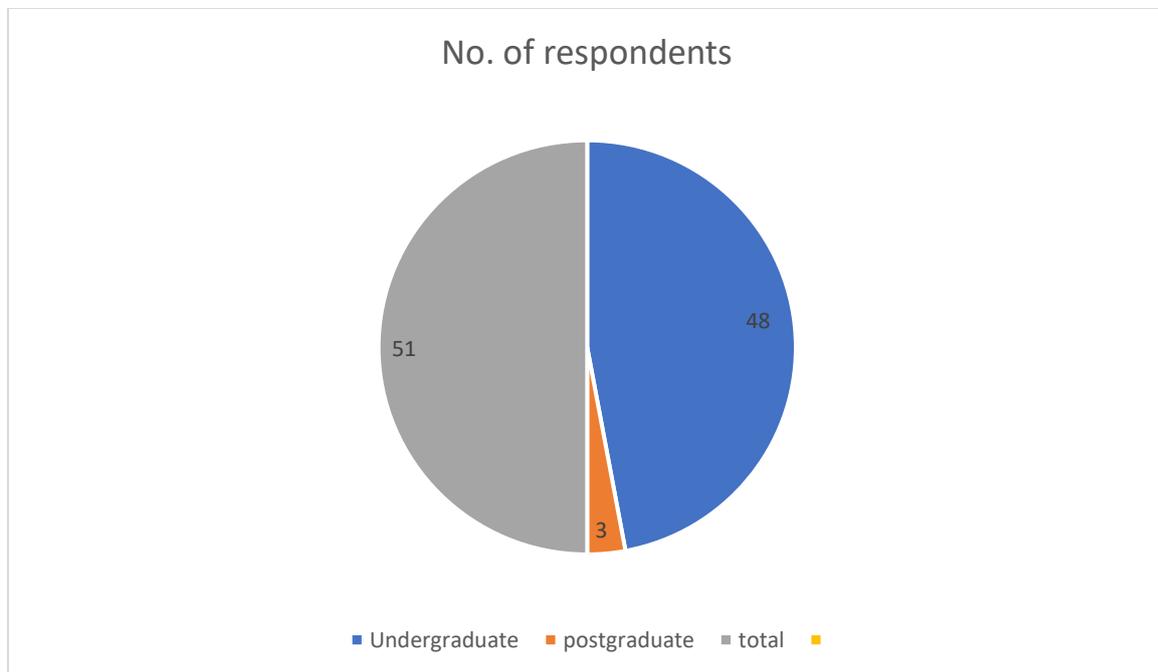
TABLE 3.2 Educational qualification

EDUCATIONAL QUALIFICATION	RESPONDENTS	PERCENTAGE
Undergraduate	48	94.11%
Postgraduate	3	5.88%
TOTAL	51	100

Source: Primary Data

EDUCATIONAL QUALIFICATION OF RESPONDENTS

FIGURE 3.2 Educational Qualification



It is observed that, most of the respondents are undergraduate, which is 94.11% and 5.88% are postgraduate.

WOMEN ENTREPRENEURS AMONG COLLEGE STUDENTS

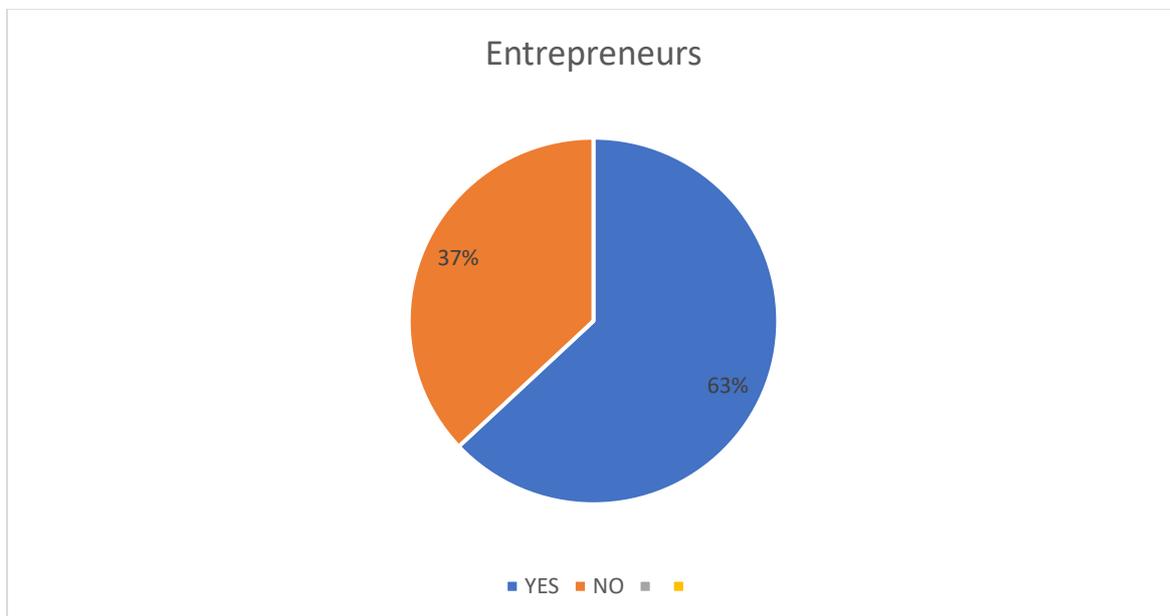
TABLE 3.3 Women entrepreneurs

SL NO.	YES/NO	RESPONDENTS	PERCENTAGE
1	Yes	32	63%
2	No	19	37%
	TOTAL	51	100%

Source: Primary Data

WOMEN ENTREPRENEURS AMONG COLLEGE STUDENTS

FIGURE 3.3 Women entrepreneurs



The above table shows the number of women entrepreneurs among college students. According to the table 63% of the women are entrepreneurs.

REASON FOR NOT BEING A WOMEN ENTREPRENEURS AMONG STUDENTS

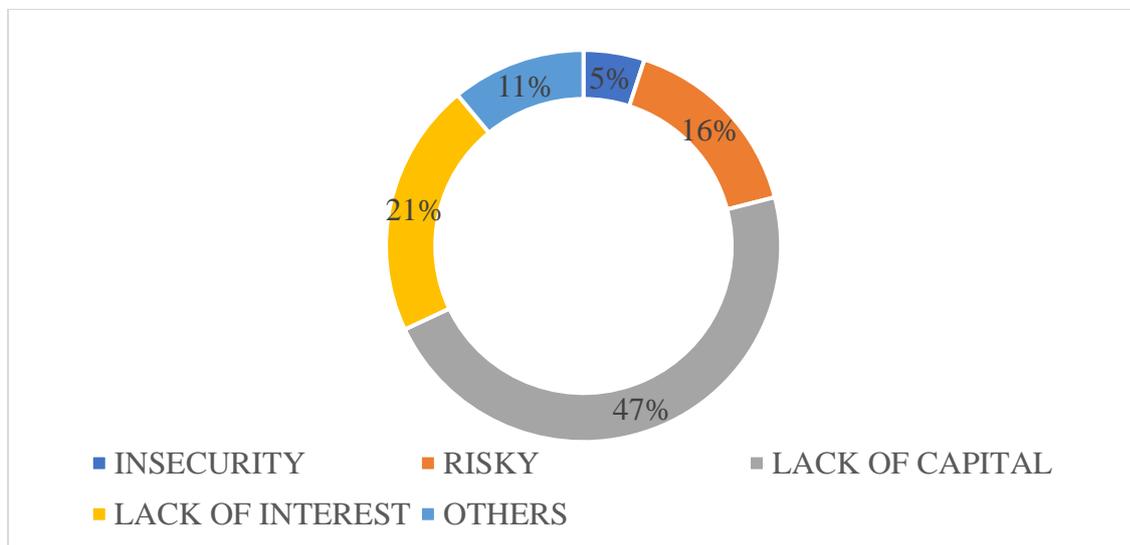
TABLE 3.4 Reason for not being an entrepreneur

SL NO.	REASON	RESPONDANTS	PERCENTAGE
1	Insecurity	1	5%
2	Risky	3	16%
3	Lack Of Capital	9	47%
4	Lack Of Interest	4	21%
5	Others	2	11%
	TOTAL	19	100%

Source: Primary Data

REASON FOR NOT BEING A WOMEN ENTREPRENEUR

FIGURE 3.4 Reason for not being an entrepreneur



The table shows that 47% of the women students are not being a women entrepreneur because of the lack of capital, 21% due to lack of interest, 16% because of the risk factor associated with it, 5% due to insecurity and rest 11% due to other reasons.

TYPE OF BUSINESS ENGAGED BY THE RESPONDENTS

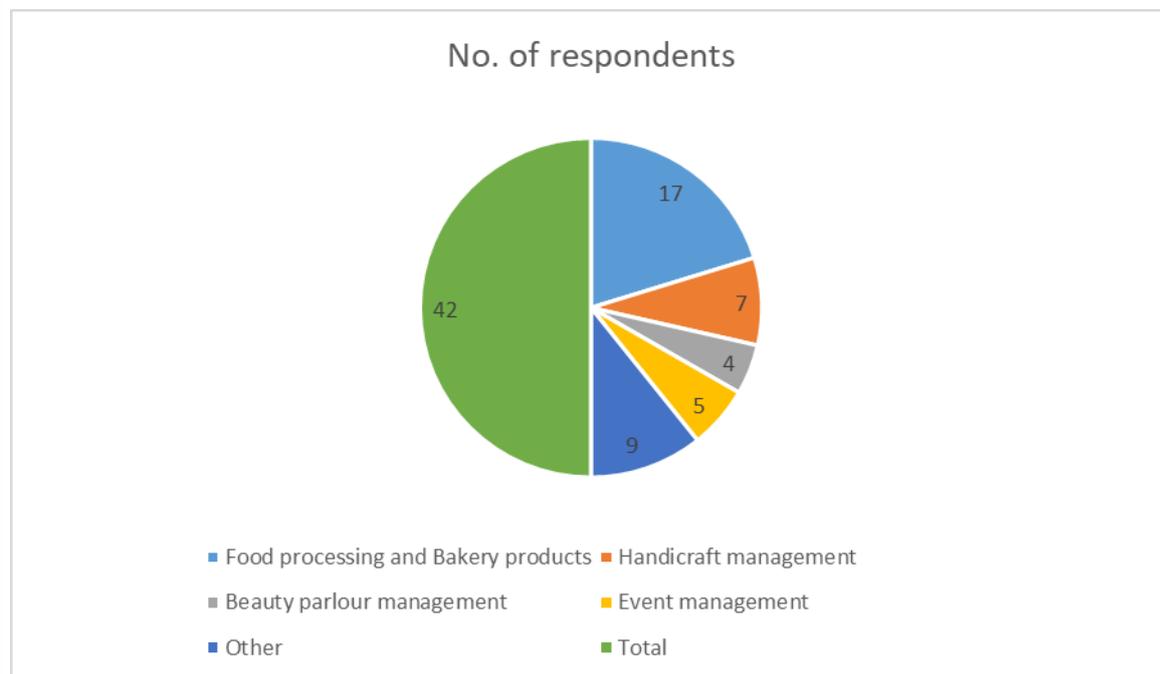
TABLE 3.5 Type of business

Source: Primary Data

TYPES OF BUSINESS	RESPONDENTS	PERCENTAGE
Food processing and Bakery products	17	33.33%
Handicraft management	7	13.72%
Beauty parlour management	4	7.84%
Event management	5	9.80%
OtherS	9	17.64%
Total	42	100

TYPE OF BUSINESS ENGAGED BY THE RESPONDENTS

FIGURE 3.5 Type of business



It is observed that, most of respondents have Food processing products as business, which is 33.33%. 13.72% owns handicraft management. 7.84% are doing beauty parlour management. 9.80% are doing event management and remaining 17.64% owns other business.

OBJECTIVES OF STARTING A BUSINESS

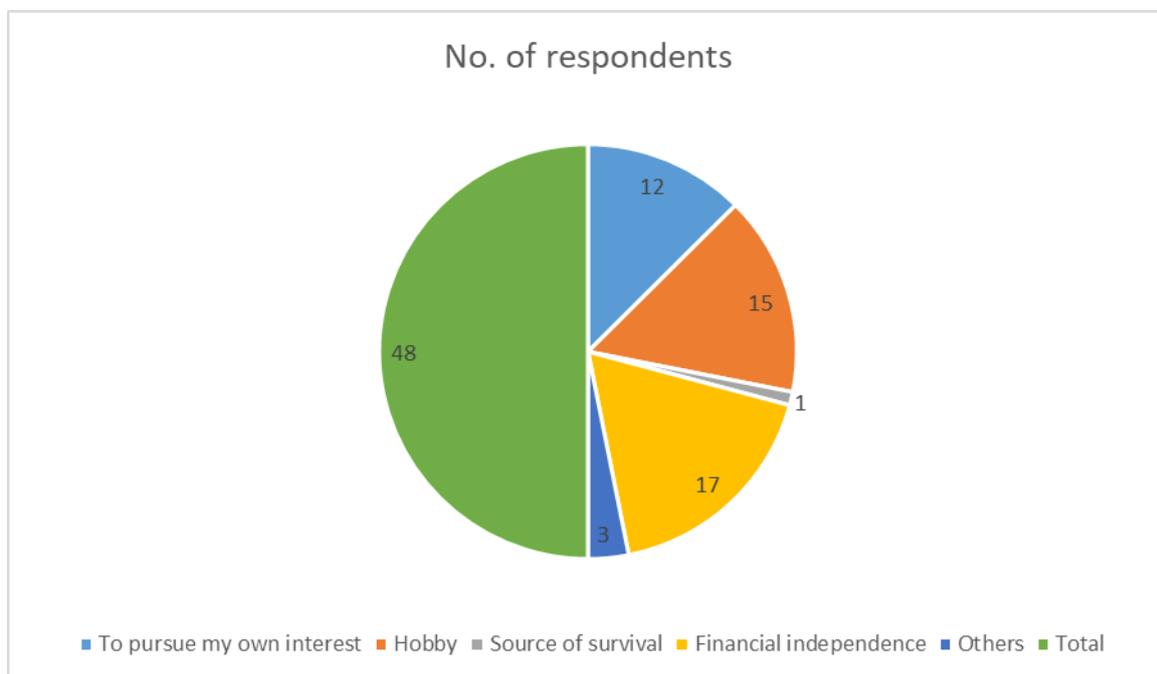
OBJECTIVE	RESPONDENTS	PERCENTAGE
To pursue my own interest	12	25%
Hobby	15	31.25%
Source of survival	1	2.08%
Financial independence	17	35.41%
Others	3	6.25%
Total	48	100

TABLE 3.6 Objectives of starting a business

Source: Primary Data

OBJECTIVES OF STARTING A BUSINESS

FIGURE 3.6 Objectives of starting a business



The above table and figure shows that the objective of most of the respondents to engaged in business is Financial independence.31.25% of respondents are engaged in business as a Hobby.25% of respondents starts business to pursue their own interest.2.08% of respondents are engaged in a business for a source of survival. Remaining 6.25% of respondent's objective of engaging in business are others.

EDUCATION Vs WOMEN ENTREPRENEURS

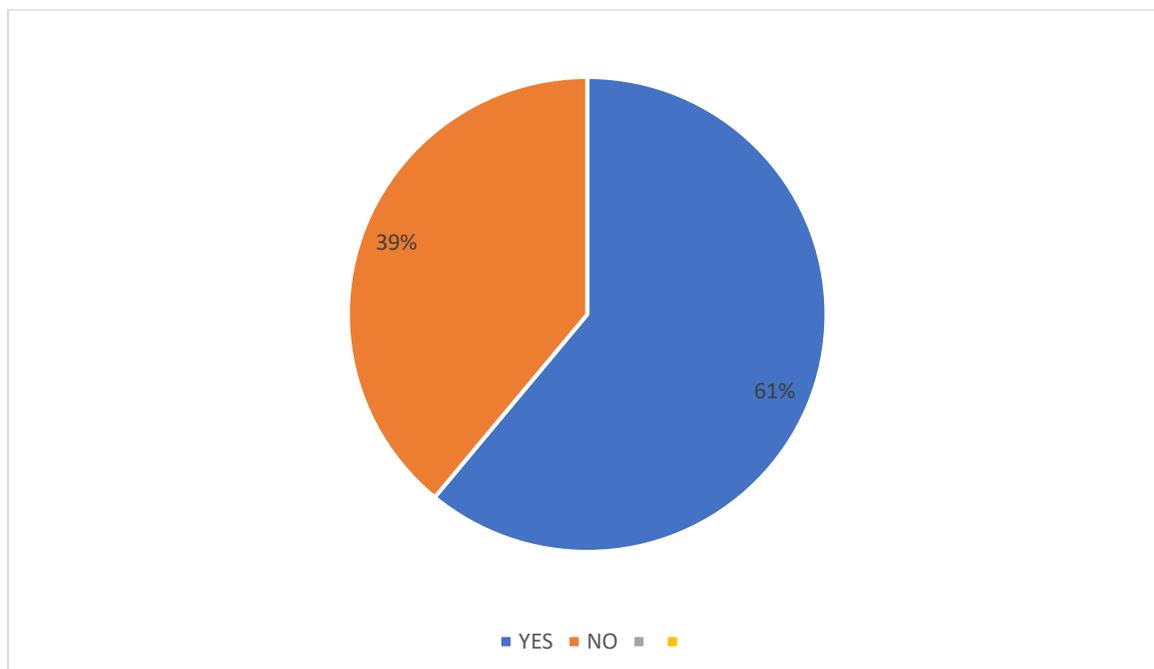
TABLE 3.7 Education Vs Women entrepreneurs

SL NO.	OPINION	RESPONDENTS	PERCENTAGE
1	Yes	31	61%
2	No	20	39%
	TOTAL	51	100%

Source: Primary Data

EDUCATION Vs WOMEN ENTREPRENEURS

FIGURE 3.7 Education Vs Women entrepreneurs



According to the table 61% of the women students thinks that education matters to be a women entrepreneur and 37% thinks that education does not matter.

AWARENESS ABOUT THE GOVERNMENT SCHEMES TO SUPPORT WOMEN ENTREPRENEURIAL ACTIVITIES

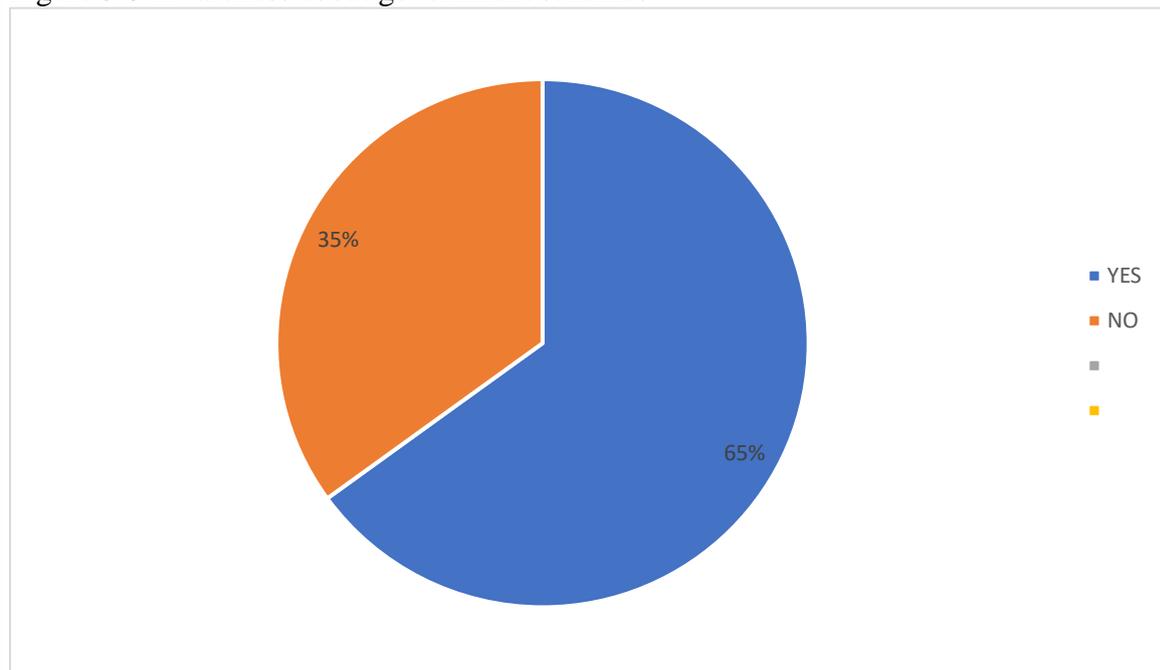
Table 3.8 Awareness about government schemes

SL NO.	AWARENESS	RESPONDENTS	PERCENTAGE
1	Yes	33	65%
2	No	18	35%
	TOTAL	51	100%

Source: Primary Data

AWARENESS ABOUT THE GOVERNMENT SCHEMES TO SUPPORT WOMEN ENTREPRENEURIAL ACTIVITIES

Figure 3.8 Awareness about government schemes



The table shows that 65% of the women students are aware of the various government schemes available to support women entrepreneurial activities and 35% are not aware about the various government schemes available to support women entrepreneurial activities.

STUDENT'S PREFERENCE FOR INITIAL SOURCE OF INVESTMENT

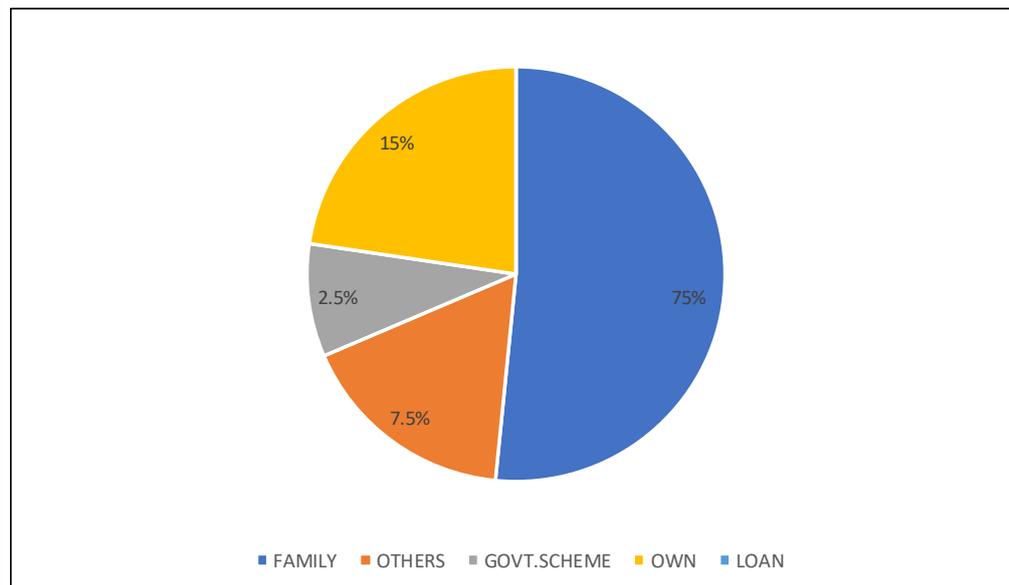
TABLE 3.9 Initial source of investment

SL NO.	INITIAL CAPITAL	RESPONDENT	PERCENTAGE
1	OWN	6	15%
2	LOAN	0	0
3	GOVT.SCHEME	1	2.5%
4	FAMILY	30	75%
5	OTHERS	3	7.5%
	TOTAL	40	100%

Source: Primary Data

STUDENT'S PREFERENCE FOR INITIAL SOURCE OF INVESTMENT

FIGURE 3.9. Initial source of investment



According to the table 3.9. 15% students use their own money to make an initial investment into their business whereas 75% would seek the help of their family. However, 2.5% may go for the Govt. schemes available.

HURDLES TO START BUSINESS

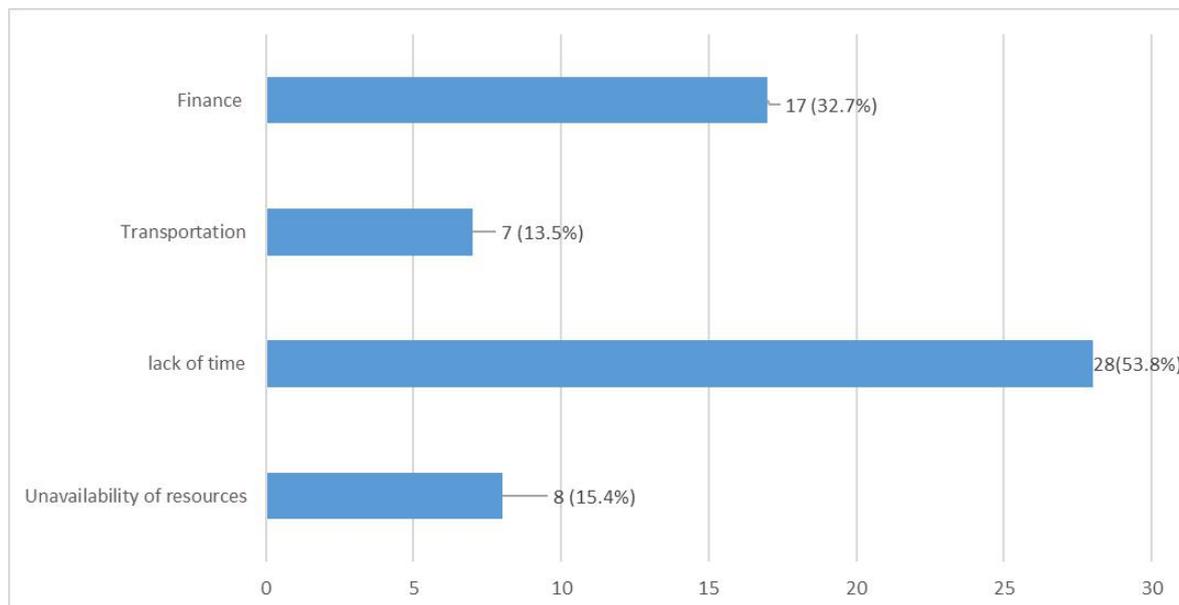
TABLE 3.10 Hurdles to start business

HURDLES	RESPONDENTS	PERCENTAGE
Finance	14	28.33
Transportation	6	11.67
Lack of time	23	46.67
Unavailability of source	7	13.33
TOTAL	50	100

Source: Primary data

HURDLES TO START BUSINESS

FIGURE 3.10 Hurdles to start business



According to the table 53.8% of the students finds, lack of time as a hurdle to start own business, 32.7% finds finance as a hurdle, 15.4% as unavailability of resources and the rest 13.5% as transportation.

BENEFITS GIVEN BY COLLEGE

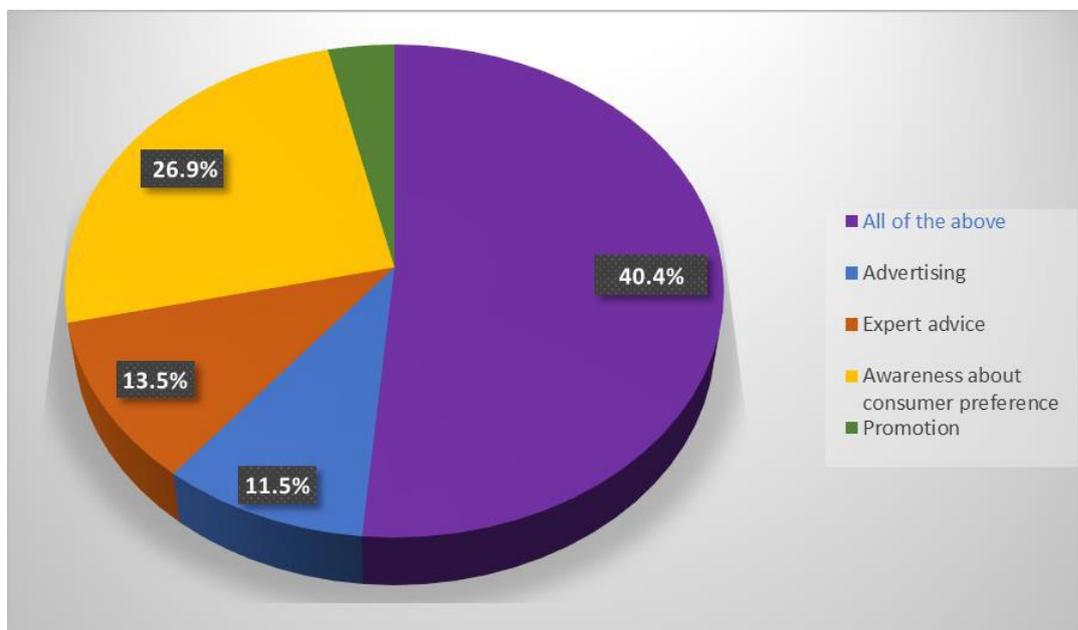
TABLE 3.11 Benefits given by college

BENEFITS	RESPONDENTS	PERCENTAGE
Advertising	6	11.54
Expert advice	7	13.46
Awareness about consumer	13	26.92
Promotion	4	7.69
All the above	20	40.38
TOTAL	50	100

Source: Primary data

BENEFITS GIVEN BY COLLEGE

FIGURE 3.11 Benefits given by college



VARIOUS INNOVATIVE STEPS TAKEN UP BY STUDENTS IN THEIR BUSINESS

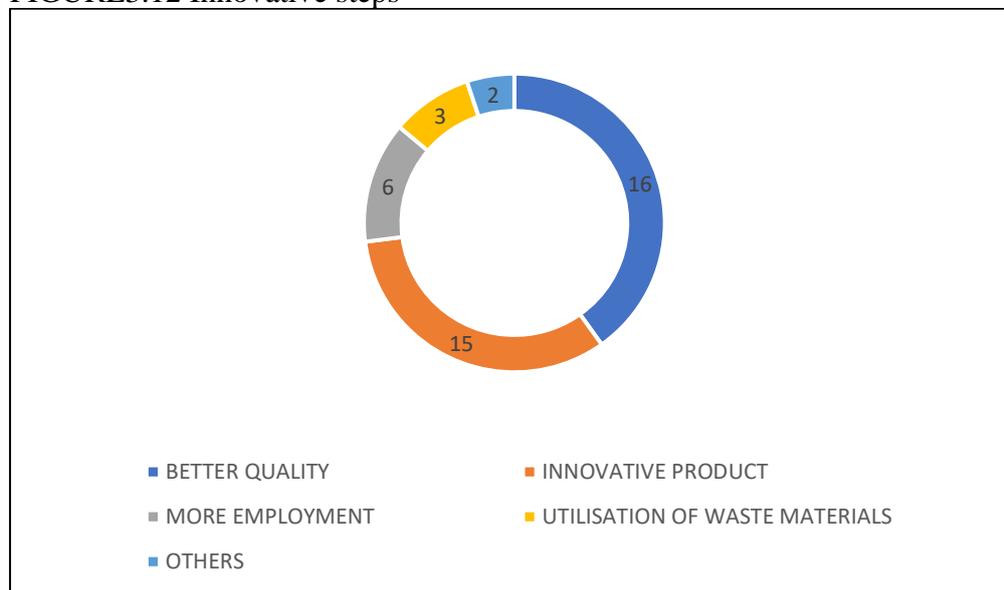
TABLE 3.12 Innovative steps

SL NO.	STEPS	RESPONDENTS	PERCENTAGE
1	Innovative Products	15	35.7%
2	Better Quality	16	38.09%
3	More Employment	6	14.2%
4	Utilisation Of Waste Materials	3	7.14%
5	Emphasis On Culture And Nation	0	0
6	Others	2	4.7%
	TOTAL	42	100

Source: Primary Data

VARIOUS INNOVATIVE STEPS TAKEN UP BY STUDENTS IN THEIR BUSINESS

FIGURE 3.12 Innovative steps



As per the table 38.09% students would use better quality products to make their business different from others. 35.7% of students would innovate their products in order to make better business. 14.2% agreed for more employment and 7.14% would make use waste materials.

CHAPTER 4
FINDINGS,
SUGGESTIONS AND
CONCLUSION

FINDINGS

1. The figure shows that 78.43% of the women entrepreneurs fall under the age group of 20-25 years and the rest 21.56% of the women fall under the age group 25-30 years.
2. From the sample respondents It is found that 94.11% of the respondents are undergraduates whereas 5.88% of the women are post graduates.
3. The above figure shows 63% of the students are women entrepreneurs.
4. It is observed that 47% of the women students are not being a women entrepreneur because of lack of capital to start a business, 21% of the respondents consider it due to lack of interest, 16% because of the risk factor associated with it, 5% due to insecurity and the rest 11% are due to other reasons.
5. According to the study It shows that 33.33% of the women entrepreneurs are engaged in the food processing business and 13.72% of the respondents are engaged in handicraft management, whereas 7.84% of the respondents opted for beauty parlour management and the rest 9.80% for event management.
6. The objective is 35.41% of the women entrepreneurs engaged in business are for financial independence which is followed by 31.25% for the hobby, 25% for pursuing their interest and 2.08% of the respondents started as a mean of survival.
7. It was found that 61% of the women students think that education matters to be an entrepreneur and other 37% of the respondents think that education does not matter to be an entrepreneur.
8. According to the study it is observed that 65% of the women students are aware about the various government schemes available to support the women's entrepreneurial activities and the rest 35% are not aware about these schemes provided by the Government.
9. The survey shows that 15% of students use their own money to make an initial investment into their business whereas 75% of the respondents would seek the help of their family members. And the rest 2.5% may go for the Govt. schemes available.
10. It is observed that 54% of the students find lack of time as a hurdle to start a business, 33% of the respondents are faced with shortage of Finance and 15% of the respondent's face unavailability of resources as a hurdle.
11. According to the study it's observed that many benefits were given by St. Teresa's College to the students in running the business which includes 40.38% of the students choose all the options, 11.54% of advertising, 13.46% of expert advice, 27% of awareness about consumer preference and 7.69% promotion are the benefits given by the college.
12. The above diagram shows 38.09% of the students use better quality products to make their business different from others, 36% of the respondents would use innovative products, whereas 14% agreed to more employment and the rest 7.14% would make use of waste materials.

SUGGESTIONS

1. To increase women participation in entrepreneurship it is necessary to aid in the areas of training and managerial skills, availability of easy credit facilities, developing needed infrastructure and exploring marketing outlet.
2. For promoting women entrepreneurship education, proper facilities and training opportunities should be provided.
3. Because of women hood, women have some strengths and some weaknesses. Training programmes should be designed in such a manner that women entrepreneurs can benefit out of their strengths and overcome their weaknesses.
4. Success stories of women entrepreneurs from varied backgrounds should be popularized through text books of schools and colleges. All possible media should be used to project these role models.
5. Potential women entrepreneurs among students should be identified and exposed to different types of emerging opportunities.
6. The benefits of various government schemes and programs must reach to the women entrepreneurs through or by awareness camps at remote villages of India so that they can avail the advantages of it.
7. Raising awareness and familiarizing students through motivational and awareness campaigns about entrepreneurship as a valuable career path. It will help to promote positive attitude towards entrepreneurship and thus a higher acceptance and legitimation in the society in the long run.
8. Entrepreneurship based education has an important impact upon young women. One of the important aim of entrepreneurship-based education should be promotion of entrepreneurship as a viable career path. Learning about business development, administration and management as well as learning necessary skills, attributes and behaviors that creates positive attitude toward entrepreneurship can have considerable impact on a young person's decision to become an entrepreneur. Government should therefore introduce entrepreneurship development studies in the course curriculum from undergraduate level itself. so that the mindset of the individual can be molded initially.
9. Students should be made aware of the government schemes- the scheme of MSME (Ministry of micro, small and medium enterprise) like credit guarantee scheme for collateral free loan, credit linked capital and up gradation scheme for technology up gradation through workshops and knowledge within the campus.
10. Creation of campus companies in college would not only encourage the students to be an entrepreneur but also helps in need recognition and making the students aware that not all ideas are opportunities.

CONCLUSIONS

This is the clear idea of a considerable level of entrepreneurship and entrepreneurial potential among students in St. Teresa's College. Many of the women entrepreneurs have undertaken business such as Food processing, Handicraft, Beauty parlour, Event management etc.

Most of the women entrepreneurs market their product through online and offline. Even though there are many women entrepreneurs in our country, they do face many problems from their family and society. Problems such as lack of time, transportation, lack of support, male dominance etc.

Moreover there are many benefits given by St Teresa's College such as advertising, promotion in running their business. Many training programs are are organised by the college for developing women entrepreneurs. Many women's initial source of income is from their family.

In recent years, the study of women entrepreneurship has experienced great growth, gaining a broad consensus among academics and contributing above all to understanding all those factors that explain the difficulty of women in undertaking an entrepreneurial career.

The causes of low female entrepreneurship rates, primary of which are unconscious biases, low confidence in business skills, difficult access to finance and networks, a lack of family support and child-care options, as well as insufficient safety in work and public spaces.

Providing business skills trainings is a basic step toward empowering women entrepreneurs, but to truly achieve transformative change, training programs need to address deeper psychological and social constraints facing women.

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ANNEXURE

QUESTIONNAIRE

A STUDY ON WOMEN ENTREPRENEURS

1. Name:

2. What is your age?

A) 15-20 B)20-25 C)25-30 D)30 Above

3. Education:

A) U.G B) P.G

4. Are you an entrepreneur?

A) Yes B) No

5. If no, why?

A) Insecurity B) Risky C) Lack of capital D) Others

6. Which type of business are you engaged in?

A) Food processing and bakery products B) Beauty parlour management

B) Event Management D) Other

8. Objectives of starting a business of your own?

A) To pursue my own interest B) Hobby

C) Source of survival D) Financial independence

E) Others

8. Do you think education matters, to be an entrepreneur?

A) Yes B) No

9. Are you aware of the Government schemes that are available to support various entrepreneurial activities?

A) Yes B) No

10. What are the benefits given by your college in running the business.

A) Advertising B) Expert advice C) Awareness about consumer preference

D) All of the above

E) None

11. What was your initial source of income?

A) Own B) Loan C) Government schemes D) Family E) None

12. What do you think are the main hurdles that you face in your business?

A) Lack of support B) Competition C) Male dominance D) Lack of fund

E) None

13. What are the tic-tacks that you will work on/take up to make your business different from other?

A) Innovative products B) Better quality C) Utilization of waste materials

D) More employment opportunities E) Others

AFTERMATH OF CORPORATE FRAUDS AND SCAMS IN INDIA- SELECTED CASE STUDIES

A project submitted by

VAJRAMOL C K (Reg no AB19COM055)

A S LAMIYA (Reg no AB19COM056)

AGLIN M V (Reg no AB19COM057)

Under the guidance of

Dr.JENCY TREESA

In partial fulfillment of requirement for award of degree of bachelor of commerce



ST TERESA'S COLLEGE AUTONOMOUS ERNAKULAM

COLLEGE WITH A POTENTIAL FOR EXCELLENCE

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This is to certify that the project entitled "**AFTERMATH OF CORPORATE FRAUDS AND SCAMS IN INDIA- SELECTED CASE STUDIES**" submitted by **Vajramol C K, Lamiya A S and Aglin M V** towards partial fulfillment of requirement for award of the degree of bachelor of commerce is a record of bonafide work carried out by them during the academic year 2021-2022.

Supervising guide Name:


Dr. Jeney Treesa

Assistant professor

Department Of Commerce.



Head of the department:


Ms Ann Thomas Kiriyanthan

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Department of commerce

Place : Ernakulam

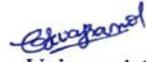
Date. : 31-03-2022

DECLARATION

We Vajramol C K, A S Lamiya and Aglin M V do hereby declare that this Dissertation entitled. "AFTERMATH OF CORPORATE FRAUDS AND SCAMS IN INDIA- SELECTED CASE STUDIES", has been prepared by us under the guidance of Dr. Jency Treesa Assistant professor, Department of commerce, St. Teresa's College, Ernakulam. We also declare that this Dissertation has not been submitted by me fully or partly for the award of any Degree. Diploma, Title or Recognition before .

Place: Ernakulam

Date :31-03-2022


Vajramol CK

Lamiya A S

Aglin MV

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CONTENTS

Sl. No	Particulars	Page No:
1.	List of tables	
2.	List of figures	
3.	Chapter one - Introduction	1
4.	Chapter two – Literature review	5
5.	Chapter three – Theoretical framework	11
6.	Chapter four – Data analysis and interpretation	23
7.	Chapter five – Summary, findings, recommendations, and conclusions	33
8.	Bibliography	

LIST OF TABLES

Table. No:	Title	Page No:
4.1	Fabricated financial statement	23
4.2	Share holding pattern in Satyam computers from 2001 to 2008	25
4.3	Satyam's total income and audit fees (Rs in Millions)	26
4.4	Impact on share price	26
4.5	Net profit and EPS of PNB from 2011 to 2021	26
4.6	ROE of PNB from 2011 to 2020	28
4.7	Amounts owe to the banks by ABG Shipyard LTD	29
4.8	Losses vs. year	30
4.9	Number of bank fraud cases across India between from financial year	31

LIST OF FIGURES

Figure No:	Title	Page No:
4.1	Fabricated balance sheet and income statement	24
4.2	Promoter shareholding from 2001 to 2008	25
4.3	Net profit of PNB from 2011 to 2021	27
4.4	ROE % vs. Date	28
4.5	Exposure to ABG shipyard	30
4.6	Losses vs. year	31
4.7	Number of bank fraud cases across India between from financial year 2009 to 2021	32

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

A corporation must be fair and transparent to its stakeholders in all its transactions. According to Jorge Paulo Lemann, “the greatest asset of a company is its people”. In a globalized scenario, corporations have to access public resources and compete in a global marketplace.

Frauds have evolved as the enormous perils which companies are unveiled to and are increasingly becoming a big threat to society. Fraud incidents are becoming more and more severe as they destroy investors' trust and interest in stock markets which results in massive loss of investment wealth and damage the reputation, management and board of directors of the firm. White collar crimes are encroaching on corporate culture these days, causing harm not only to our country's trade and industry, but also to the statistics of the companies involved. A corporation or entity fraud takes place when it alters important information purposefully. Companies employ several modes of operation to engage in such corporate frauds, including misinformation, manipulation of financial records etc. Advances in technological and scientific development also contributed to corporate fraud in India.

Even though there are various rules and regulations in our country, the number of frauds are increasing at an alarming rate. This is clearly evident that our statutes failed to eradicate such frauds from the face of business. In every cases the fraud or scams happens because of silly things that could have been detected by the government and authorities. The losses in human terms are almost incalculable. Business firms face a number of challenges – globalisation, rapidly-evolving technology, rapid development in business and industry, risk and complexity of data. Consequently, the risk faced by such organisations increases manifold and there arises the need to effectively manage and mitigate the risk. However, finding a solution to mitigate, actually to exterminate scams is difficult. This research intends to study scams and to: derive a solution to the increasing rate of scams.

1.2 RESEARCH QUESTIONS

- Which are the major corporate frauds that happened in India?
- How do corporate scams and frauds affect stock markets?

- How does it affect the GDP of the country?
- Does the legal system fail to eradicate such frauds?

1.3 RESEARCH OBJECTIVES

- To understand the major corporate frauds that happened in India with special focus on financial statement mis-statement frauds and bank frauds.
- To analyse the nature of corporate frauds and its impact on the stock markets.
- To understand how the corporate scams have impacted the profitability and financial position of the companies.
- To compare the share holding pattern of the accused companies before and after the corporate scams or frauds.

1.4 SCOPE OF STUDY

The study primarily focuses on the corporate frauds and scams in India since 2000. The study has included companies namely Satyam computers, Firestar Diamonds, Punjab National Bank, and ABG groups. This project was conducted with a focus on financial statement mis-statement frauds and bank frauds. The study has mainly analysed how these scams and frauds have impacted the profitability and financial position of the companies. The study has also compared the share holding pattern of the accused companies before and after the corporate scams or frauds.

1.5 SIGNIFICANCE OF STUDY

The impact of corporate frauds is not only confined to monetary terms, it affects the name and fame of the nation itself. This study seeks to evaluate the causes for frauds and scams. It aims to give an insight towards preventive mechanisms and their awareness towards various frauds. The study signifies the importance of training in prevention of frauds. A strong system of internal control and good employment practices prevent frauds and mitigate losses.

In a technically fueled world, the number of frauds is increasing to the extent that it even affects stock markets, GDP, exports and imports and inflation in our corporate governance is under a question mark and existing law failed to question this frauds. Loopholes of norms are getting misused. In this scenario the need of this study arises.

1.6 RESEARCH DESIGN AND METHODOLOGY

To study the objective, Secondary data has been used. Websites, journals and research papers are used as secondary data sources. Area of our study is confined to India only.

1.7 LIMITATIONS

- The analysis is mainly on the basis of Secondary data. Primary data is difficult to access in the case of these sensitive studies.
- Many companies have undergone external reconstruction and therefore, data relating to liquidated and merged companies were not available.
- Profitability, financial position and the shareholding pattern of the affected companies were only probed into. Other aspects were not studied as it will require more time and other resources.

1.8 OPERATIONAL DEFINITIONS

- **Frauds:** Corporate fraud refers to illegal activities undertaken by an individual or company that are done in an unethical manner.
- **Body corporate:** According to Section 2(7) in The Companies Act, 1956 " body corporate" or 'corporation' includes a company incorporated outside India but does not include-a corporation sole,a co- operative society registered under any law relating to co- operative societies and any other body corporate (not being a company as defined in this Act) which the Central Government may, by notification in the Official Gazette, specify in this behalf.
- **Banking company:** " Banking company" means any company which transacts the business of banking.
- **Financial statements:** Financial statements according to S2(40) financial statement in relation to a company, includes— (i) a balance sheet as at the end of the financial year; (ii) a profit and loss account, or in case of a company carrying on any activity not for profit, an income and expenditure account for the financial

year; (iii) cash flow statement for the financial year; and (iv) any explanatory note annexed to, or forming part of, any document referred to in sub-clause.

- **Scams:** A scam is a deceptive scheme or trick used to cheat someone out of something, especially money.
- **Merger:** A merger is the combination of two companies into one by either closing the old entities into one new entity or by one company absorbing the other. In other words, two or more companies are consolidated into one company
- **Acquisition:** Acquisition is a corporate action in which a company buys most of the target company's ownership stake in order to assume control of the target firm.
- **Liquidation:** Liquidation or winding up is the process by which an entity converts its assets to cash or other assets and settles its obligations with creditors in anticipation of ceasing all operating activities.

CHAPTER 2
LITERATURE REVIEW

2.LITERATURE REVIEW

In any research it is essential to conduct a comprehensive literature review to identify the research gaps and scope of the study. Reviewing the previous studies on the same topic will give an idea about the data collected and interpretation of the study. Various authors have conducted studies relating to corporate frauds and scams in India. This chapter reviews the literature provided by eminent authors in this particular topic. There are extensive studies, reports and books available on this topic. We have reviewed some literature pertaining to the topic under study.

Sanjeev Gupta in his paper (2018) " Corporate frauds and the auditor's responsibility " intended to examine the concept and types of frauds as given in the new Companies Act and to identify the types and victims of corporate frauds, with reference to the infamous corporate frauds in India, and the existing legal provisions intended to prevent and regulate corporate frauds in India. The methodology used in the study is mainly based on the secondary data. Some data was collected from the corporate executives' investors and government officers. The main limitation of the study is that it is confined only to the corporate sectors. However, similar types of frauds might be indulged in other sectors also. The study has emphasized the need for strengthening the internal control system, reporting of fraud by auditors and companies, effective 'due diligence' by banks and financial institutions and more professionalism on the Board of Directors and strong internal control system. The prevention of corporate fraud reduces the anxiety and improves the stakeholders' confidence which affects resources and reputation of the company. The findings of the study will be helpful to the policy-makers and regulatory bodies to curb corporate frauds.

Dr. Anil Dogra in 2018 conducted a case study on frauds of Nirav Modi and Vijay Mallya in Banking sector. The Purpose of their study was to get rid of fraud and corruption by related parties. The objectives of this study are to position a bank in terms of the frauds made by the white color people, to examine the risk exposure of banks and to critically examine the existing debate on banking in the context of sample study. Their research methodology was to study the cases of two big frauds in the banking sector. They have briefly studied the scenario of the fraud conducted by Nirav Modi. The Punjab National Bank scam relates to a fraudulent letter of undertaking worth Rs 10,000 core issued by the bank. They also discussed Vijay Mallya, who owes 17 Indian banks an estimated Rs 9,000 crore, is

accused of fraud and money laundering in the country. Multi factor authentication, continuous monitoring of transactions, daily reconciliation of corporate accounts, use of dual and triple controls and continuous education of the business customers were the suggestions made by them.

LexQuest Foundation conducted a study on Saradha Scam: A Critical Analysis- The greed for money and limited knowledge on banking has created a web of informal banking, by moneylenders. However, failure to curb the role of these moneylenders and mitigate informal systems gave rise to devious financial operators, introducing attractive schemes like Ponzi. This is a fraudulent investing scam promising high rates of returns with little risk to the investors. Returns under this scheme are generated by acquiring new investors. The Saradha Scam is one of such kinds. A major financial and political scandal resulted out of the collapse of a Ponzi scheme, run by Saradha Group. The Saradha Group comprises companies, incorporated in 2006. Investors were attracted towards these Ponzi schemes as Saradha Group promised exorbitant returns and credible investments. SEBI has initiated immediate action and taken measures to have control over the activities of the Group so as to desist further scandal. It would be unfair to declare TMC/Mamata Banerjee as criminals when the case is still pending. But it is still not advisable to grant bail, as lakhs of people were swindled of their hard-earned money.

P.K Gupta and Sanjeev Gupta in their paper "Corporate frauds in India - perceptions and emerging issues "(2015) examined the nature of corporate frauds in India and their consequences in the business and economic systems. It highlights the emerging issues so that existing legal and regulatory obligations can be redefined and structured. An exploratory research was conducted through a combined mode of literature review; case studies; structured questionnaires from 346 sample companies; and 43 interviews with the corporate professionals, management, investors, government offices and authorities having wide experience. It was found that the regulatory system is weak, and there is a need to redefine the role of auditors. Coordination among different regulatory authorities is poor. Reporting of fraud and publication of fraud prevention policy are missing. Banks and financial institutions are ineffective on due diligence, and there is a lack of professionalism on the board and other executive levels in companies. This study assumes that fraud could be mitigated by proactive and conscious action by auditors and corporate executives who are willing to avoid perpetrating financial fraud despite pressures from investors, government securities regulators

and market fluctuations. The authors relied on the honesty of the respondents during the sample collection and recorded semi-structured interviews. A minimum level of five years' The research work is based on a thorough analysis of regulatory framework and Fraud case studies and primary data collected from companies, banks and other government and developmental institutions.

Manmeet Singh conducted a study on Business Ethics and Corporate Frauds; Issues and Case Study. Business ethics (also corporate ethics) is a form of applied ethics or professional ethics that examines ethical principles and moral or ethical problems that arise in a business environment. It applies to all aspects of business conduct and is relevant to the conduct of individuals and entire organizations. Corporate frauds are viewed as 'illegal acts or omissions, punishable by the State under administrative, civil or criminal law. These can include Presidents, managers, directors and chairman, sales people, agents, or anyone within a company that has authority to act on behalf of the firm. Examples of corporate criminal behaviour in most jurisdictions include: antitrust violations, fraud, damage to the environment in violation of environmental legislation, exploitation of labour laws, and failure to maintain a fiduciary responsibility towards shareholders.

Aron Almeida conducted a study on Satyam Scam-The story of India's biggest corporate fraud: A Case Study on 'Satyam Scam' Accounting Scandal: When the 2008 recession hit the world, India was not only going through a financial crisis but also an ethical crisis. Imagine a hypothetical scenario in the stock market where the very basic financials provided to you by a company are manipulated. This was what happened with Satyam Computer Services. The Satyam scam was finally exposed early in 2009. Analysts dubbed the scam as India's own Enron. Today, we take a look at the scandal that hit the nation in the midst of a recession, its effects, and how it was dealt with. This in turn, would allow the company easy access to loans and the impression of its success resulted in an increase in the share price. Also, the cash that the company had raised from the markets in the US never even made it to the balance sheets. PwC was not able to detect the fraud for almost 9 years but Merrill Lynch discovered the fraud as part of their due diligence in merely 10 days.

Manjari Sharma (2020) studied On the topic " Dreamers to Swindlers: Case Studies of the Infamous Scams that shook the Indian Stock market ". The objective of study was to discuss two scandals that devastated the Indian Stock Market and disturbed SEBI to its very core. She adopted a content analysis method to present the paper. She found in studies that

Harshad took advantage of prospect for arbitrage to break the partition between two markets by using technique called Ready Forward Deal. She analysed deeply about the impact of scam on the public as well as the stock market. In her studies she made it clear how Ketan Parekh made average investor to believe in the stocks which he looked out, which had low market capitalization and low liquidity and how he inflated the prices by thrusting money into these shares and started fictitious trading within a network of his own companies. She also pointed out ethical dimensions of these two scams which may include failure of banking system, too much Reliance on brokers, bonding between high level investors and officials. etc. Manjari explained how the stock market changed after these two scams, interns of working time, abolishing of Badla etc.

Gaurav Dawar and Swati Goya conducted research on " Impact of corporate scams on Share price: A study of Indian Stock market" in 2013. This paper studied the impact of the corporate scams on the share prices of the companies. In the pre-fraud period, the typical fraudulent firm has a higher valuation, invests more and exhibits higher sensitivity of investment than industry peers. The fraud period, by contrast, is characterized by signs of drops in valuation and investment. Corporate scandals around the world in recent years, especially the Satyam scandal in India, created a need to produce quantitative measures on ownership and to estimate their impact on the value and decision-making process of companies. The study of 8 companies which have undergone the scam in the past 8 years & their impact on the Indian Stock Market. Event study has been used to examine the impact of corporate scams on stock returns. The AABRs and CAARRs of Overall samples are insignificant at 5% level of significance. The research design used for this study is empirical in nature which includes both descriptive and exploratory. Now the study is empirical in nature because the data is derived by means of direct observation or experiment, and it will be used in the research to answer a question or test a hypothesis. It has been designed in this study to determine the direction and the magnitude of the effect of the particular information on the stock prices. Convenience sampling technique is chosen for this research work because of the availability of the data. The sample size for the research is 8 companies which have undergone financial scams in the Indian stock market in the past 8 years (2001-2009). The secondary data has been collected from various websites such as NSE, books, journals, newspapers & magazines etc. The date of the financial scam has been collected from NSE. The main objective is to investigate the validity of the effect of scam on the share price of the company. This leads to the hypothesis: There is no positive signalling in Share price

behaviour around the financial scams. As the market is assumed to be efficient, the expectation is that stock prices should reflect the level of share price of the company, given that an abnormal return is evident upon the announcement. This leads to the second hypothesis: Stock is positive signalling in Share price behaviour around the financial scams. Event study has been used because of its relative ease of use and the wide accessibility of stock. The study concluded that the market is very efficient at absorbing all the information regarding the event.

Dr. M Sree Rama Devi (2016) presents a paper on the topic " Fraudulent Financial Practices - A Case Study of Vijay Mallya ". The Objective of the paper is to understand fraudulent practices in business and study the case of Vijay Mallya scam and to analyse reasons for the default. The paper mostly relies on descriptive methodology based on secondary data from newspapers, journals and websites. He has cited reasons for the failure of Kingfisher airlines such as increased crude prices, acquisition of Deccan, crisis in the aviation industry etc. In this study she found that Banks NPAs are increasing leading to Poor performance of banks. Failure of Banking System and regulatory mechanism will give negative signs to the common investor. Suggestions given by the researcher are strengthening of corporate government structure, establishing controlling measures to deter fraud, formation of strong regulatory and anti-fraud collaborations.

Gangineni Dhanaiah and Dr. R. Siva Ram Prasad (2016) investigated on the topic "Frauds in Indian Capital Market: A Study". The purpose of the study was to explain different forms of financial market Frauds in India, to examine the role of SEBI in protecting market integrity. The Methodology used for the study was content analysis. They listed out and categorised scams related to primary and secondary market into 12 categories. They tabulated the operational mechanism of scams and regulatory actions of SEBI. Trends in investigation and status of the court cases in which SEBI is a party also included in the study. Scams led to regulatory reforms and formation of institutions like SEBI NSE. They concluded with the suggestion that coordination of RBI, SEBI, department of company affairs and department of finance is required to mitigate the scams and violence surveillance system of regulatory authorities have to be strengthened.

Narayanan & Supreena (2004) has investigated the topic " Financial Market Regulation-Security Scams in India with historical evidence and the role of corporate governance". The objective of the paper is to analyse some of the major misdemeanours in

the financial system during 1991 and 2001 in India, to understand the financial regulatory measures adopted after the 1991 share scam in India and why despite such measures adopted security scam has occurred in 2001. From his studies he found that these scams attributed to a failure of corporate governance in finance and that of financial regulation. Other causes pointed out are poor legal systems, corruption and bankruptcy.

CHAPTER 3

THEORETICAL FRAMEWORK

3.THEORETICAL FRAMEWORK

3.1 Fraud

The Standard on Auditing (SA) 240 “The Auditor’s Responsibilities Relating to Fraud in an Audit of Financial Statements” defines the term ‘fraud’ as-“an intentional act by one or more individuals among management, those charged with governance, employees, or third parties, involving the use of deception to obtain an unjust or illegal advantage”.

Two types of intentional misstatements are relevant to the auditor–

1. misstatements resulting from fraudulent financial reporting and
2. misstatements resulting from misappropriation of assets.

3.1.1 Characteristics of fraud

- Fraud is Intentional: Misstatements in the financial statements can arise from either fraud or error. The distinguishing factor between fraud and error is whether the underlying action that results in the misstatement of the financial statements is intentional or unintentional.
- Fraud is a broad legal concept: The auditor is concerned with fraud that causes a material misstatement in the financial statements.

3.1.2 Types of frauds

1. Fraudulent Financial Statements
2. Employee Fraud
3. Vendor Fraud
4. Customer Fraud
5. Investment Scams
6. Bankruptcy Frauds
7. Miscellaneous

3.1.3 Fraudulent financial statement Frauds in India

- Satyam scam
- Harshad Mehta scam

- Mudra scam

3.1.4 Bankruptcy scams

- PNB scam
- ABG shipyard scam
- Kingfisher airlines scam

3.1.5 Miscellaneous

- Ketan parekh scam
- Saradha scam
- Sahara scam

3.2 Major Scams-Case study

3.2.1 SATYAM SCAM: A Case Study of India's own Enron

Ramalinga Raju

Byrraju Ramalinga Raju was born on 16th September 1954 in Andhra Pradesh. He earned a bachelor of commerce degree from Andhra Loyola College at Vijayawada and an MBA from Ohio University. He was involved in a variety of businesses including hotels, cotton spinning Mills...etc. On the failure of the same he moved into real estate and started a construction company named Maytas Infra Ltd.

Satyam computers Ltd

Satyam Computers Services Ltd was an Indian information technology services company in Hyderabad by Ramalinga Raju and his brother in law DVS Raju in 1987 which offers software development, system maintenance, packaged software integration and engineering design services.

- It was initially started with 20 employees which eventually increased to 52000 employees across the world.
- It has become one of India's five top IT companies.

- The initial success of the company soon led to it getting listed and opting for an IPO in the BSE in 1991 which was oversubscribed by 17 times.
- In 1993 it has become the first Indian IT company to be listed in the new york stock exchange and in three international stock exchanges,also it expanded its footprints to 30 countries.
- In 2000 Satyam was awarded the Dataquest man of the year award. It was the first IT company in the world certified under ISO 9001.
- Satyam also bagged the Asia business leader award in 2002.
- In 2006 its revenue crossed 1 billion dollars, eventually the veil of Satyam computers' super-fast growth was lifted.
- In 2009 Ramalinga Raju revealed misstatements in financial statements.
- Analysts pronounced the scam as India's own Enron.

How scam happened

They manipulated financial statements and attracted investors. By selling shares, an amount has been raised and invested in the real estate business. Raju has misled various investors and used fake invoices and accounts to trade in Satyam's shares and he has violated insider trading norms. Satyam's books were cooked by overstating its revenues, profit margins, and profits for over a period of 5 years from 2003 to 2008. There were off-balance-sheet transactions involved. The books of accounts portrayed it to be a far bigger company than it actually was. They sewed up projects with fictitious clients and had fake and non-existent teams working on these projects. Over 7561 fake invoices were added to the company's computer systems to record sales that did not exist. They projected fake bank statements which held more money than actual one. 10 imaginary fixed deposits which were supposed to grow from 3.35 crores in 1998-99 to a massive Rs. 3320.19 crore in 2007-08 are all fake.

Funds from Satyam were diverted to Maytas. allegedly withdrawing 20 crore rupees every month for paying 13000 non-existent employees. On being questioned by the criminal investigation department of Andhra Pradesh police he reportedly admitted to using Satyam money for buying prime land in and around Hyderabad.

Ramalinga Raju overextended himself in buying properties which required more money. Manipulated accounts have invited the company to grow in its worth which actually attracted

investors. These funds were diverted to his construction company Maytas to buy properties. The 2008 recession caused real estate prices to fall.

Technical support for fraud

Developed an ERP system for accounting purposes which had many loopholes. It's a system that runs on a central single collection of data. Usually it helps to keep things streamlined rather than using multiple books of numbers and information that could lead to multiple places of human error. Also the software usually only tracks data that the users input. It's pretty easy to leave things out because software would not know that they're missing it. Since all the data was held in one database, the data could so easily be manipulated at the same time.

How auditor behaved

PriceWaterhouseCoopers who were the auditors of Satyam Computers who was supposed to verify all of these documents didn't do a good job. Around 7561 fake bills were created and auditors didn't spot them for almost 8 years. Physical verification wasn't done either. All of the red flags went undetected by the external auditors from PwC.

Causes of fraud

1. Raju wanted to take over Maytas infra and Maytas properties.
2. He was blamed that he was using the funds of the investors for family business.
3. World Bank has banned the Satyam to take any service for 8years due to illegal profit and lack of essential documents

3.2.2 PNB scam

Neerav modi

Neerav modi was born in Gujarat on 27th February 1971. He was born into a family of jewellers and grew up in Belgium. He moved to India and started working with his uncle Mehul Choksi, owner of Gitanjali gems another co-accused in the scam. In between he attended the Wharton school at the University of Pennsylvania but eventually dropped out. From 1998-99 he stayed with his uncle and studied everything about diamond business. He

was the first Indian jeweller to be featured on the covers of Christie's and Sotheby's catalogues. He was also featured on Forbes list of Indian billionaires. In 2014 Nirav modi the brand was born with its first store opening in New Delhi.

Firestar diamond international

In 1999 Neerav Modi eventually started his own diamond firm Firestar. In 2010, He became the first Indian jeweller to be featured on the cover of the auction catalogue of Christie's. This golconda diamond necklace was sold for 3.56 million dollars. In 2015 he opened a store on Madison Avenue in New York followed by stores in Hong Kong, London, Macau, Beijing and Singapore. Soon he and his designs were being talked about in the elite circles. They were even worn by Priyanka Chopra, Sonam Kapoor, Anushka Sharma and Kate Winslet. He became a premier luxury brand. According to the 2017 Forbes list his net worth was around 1.8 billion dollars. But his big dream to have 100 boutique retail stores worldwide by 2025 seems to have been cut short following the allegations of one of India's biggest banking scams.

Punjab National Bank

Punjab National Bank (PNB) is an Indian nationalized bank, headquartered at New Delhi, India. It is under the ownership of the Ministry of Finance, government of India. It was registered on 19 May 1894 under the Indian Companies Act. It is the second largest government-owned bank in India, both in terms of its business volumes and its network. Punjab National Bank is India's first Swadeshi Bank which started its operations on April 12, 1895 from Lahore, with an authorized capital of Rs 2 lac and working capital of Rs 20,000. The Bank was established by the spirit of nationalism and was the first bank purely managed by Indians with Indian Capital. During the long history of the Bank, 9 banks have been merged with PNB. The bank has over 180 million customers and 12,248 branches. Punjab National Bank is a PSU working under the government of India regulated by the Reserve Bank of India Act, 1934 and the Banking Regulation Act, 1949. The bank opened for business on 12 April 1895 in Lahore. In 1900, it established its first branch outside Lahore in India followed by Branches in Karachi and Peshawar.

How the scam happened

Neerav Modi is an importer of diamonds. Importers prefer to take loans in foreign currencies as interest rates are lower. In January 2018, some officials of Nirav Modi's company approached the Brady House branch of Punjab National Bank for availing Buyer's Credit.

Buyer's Credit refers to a short term loan that is taken from an overseas bank and guaranteed by PNB. To do this PNB had to issue a Letter of Undertaking (LoU) to an overseas bank. Most of these overseas banks are Indian banks with foreign branches. The assurance is directly between the overseas bank and home bank(PNB).

Letter of Undertaking is a bank guarantee which allows someone to borrow money from another bank's foreign branch. In case the customer of the bank is unable to pay it back to the foreign branch the bank which issues the LoU is liable to pay it back. So if he defaulted on any payment to a foreign branch it was PNB's liability. The foreign bank gives loan on the basis of LoU and not on the basis of credit worthiness of the customer.

Usually while giving an LoU the bank would ask for a cash margin, an amount deposited with the bank by the borrower. When the bank asked for a 100 % cash margin, the officials of Nirav Modi's firm claimed that they had in past been allowed credit without any margin. The major role in this scam is played by a document called LoU. Without following the norms, he was availing LoU's from 2011. Some of the officials were alleged to be involved in this scheme.

SWIFT is a messaging network for banks and financial institutions all over the world. When an LoU was issued, a message was sent through SWIFT.

PNB'S CBS which is their core banking system was not synced with SWIFT. The colluding officials of the bank would send information on SWIFT to the overseas branches about the LoUs. But they didn't record these entries on CBS. So the fraud carried on for many years.

An account created by PNB is called a "**Nostro**" account that a bank holds in another bank overseas in a foreign currency. It is an account to which an overseas bank lends the loan. On the basis of LoU, the foreign branch would remit the funds to the Nostro account of the Indian bank. In this case, Axis bank, Allahabad bank, UCO bank were some of the foreign banks that provided funds to PNB'S Nostro account. At that time, LoU 's for gems and

jewellery had a validity of 90 days. In this case, the LoU's were rolled over. There were more than 1200 LoUs that he used on PNB'S name for getting money from foreign branches. The fact that the fraud was not discovered indicates that the audit processes were not thorough enough. He also used his shell companies to execute repeated transactions of the same item within the companies to generate invoices for LoU's. The initial assessment of the fraud made by PNB valued it at around 280 Crore, but it was later valued at more than 11000 crores.

Effects

The stores have been closed, people have lost their jobs. ED has been attaching his properties, valuables and other assets to recover the due amount. Even auctioning off his personal collectibles. Though the recovery was not full, the government, who is the biggest stakeholder in PNB, had to bail it out using taxpayer's money. Also, RBI started to follow strict guidelines ordering linking of SWIFT with CBS for banks and stopped issuing LoUs for trade credit for importers into India. A few days before the scam was unveiled, Nirav Modi, Mehul Choksy left India in early January 2018. Later he was then arrested after India interviewed and has since been in jail in London.

3.2.3 ABG SHIPYARD SCAM

ABG SHIPYARD

ABG Shipyard Limited operates as a private sector ship building company. The company was incorporated on 15 March 1985 and has since been one of the big players in India's shipbuilding and repair business. Their shipyards are located in Dahej and Surat in Gujarat. The company is known for creating newsprint carriers, self-discharging and loading bulk cement carriers, floating cranes, interceptor boats, dynamic positioning diving support vessels, pusher tugs and flotilla for leading companies in India and abroad. The firm has constructed over 165 vessels in the last 16 years. It has gained accreditation and approval from international classification companies like Lloyds, American Bureau of Shipping, Bureau Veritas, IRS, DNV. ABG also enjoyed the golden run of the early 2000s. After 1991, the company's business grew very fast. It started getting huge orders from India and abroad. This leads to an increase in profit of the company.

Rishi Agarwal

Rishi Agarwal is a first generation entrepreneur and the Founder & Chairman of ABG Group. He is extremely passionate about ships and shipbuilding. Under Rishi Agarwal's leadership, ABG Shipyard has started the business of shipbuilding and repairs with a modest beginning by acquiring Magdala Shipyard Pvt. Ltd. He has completed his MBA from Purdue University. In 2016-17, his revenues were ₹ 16.40 crore, whereas his debt was ₹ 10,000 crore. He is booked by the CBI for felony conspiracy, dishonesty, felony breach of belief, and abuse of official place below the IPC and the Prevention of Corruption Act.

How scam happened

Rishi Agarwal of ABG Shipyard is accused of misappropriating Rs 22,842 crore in loans from a consortium of 28 Indian banks. Following the 2008 financial crisis, the quantity of orders received by the firm dropped dramatically, resulting in an increase in inventory. It was because they didn't have enough money to run their business. As a result, loans were required. The corporation began acquiring large debts and transferring them to linked parties between 2005 and 2010. The money was moved here by other firms in the same group. ABG Shipyard, which was in financial trouble and had to take out loans, decided to invest in another firm in their own group. They made a Rs 300 crore investment in ABG. They also loaned a large sum of money to ABG Singapore. They were continually transferring funds to their group's other businesses. ABG Shipyard will first move part of its funds to a subsidiary business. The latter business repaid a portion of those cash, while the remainder was transferred to the third company. The monies are subsequently transferred to the fourth firm. The monies were cycled in this manner. This approach is known as **ROUND TRIPPING** in the financial world. Money is cycled in island nations in situations of round tripping in order to avoid paying taxes or conduct fraud. The names of the companies' owners and other information are not given.

In the instance of ABG, the consortium was led by a private bank, with a total of 28 banks participating in the debt disposal led by ICICI Bank. ICICI Bank owes Rs 7089 crore to ABG

Shipyards, SBI owes Rs 2925 crore to SBI, IDBI Bank owes Rs 3,639 crore to IDBI Bank, Bank of Baroda owes Rs 1,614 crore to Bank of Baroda, and Exim Bank of India owes Rs 1,327 crore to Exim Bank of India.

Between 2012 and 2017, this money was loaned. Banks were eager to lend millions of crores of rupees despite the fact that they couldn't afford to pay the interest. The majority of these loans were secured by the company's assets, with the remainder secured by the promoters' guarantees.

The company's total current assets and liabilities in 2012 were Rs 5540 crores and Rs 5695 crores, respectively. It possessed assets worth Rs 5540 crores that might be liquidated within a year to pay off the debts. However, the number of current assets included a large inventory of ships, which totaled Rs 3260 crores. Due to the low number of purchasers for these ships, current assets excluding inventory was Rs 2280 crores, while liabilities totaled Rs 5695 crores. Despite these numbers, they were able to get large bank loans. This is because the Indian navy and the shipping firm had given them orders.

ABG was profitable until 2012, when it began to lose money. It went from a loss of 199 crores in 2013 to a loss of 897 crores in 2014-2015. It had a net loss of 3704 crores by March 2016. From 401 crores to 37 crores, revenue had plummeted. The firm began defaulting on debts in 2013. When SBI officials noticed the company's transactions, they began to have doubts. In 2014, debt restructuring took place, with interest rates being lowered and loan terms being extended to make recovery easier. However, it failed, and in July 2016, the account was categorised as a non-performing asset. The scam was discovered when Ernst & Young, who had been hired as a forensic auditor by all of these institutions, discovered it.

The financial recession of 2007-08 apparently took a toll on the corporation, and by 2012, its coffers had been depleted. As a result of the catastrophe, the corporation had to take out large loans from multiple banks. This money, however, was routed to its foreign companies, and money was even transmitted to various offshore parties. A network of transactions conducted by the shipping company is at the heart of the scheme. The funds borrowed by ABG Shipyards were used to repay loans, pay for ABG Group of Companies expenditures, and write letters of credit. This money was used to acquire properties that were tied to cash granted by ABG Shipyards, which diverted loans from these institutions. The funds were also used to invest in overseas subsidiaries, purchase assets from associated corporations, and transfer funds to

related parties. In addition, the shipbuilding firm, which became a non-performing asset (NPA) in 2013, broke the provisions of the Corporate Debt Restructuring Agreement (CDR). CDR is a process through which the lending banks either lower the interest rates on the troubled borrower's loans or extend the payback period. Rishi Kamlesh, the former chairman and managing director of ABC Shipyard, and others have been charged with defrauding a group of 28 institutions, including the SBI, ICICI Bank, Bank of Baroda, and the Central Bank of India.

3.2.4 Ketan parekh scam

Ketan Parekh is a former Mumbai stockbroker who was found guilty in 2008 for his role in the Indian stock market manipulation scheme that took place between late 1998 and 2001. Ketan Parekh bought huge holdings in lesser-known small-cap firms and jacked up their values through collaboration with these companies and large institutional investors, as well as through circular trading with other traders. As a result, stock values skyrocketed. This group of ten equities was dubbed "K-10" stocks, while Parekh was dubbed "Pentafour." After the Harshad Mehta scam, the Ketan Parekh scam was the second most major to hit the Bombay stock exchange. It was later discovered that entrepreneurs and manufacturers frequently provided Parekh cash in order to artificially inflate the value of their stock. In Mumbai, a bear cartel of brokers opposed to Parekh attempted to sell their K-10 stock. Panicked, Parekh sold his entire holdings in the so-called K-10 equities he had successfully accumulated over the previous two years, particularly those of two entities: GTB bank and MNCB bank. He dumped a big amount of stock at the Calcutta Stock Exchange in the evening, after regular trading hours, from 5pm until midnight. The next day, the stock market crashed, causing large-scale losses for huge institutional investors such as insurance firms and mutual funds.

3.2.5 Harshad mehta scam

Harshad Shantilal Mehta, the perpetrator who drove the stock market to its knees, is commonly mentioned in connection with the 1992 stock market hoax. The scandal involved an embezzlement of Rs 1439 crores, causing a serious cash shortage and a dramatic loss of wealth in many investors' life savings of Rs 3542 crores. Harshad Mehta is also being presented as a victim as a result of purported political affiliations with high-ranking government officials. After a string of odd occupations, Mehta earned the nickname "Big Bull" for his booming success with his Grow More Research and Asset Management

organisation. He possessed shares in Associated Cement Company (ACC), which had gone from a low of Rs. 200 to a high of Rs. 9,000 in an incomprehensible price increase. Mehta explained his investment decisions by claiming that the stock had been cheap all along. As a result, a market wave of investors flocked to his picks. The market's implosion was caused by the bandwagon, as well as the dysfunctional financial structure that was beginning to take root in the country where Mehta saw his opportunity. The fact that Mehta was heavily involved in market manipulation and exploiting banking loopholes is one of the main justifications for his criminal charges.

3.2.6 Kingfisher airlines scam

Vijay Mallya is a former member of the Indian Parliament and a businessman from India. He launched the Kingfisher Airlines (KFA) airline in 2005 which was luxurious .. KFA was an airline group based in India with its headquarters in Mumbai, India. To expand KFA at a global level, he bought Air Deccan, which was known for its low-cost airline service in India in order to get a minimum requirement of five-year experience in domestic service. about KFA and Air Deccan, one was the most luxurious, the other was the cheapest. The market stake of KFA started declining, and the operating cost began turning into debts. Consequently, Vijay Mallya started experiencing a great deal of loss in his airline business. He decided to contact foreign companies for their investment in his business. It was not allowed in India to have a Foreign Direct Investment (FDI) in the airlines sector. The airline industry was 100% domestically owned during that time. He could not pay the salaries to his airline employees due to his downfall. He ended up taking a loan from seventeen different banks, out of which the majority were PSU banks. The reason behind the PSU banks giving loans to Vijay Mallya, despite his dooming business and low credibility, was because he was a member of Rajya Sabha And had good political connections. It resulted in bank officials getting involved in the landmark kingfisher scam. The banks were pressured by the government officials to grant him the loan. Due to this reason, SBI Bangalore granted a loan of about Rs. 1,600 crores to him.it was exposed that P. Chidambaram, the then Finance Minister of India, helped him in getting the loans. Hence, SBI did a meeting, loosened their policies and granted him NOC under pressure. After getting into negotiation with banks on 2nd March 2016, Vijay Mallya asserted that he is ready to pay Rs. 6,000 crores, which was just the principal amount. He demanded to waive off all interest charges The bank's desired complete debt repayment. Meanwhile, he fled India and resided in the United Kingdom. He is

now on India's 'Wanted List' for deliberate default, but he cannot be brought before the court since he is staying in a foreign nation.

CHAPTER 4

DATA ANALYSIS

4. DATA ANALYSIS AND INTERPRETATION

To grasp the problem and reach a conclusion, data must be analysed and interpreted. The data is transformed into research information through data analysis. The conclusion drawn from the data is known as data interpretation.

Satyam scam

Table 4.1

FABRICATED FINANCIAL STATEMENT			
Items RS in crores	Actual	Reported	Difference
Cash and bank balances	321	5361	5040
accrued interest on bank fixed deposits	Nil	376.5	376.5
Understated liability	1230	Nil	1230
Overstated debtors	2161	2651	490
Total	Nil	Nil	7136
Revenues	2112	2700	588
Operating profit	61	649	588

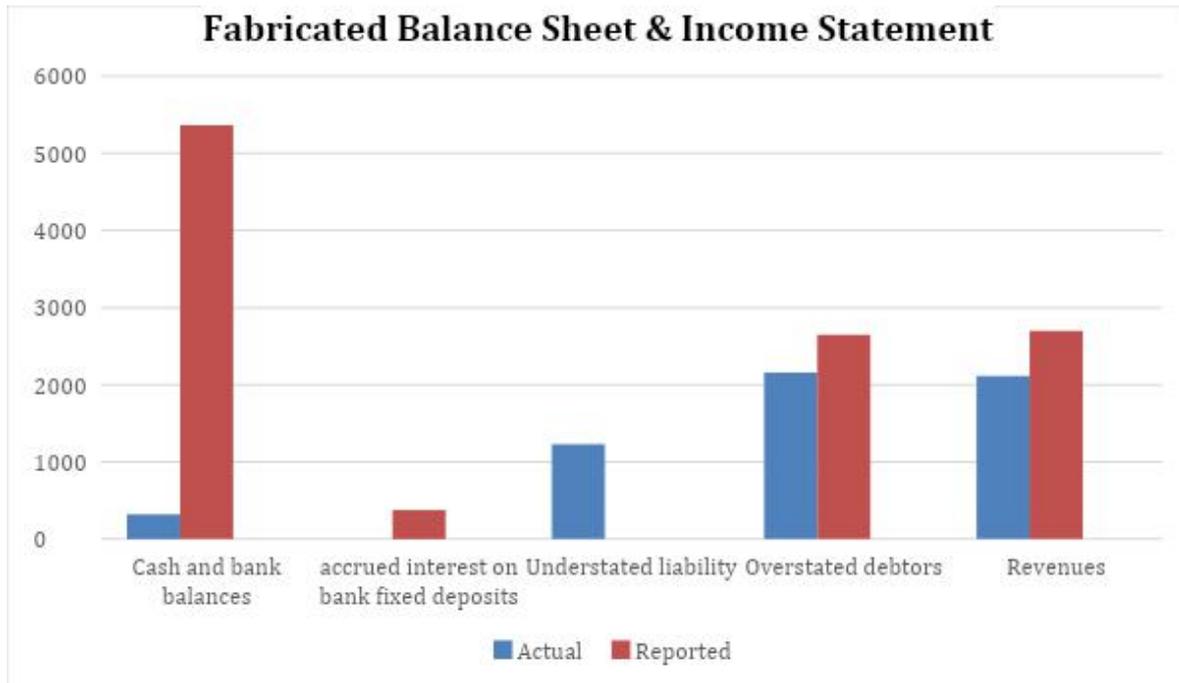


Figure 4.1

Interpretation

- Actual cash balance of satyam computers were 321 crores whereas reported amount was 5361 crores which is almost 17 times.
- Accrued interest which is reported as 376.5 crore was fake since there weren't any fixed deposits.
- Satyam reported that it doesn't have any outstanding liabilities on the contrary it had outstanding liabilities of 1230 crores.
- The genuine indebted individuals were less by 490 crore than reported indebted individuals.
- Reported revenue was 2700 crore, in contrast actual revenue was 2112 crore.
- Operating profit reported was almost 10 times of actual operating profit

Table 4.2

Shareholding pattern in Satyam computers from 2001 to 2008									
As on	2001	2002	2003	2004	2005	2006	2007	2008	December 2008
Promoters holding in %	25.6	22.26	20.74	17.35	15.67	14.02	8.79	8.74	2.18

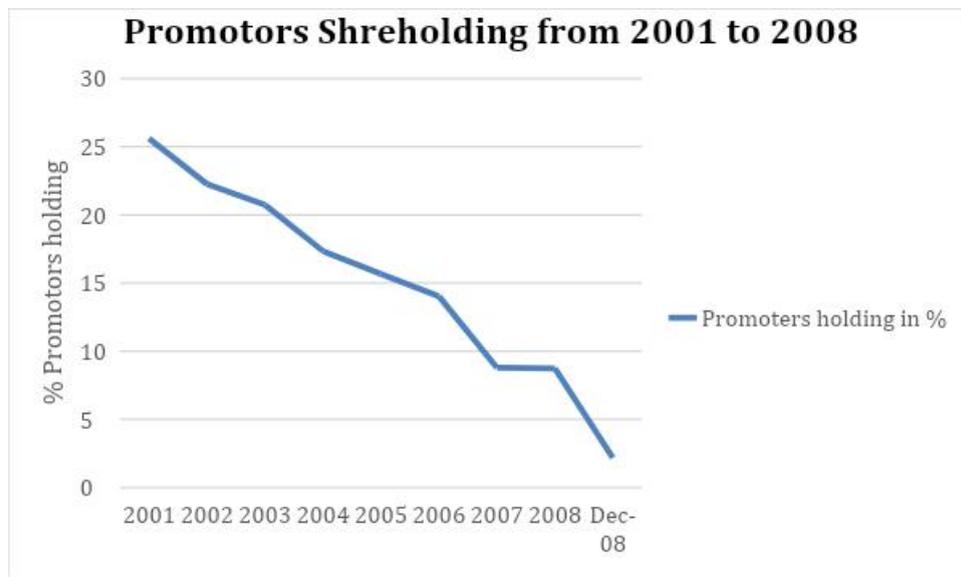


Figure 4.2

*Scam occurred in 2008, therefore percentage of shareholding in the beginning and end is given.

Interpretation

- Initially promoters holding was almost a quarter of the total holding in 2001.
- In 2002 promoter shareholding was reduced to 22.26%.
- In 2003 it had fallen by 1.52%.
- In 2004 it again fallen to 17.35%.
- In 2005 and 2006 it had reduced slightly
- In 2007 promoters sold 5.41% of their holdings.
- Promoter shareholding has decreased continuously over the period of time. It had fallen from 25% to 2.18% from 2001 to 2008.

Table 4.3

Satyam's total income and audit fees (Rupees in Millions)				
Year	2004-05	2005-06	2006-07	2007-08
Total income	35468	50122.2	64100.8	83944.8
Audit fees	6.537	11.5	36.7	37.3
% of audit fees to total income	0.0184	0.0229	0.0573	0.0444

Table 4.4

IMPACT ON SHARE PRICE		
Date	January 2008	January 2009
Share price	544	6.5

Interpretation

- Auditor of Satyam computers services Ltd that's PWC was paid 0.0184% of the total revenue in 2004-05.
- In 2005-06 it increased to 0.0229%.
- In 2006-07 audit fees increased to 0.5773%.
- In 2007-08 it was 0.0444%.
- During January 2008 Satyam's share price was 544 Rs which fell sharply to 6.5 Rs.

PNB SCAM

Table 4.5

Net profit and EPS of PNB from 2011 to 2021		
Date	Net Profit (Rupees in Crores)	EPS
March 2011	4434	27.99
March 2012	4884	28.8
March 2013	4748	26.86
March 2014	3343	18.46
March 2015	3062	16.51
March 2016	-3974	-20.24
March 2017	1325	6.23
March 2018	-12283	-44.49
March 2019	-9975	-21.67
March 2020	336	0.5
March 2021	2022	1.93

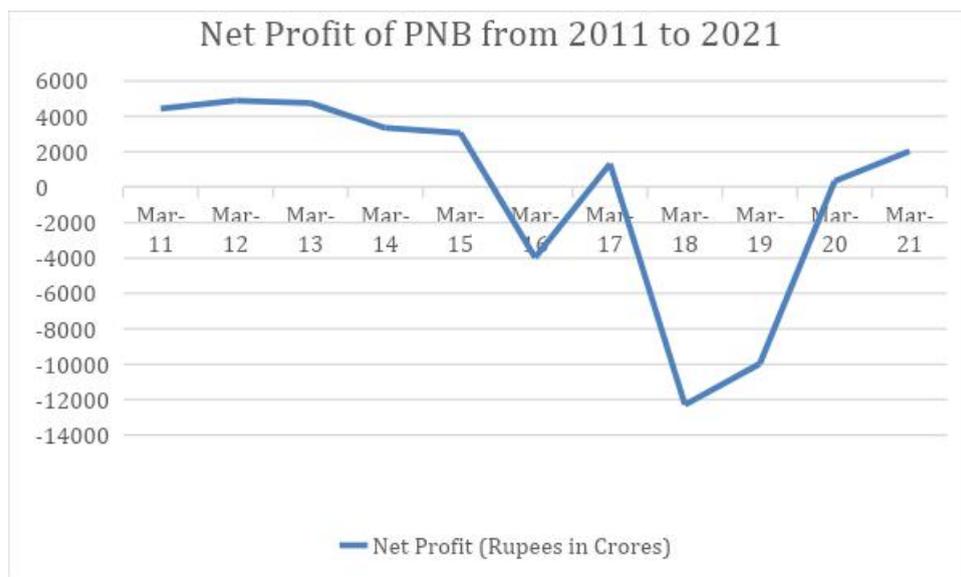


Figure 4.3

Interpretation

- In March 2011 PNB had profits of 4434 crores.
- It has increased to 4884 crores in March 2012.
- In March 2013 it increased to 4748 crores.
- In March 2014 and in March 2015 were 3343 crores and 3062 crores respectively.
- It has marked a loss of 3974 crores in March 2016.
- In March 2017 it had a profit of 1325 crores.
- In 2018, it recorded a huge loss of 12283 crores.
- Loss has decreased by 2308 crores in 2019.
- Eps has decreased from 27.99 to 0.5 from 2011 to 2020.
- Eps in 2018 was -44.49 Rs

ROE OF PNB FROM 2011 TO 2020

Table 4.6

Date	Mar 2011	Mar 2012	Mar 2013	Mar 2014	Mar 2015	Mar 2016	Mar 2017	Mar 2018	Mar 2019	Mar 2020
ROE %	23%	20%	16%	10%	8%	-10%	3%	-30%	-23%	1%

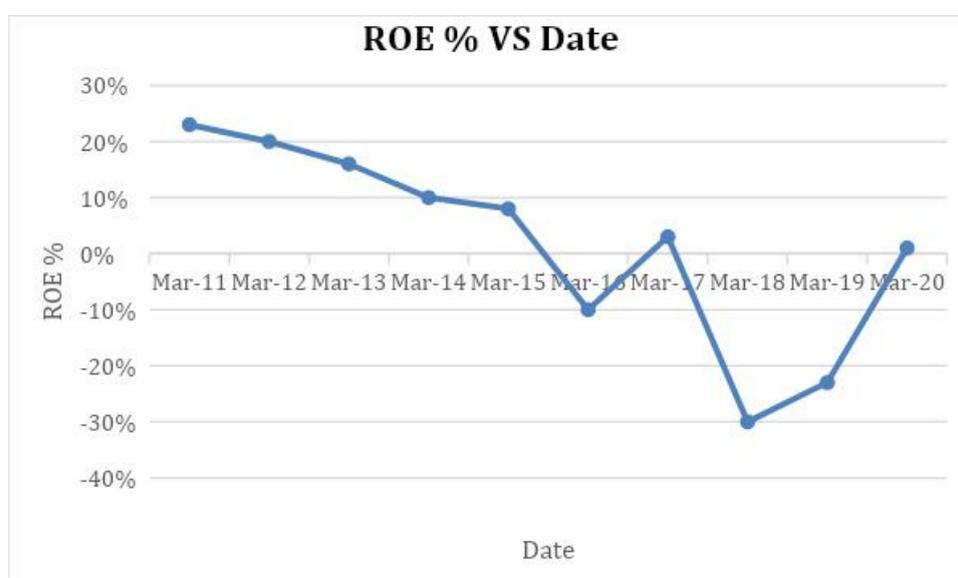


Figure 4.4

Interpretations

- Return on equity was 23% in 2011 and it has decreased to 20% in 2012.
- ROE has declined by 4% in 2013.
- It again fell to 10% in 2014.
- It was marked as 8% in 2015.
- In 2016 ROE became negative 10%.
- ROE was 3% in 2017.
- In March 2018 ROE was -30%
- In March 2019 continued to be negative.that is 23%.

AMONT OWE TO BANKS BY ABG SHIPYARD LTD

TABLE 4.7

BANKS	AMOUNT (Rupees in Crores)
ICICI BANK	7089
BANK OF BARODA	1614
PUNJAB NATIONAL BANK	1244
IDBI BANK	3634
IOB BANK	1228

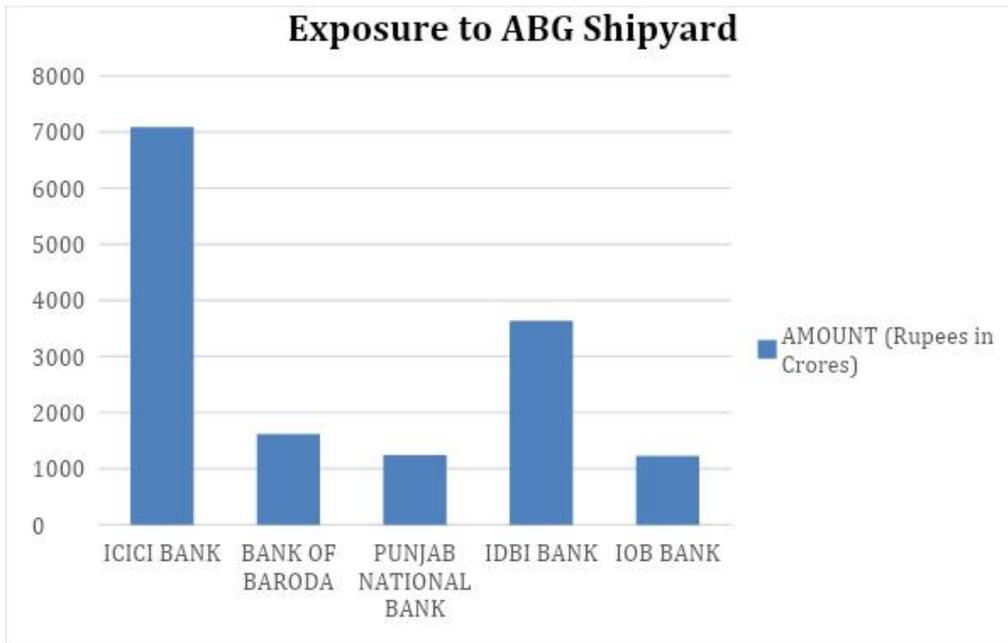


Figure 4.5

Interpretation

- ABG had to pay 7089 crores to ICICI Bank
- Whereas ABG owes 1614 crores to Bank of Baroda.
- Punjab National Bank has given an amount of 1244 crores to ABG Ltd
- IDBI and Indian Overseas Bank have to recover 3634 crores and 1228 crores respectively from ABG shipyard.
- The company owes a total of Rs 22,842 crore. Out of this amount, it owes ICICI (which was leading the consortium) Rs 7,089 crore, SBI Rs 2,925 crore, IDBI Bank Rs 3,639 crore, Bank of Baroda Rs 1,614 crore, Punjab National Bank Rs 1,244 crore, Exim Bank Rs 1,327, Indian Overseas Bank Rs 1,244 crore, and Bank of India Rs 719 crore.

Table 4.8

YEAR	2013	2014-15	2016
LOSSES	199	897	3704

LOSSES vs. YEAR

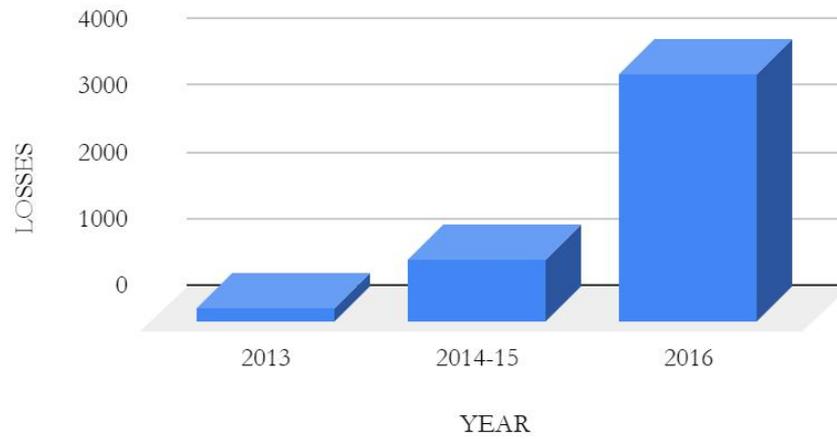


Figure 4.6

Interpretation

- ABG Shipyard incurred a loss of 199 crore in 2013.
- During the period of 2014-15 the loss has increased to 897 crores.
- In 2016 it had a massive loss of 3704 crores.

Number of bank fraud cases across India between from financial year

Table 4.9

Year	No. of frauds
2009	4372
2010	4669
2011	4534
2012	4093
2013	4235
2014	4306
2015	4639
2016	4693
2017	5076

2018	5916
2019	6800
2020	8700
2021	7400

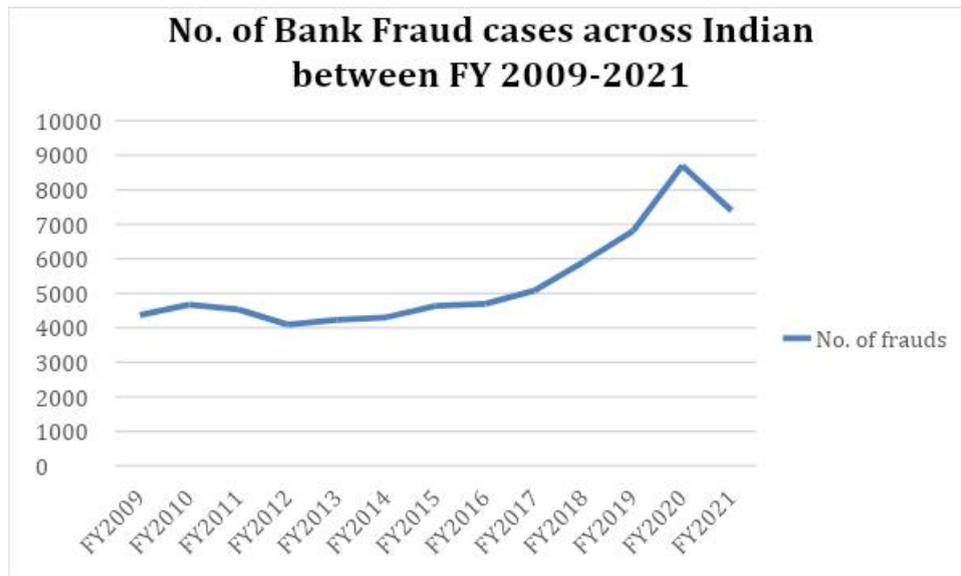


Figure 4.7

Interpretation

- Over the years bank fraud has been constantly increasing over the years from 2009 to 2021.
- In 2020 it had increased to 8700.
- From 2009 to 2021 bank frauds doubled almost.

CHAPTER 5

SUMMARY, FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

5. SUMMARY, FINDINGS, RECOMMENDATIONS AND CONCLUSIONS

5.1 FINDINGS

Satyam scam in effect was an accounting scandal. The lessons that we could understand from this detailed case study can be summarised.

1. Corporate governance was a complete mess in case of satyam scam. Siphoning off public monies from the Company by falsifying data and accounting in collusion with external auditors is not only weak governance, but also dishonest governance.
2. Satyam not only affected its own existence but also defamed the IT industry. Indian IT companies started to lose their international clients. Thousands of employees lost their jobs and the Indian IT sector has lost charm and its reputation.
3. NFRA was set up to have a control on auditors because the errors in Satyam's financial statements were certainly not small, rounding-off errors and they had been a part of the published financial statements for five to eight years. Yet both Satyam's internal as well as statutory auditors didn't bring it to anyone's notice.
4. The shares fell to Rs 11.5 compared to heights of Rs 544 in 2008, causing losses of Rs 5,000 crore to almost 300,000 investors.
5. The news of the Satyam scam sent Indian equity markets into a tail-spin, with Bombay's main benchmark index tumbling 7.3% and the Indian rupee fell.
6. There were various factors which contributed to the fraud, some of these factors were; deceptive reporting practices, lack of transparency, excessive interest in stock prices, lack of proper accounting rules, weak independent directors, inefficient audit committee.
7. Satyam's case exposed weaknesses in our regulatory system and lack of adequate investor protection. systems and processes should be strengthened. The Satyam case provided a wake-up call that helped strengthen accounting and regulatory practices.
8. Independent directors are independent on paper only. They are picked up only if they are close to the promoter or family circle.

9. The government too is equally guilty in not having managed to save the shareholders, the employees and some clients of the company from losing heavily

Punjab National Bank scam involved sophisticated and carefully organized scheme designed to defraud bankers. It was dubbed as biggest fraud in India's banking history, in which Nirav Modi and his relatives escaped India in early 2018, days before the news of the scam became public.

1. the PNB failed to monitor transactions involving LoUs from the very beginning. The fraud began in 2011. The bank kept honouring the instrument all these years till the scam came out in public in February 2018.
2. PNB could have stopped the fraud in 24 hours if it had followed the checks and controls in place.
3. The RBI committed another blunder by terminating LoUs altogether without giving much thought about the larger impact on the country's importers and exporters.
4. RBI doesn't have strong regulatory control over PSBs, as it does with private banks. There are seven areas or instances where the RBI cannot initiate actions on state-run banks, which control 70 percent of the assets of the banking industry including provisions such as inability of the RBI to remove directors and management at PSBs.
5. The first notable realization was that banks urgently needed to better manage their operational risks, essentially in the realm of credit, market and operation risks.
6. Full integration and reconciliation of SWIFT transactions with the core banking solution software was not done nor sought. Audit reports did not find it a grave potential risk zone.
7. Rotation of employees every three years - a standard practice in banks and elsewhere - was not done. One particular bank officer, who is an accused, stayed posted on the same desk in the same department for seven years.
8. Every probationary officer of the bank is asked during the orientation and training programmes that sharing of passwords is prohibited even with the colleagues. In the 2016 advisory, the RBI had warned that unauthorized

sharing user IDs and passwords might put SWIFT transactions at risk. In the PNB fraud case, one employee used two or at times three officers' passwords.

9. The maker-verifier-approver chain was not followed in issuing the Letter of Undertakings to firms linked with diamond merchants Nirav Modi and Mehul Choksi. LoUs were issued to customers having no sanctioned credit limits. The follow up on these LoUs was not done as many of them were not repaid even after expiry of the prescribed period of 90 days.
10. No communication was recorded for issue of LoUs and end transactions caused by the credit assurances. Inter-bank communication involving the lending overseas branch was not maintained. Reconciliation and confirmation processes were not followed.
11. A lack of regulation, flawed lending policies, and an inefficient fraud monitoring mechanism are among the factors that have frequently led to instances of fraud and a rise in non-performing assets (NPA).

5.2 SUGGESTIONS

- Business transactions continue to move online, so corporations are more susceptible than ever to frauds using technology. Companies should incorporate stricter rules with the same.
- Auditors shall be monitored and regulated more cautiously and auditors must be completely independent in forming opinions.
- Accounting standards shall be introduced to reduce loopholes in accounting practices.
- Stock market booms shall be monitored from time to time and investigate whether the reason for such boom is cooked or real.
- In case of bank frauds, Banks can help change the way we look at them by imposing strict penalties on the conspirators and by not bending the rules to grant political favours.
- The RBI should also issue a firm statement authorising banks to take whatever action they see fit as soon as they discover a fraudulent transaction, rather than having to fill out long paperwork first, by which time the fraudster would have vanished, as in this case.
- The alertness of the employees around people handling sensitive and dangerous portfolios is vital, in addition to their own behaviour. Apart from instituting a

whistle-blower policy, employees should be able to detect any problems and alert management. It's important to remember that maintaining the workplace safe and secure is everyone's duty, even if they aren't aware of it.

- All the banks should review their critical systems and processes including the IT segment regularly. Ethical banking practices should be preferred. Disclosures to RBI, SEBI and other regulators should be made with consistent periodicity.
- Banks should ensure that there are adequate systems and controls in place to identify potential risks and that they are being followed at all relevant branches.
- SWIFT-CBS linking must be made mandatory for all LoUs. Confirmation from lending foreign branches must be done for each of the LoUs.
- All internal and external audits must be completed on time at branch level. The audit reports should be shared with the government's auditors and examined by the RBI, which should conduct a separate audit every year. In the PNB fraud case, the bank has told the finance ministry that the last audit by RBI was done in March 2009.
- Bank employees should be trained in order to improve their skills and raise knowledge about the many types of banking fraud. Within the financial ecosystem, the use of technology to combat fraud should be promoted.
- All banking transactions may be recorded using new technologies such as block chain. According to some analysts, the block chain may have spotted the first in the PNB's series of crimes. When a fraud is discovered, the bank should notify the appropriate agencies and the scam should be investigated quickly.
- There is the need for concerted efforts by authorities to prevent mishandling of public money
- At the time of giving a big corporate loan, banks should insist on an affidavit from the promoter about all the passports he holds. Typically, banks only insist on Indian passports, but as we have seen in all these cases, fraudsters carry multiple passports and later use them to hide from Indian laws
- New loans and extensions arising out of the government's support to businesses, along with the RBI's moratorium, need careful monitoring of companies' creditworthiness and viability of businesses in changing scenarios.
- Forensic accounting and forensic audit shall be given more consideration.

- Providing more powers to the investigators and regulators especially SEBI.

5.3 Conclusion

After satyam scam corporate governance has improved, auditors are governed not only by ICAI but also by NFRA which was set up as a result of satyam scam. After the PNB scam, the government makes Passport details mandatory for loans of Rs 50 crore and above, but we have miles to go to have a fraud free India. There are many loopholes in our accounting systems, IT, legal and political framework etc. Proper regulations and rules must be built to make sure funds are not misappropriating. A scam does not confine to a company but extends to an industry, a nation, and a wide range of public. Hard earned money of investors and the resources of banks are getting plundered by business tycoons. But some frauds happen only due to lack of support from the government and some are rather a business failure like Kingfishers. The Satyam scam was the biggest accounting fraud and PNB scam was a sophisticated banking fraud. About the latest fraud ABG shipyard it was the biggest banking scam where numbers of victims are high. Even after the PNB scam, the ABG scam purely shows the inefficiency of regulators of the banking sector.

In the new era of business, the happening of frauds has become a day to day problem irrespective of nature, size and amount involved. It is thought that strict and concentrated action is required. Though a crime-free society is a pipe dream, we should make concerted efforts.

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WOMEN AND HYSTERIA: TRACING FEMALE ILLNESS IN LITERATURE



Project submitted to St. Teresa's College (Autonomous) in partial fulfilment

of the requirement for the degree of BACHELOR OF ARTS in

English Language and Literature

By

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DECLARATION

I hereby declare that this project entitled “Women and Hysteria: Tracing Female Illness in Literature” is the record of bona fide work done by me under the guidance and supervision of Ms. Vinitha John, Assistant Professor, Department of English.

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CERTIFICATE

I hereby declare that this project entitled “Women and Hysteria: Tracing Female Illness in Literature” by VARADA T P is a record of bona fide work carried out by her under my supervision and guidance.

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An Abstract of the Project entitled
WOMEN AND HYSTERIA: TRACING FEMALE ILLNESS IN LITERATURE

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Patriarchy has always promoted the belief that women are innately inferior to men based on biological differences and has categorized them as emotional, dependent, and susceptible to illness. Cultural norms and values have always constructed and shaped our views of mental illness as feminine. Madness has been considered a female illness for centuries and continues to be gendered. Particularly, nineteenth-century society categorized women as vulnerable to being mentally ill and confined in asylums. This project analyses the stigma of gendering mental illness and focuses on how it is reflected in literature at various points in time. This is examined through the theoretical perspectives of 'Victorian Women and Insanity' by Elaine Showalter and *Women and Madness* by Phyllis Chesler. The study critically engages with the works, *The Yellow Wallpaper* by Charlotte Perkins Gilman, *The Awakening* by Kate Chopin, and *Next to Normal* by Brian Yorkey and Tom Kitt, to trace the association of hysteria as a female illness and the changes that have come about in modern society.

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Varada T P

CONTENTS

	Introduction	1
Chapter 1:	Hysteria as a Female Illness: An Overview	4
Chapter 2:	<i>The Yellow Wallpaper</i> and the Victorian Woman	11
Chapter 3:	<i>The Awakening</i> : Madness as a Social Construction	17
Chapter 4:	<i>Next to Normal</i> : Tracing the Changes	23
	Conclusion	28
	Works Cited	30

Introduction

For a major part of human history, women have been silenced, given only background roles, and their emotions and feelings were considered unimportant. The patriarchy propagated a belief that women are inferior to men based on biological indifference and attributed some unchangeable roles on the basis of this. Women were expected to be wives and mothers, and they didn't have any kind of social life as they were expected to do the household chores and be at home all the time. They always relied upon their fathers and husbands for financial support and had no right over the property. Also, they were expected to be gentle, rational, and dependent.

In the late nineteenth-century European culture, theories related to women's weakness flourished by providing a logical reason to support the public's belief that women are a weaker gender. It was the time Charles Darwin's *Origin of Species* was published, in which he argued that male species evolved physically and intellectually more than women. So, women were considered to be weak thus more susceptible to illness. This was directly connected to their biological construction. The uterus played a serious role in women's physical and mental health. Hysteria was a common term to refer to all kinds of female disease which was considered to be related to a displaced uterus inside the female body. The Victorian houses even had a special room for these weak women to lay down when they felt 'hysterical'. The field of medicine was not much progressed then, so doctors believed that this was happening because the female uterus got misplaced and wandered around the female body. The treatments for this were also strange.

It was after this Victorian era; we have the emergence of modernism and feminism. But the society's response to this was not positive. Especially towards feminism. Women, becoming aware of the inequalities that they are facing and rising against it was a lot for the patriarchal

society. So, they created madness as an explanation for their strange behaviour or alienation from the traditional gender roles. Patriarchy always framed rebellious women as hysterical. They made the rebel girls mentally ill and put them in the asylums. Elizabeth Packard, Ellen West, Zelda Fitzgerald, and Sylvia Plath are some examples of such women who were forced into the asylums. The number of mental asylums and the number of female patients in it radically increased in the late nineteenth and early twentieth century. The madness was always not a mental illness, it was more of a social construct.

But in the modern age, things are different. A lot of changes happened in the approach of society towards mental health. Now madness or mental illness is not a stereotypical term that is attributed to women alone. The stigma of mental instability as a female illness has changed now. It is okay to talk about mental health in this society and to seek medical help for both men and women. As there is progress in modern medicine from what is ancient, so is the approach towards mental health and madness. Especially during this time of the pandemic when people are quarantined in their houses, there is a considerable increase in the discussions on mental health and mental wellbeing. People took mental health into concern and addressed the issue as the number of suicides and people struggling with stress and burnout increased.

This project intends to analyze the history of hysteria as a female illness and tries to trace the changes in the perception of hysteria from Victorian society to Modern society. Chapter one, "Hysteria as a Female Illness: An Overview", briefly analyzes the historical background of hysteria and female mental illness and also the changes that have happened in society throughout time. It examines how hysteria was used to establish the man's power over rebellious women. For analyzing these concepts, the essay 'Victorian Women and Insanity', by Elaine Showalter and the book *Women and Madness* by Phyllis Chesler are studied. Chapter two, "*The Yellow*

Wallpaper and the Victorian Woman”, analyses the novella *The Yellow Wallpaper* by Charlotte Perkins Gilman to examine how in the late nineteenth-century Victorian society, the female mental illness was misinterpreted and misdiagnosed as hysteria. Chapter three, “*The Awakening: Madness as a Social Construction*”, deals with the novel *The Awakening* by Kate Chopin and analyses how madness was a social construction that was forcefully imposed upon women, by patriarchy, who deviated from the expected gender roles. Chapter four, “*Next to Normal: Tracing the Changes*”, analyses the changes that happened in society’s attitude to mental illness by examining the contemporary rock-musical *Next to Normal*. It traces how, in modern society, mental illness is not a stereotypical female illness anymore.

Chapter 1

Hysteria as a Female Illness: An Overview

In the late nineteenth century, theories about female inferiority circulated prominently in society. Victorian society was very biased towards women. Men were considered to be superior, dominant, and powerful whereas women were considered to be inferior and weak. Many scientific and intellectual theories came up during the age to validate this point. Sociologists like Auguste Comte, evolutionary theorists like Charles Darwin and Herbert Spencer, and other anthropologists, neurologists, philosophers, etc. contributed to this belief. Their theories and text supported the stereotypes that existed then and society took it as justification.

Darwin's theory of evolution and natural selection argued that females are physically and emotionally incapable and their brain is inferior and underdeveloped. This female inferiority was a logical explanation for men being superior in natural selection. It justified that, men have evolved more than women and have a dominant place in society. Men were considered to be muscular and rational and capable to perform any kind of physical and intellectual jobs, whereas women were considered to be weak, emotional, and sentimental and thus incapable of the jobs men do. They were considered to be more vulnerable as they were uneducated. This pushed women into the domestic spheres. And they were expected only to perform the duties of a mother and wife.

Before Darwin, positivism which already existed in society examined female inferiority and used it as a justification for female subordination. The main thinker of positivism was the French sociologist Auguste Comte. In his book *The Positive Philosophy*, he talks about female inferiority and approves women being secondary to men in the social domain performing

complementary works to men. Women are always the 'other', according to Comte. These Darwinist and positivist theories on female inferiority made a serious impact on society and the social mentality. As it was an authentic and biological justification for female subordination and was based on science rather than divine or social order, society came to believe the natural inferiority of women to men.

Female inferiority was defined not only based on physical strength but also based on their mental ability. Victorian society considered women to be emotional and sentimental and too delicate to handle. The theory of natural selection supported the argument that female brains were not evolved as much as male brains. So they were considered to be more prone to suffer from nervous disorders. And Victorian society believed these nervous disorders solely as a female illness. British physician William Cullen classified neuroses as something "embraced all disorders presumed to involve the nervous system, but occurring without any evidence whatsoever of structural change, inflammation, or lesion" (Oppenheim 8). Everything from simple headaches to insanity and melancholia was considered to be a nervous disorder.

In the late nineteenth century, American physician George Miller Beard's name was inextricably linked to studying the condition of neurasthenia, or nervous exhaustion, and his theory of nervous energy, the term used to refer to the health of the nervous system. According to Beard, if this energy was depleted or abused, the person would fall into nervous exhaustion and its debilitating conditions. The prescribed cure was withdrawal from the pressures of urban life, rest, and a simple, healthy lifestyle. For many women, however, the rest cure represented the ultimate confinement within the domestic sphere, the very source for many of their nervous exhaustion. (Ramsey-Portolano 15)

Female mental illness was also considered to be directly connected with their reproductive system. Biological indifference is examined as the cause of mental instability. In the essay “Victorian Women and Insanity”, Elaine Showalter has explained this.

From a theoretical perspective, female psychiatric symptoms were interpreted according to a biological model of sex differences and associated with disorders of the uterus and the reproductive system. While physicians might pay attention to the contexts of the female complaint, such as poverty, the death of a relative, or physical complications, they were indifferent to content. Expressions of unhappiness, low self-esteem, helplessness, anxiety, and fear were not connected to the realities of women's lives, while expressions of sexual desire, anger, and aggression were taken as morbid deviations from the normal female personality.

(169)

Women's life cycle was always connected to their reproductive system and how they have to take great care not to upset their brains. “The menstrual discharge in itself predisposed women to insanity” (Showalter 170). Because madness was considered as a disease of blood so over quantity or deficiency of blood could affect the brain. So girls had to take serious care of their menstrual health to protect their mental health. After surviving puberty, the women have to face the next stage of a mental shipwreck that is pregnancy and childbirth. They had to face serious psychological problems, postpartum depression, and suicidal tendencies. The end of the reproductive life of a woman, the menopause period, was also a period of mental upheavals. The end of reproductive life is described as a struggle of every organ and function of the female body. Mental illness was thus considered as a female illness that was completely connected to their biological system.

Hysteria was a common disease then, which was exclusively attributed to women. This was directly related to their reproductive organs. Hysteria is a Greek word meaning 'uterus' or 'wandering uterus' and the word directly refers to psychological disorders of 'women'. People of that time thought the uterus is something that changes its position in time and wander around in the female body. Displaced uteruses were considered to be the reason behind female mental illness. So women were more tend to get ill. Victorian houses had a special sick room for women to rest whenever they felt 'hysterical'.

In the late nineteenth century, there was a considerable increase in the number of mental asylums during the time. In the essay "Victorian Women and Insanity", Elaine Showalter deeply analyses the increase in the number of asylums in the nineteenth century and the conditions of female patients in it. She explains the horror of asylums referring to the experience of the writer Charles Dickens visiting a mental asylum in 1851. It says that till the mid-nineteenth century there were more male patients in the asylums than women patients. "A study by John Thurman, medical superintendent of the York Retreat, published in 1845, indicated that in private asylums and provincial houses, male patients outnumbered women by about thirty percent" (Showalter 159). But after the mid-nineteenth century, the situation reversed and the number of female patients in those asylums was significantly higher than that of the male patients. It was assumed that women were considered to be more likely to catch illness as they were vulnerable because of their reproductive system and sensibilities. According to Showalter,

This sudden shift between the genders of the icon of madness was no coincidence. New diagnoses included hysteria, anorexia nervosa, and neurasthenia, almost all exclusively attributed to women. Not all of these were created equal in the eyes of the psychiatrists. Nervosa anorexia was seen as self-sacrificing and a very

feminine disease while hysteria was often deemed selfish and destructive, a rebellion of which doctors did not approve. (133)

Women were victims of the Victorian social norms with no rights or agency of their own. And any act of challenging or questioning the norms deemed them as mentally ill and was sent away to mental asylums. According to the 1871 census, the ratio of female lunatics to males was 1182:1000.

Apart from asylums, there were other methods of diagnosis. Surgical clinics, water-cure establishments, rest-cure homes, reformed asylums, etc. were some of it. By this time mental illness became gendered. Females who were considered to be naturally subordinate to men in every aspect were more susceptible to getting ill. And therefore, hysteria, melancholia, madness, etc. were female illnesses. Dr. Silas Weir Mitchell was the famous American physician of that time who invented the rest-cure method. He wrote several books about female neurosis and his method of treating his patients. The diagnosis for this included plenty of food and rest. The patient will be locked up in a room with food provided and they were not supposed to leave the bed without his approval. This resulted in the opposite of the aim of the curing method. The rest-cure method of diagnosis, according to Dr. Silas Weir Mitchell, was to teach women discipline which they refused to by avoiding household chores.

This mental illness that victimized women can be seen as a social construct. When women refused to do the household duties, refused to perform their roles as a mother or wife, refused to obey their husbands, they were portrayed as mentally ill. “Perhaps what we consider “madness,” whether it appears in women or men, is either the acting out of the devalued female role or the total or partial rejection of one’s sex-role stereotype” (Chesler). Deviating from the

moral code that men had constructed and challenging the patriarchal institutions termed women mad and hysteric. This was also a time when early feminist thoughts were sprouting. Women were not given the right to vote or own property. They always had to rely upon their husbands or fathers, which gave them a subservient position in society. In the textbooks about cases of female insanity, they talk about women who were rebellious, disobedient, and openly protested against the gender prescribed roles and portray them as mentally ill. Doctors described women who protested for their rights as mentally unstable.

Elizabeth Packard, Ellen West, Zelda Fitzgerald, and Sylvia Plath are some examples of rebellious women who were forced to be in asylums for their fight against patriarchy. Women in the asylums were thus subjected to great surveillance. Victorians called it ‘careful watching’, and the women were watched more carefully so that they will be protected against having a self-revelation. “In 1861, Susan B. Anthony and Elizabeth Cady Stanton wrote: “Could the dark secrets of those insane asylums be brought to light... we would be shocked to know the countless number of rebellious wives, sisters, and daughters that are thus annually sacrificed to false customs and conventions, and barbarous laws made by men for women” (Chesler).

But hysteria, as a female disease, has eventually disappeared from society. Today the situations have changed as well as society's approach towards mental illness. Even though we can still see the traces of gender stereotypes and discrimination in society, the idea of mental illness as something feminine has somehow disappeared. There are still mental disorders that exist in society like depression, anxiety, bipolar disorder, etc., but there is nothing like ‘hysteria’ which is solely considered to be a female mental disorder.

It is estimated that 43.7 million adults suffer from various psychological illnesses. In

that, about 10 million more women are there than men. But the approach of society towards them has significantly changed. In the past few decades, a huge shift happened in the field of psychiatry and medicine. Mental illness is not a female-specific illness anymore. There are many men also approaching psychiatrists to seek help for mental health and mental illness. In twentieth-century society, the media plays an important role in influencing and shaping human thoughts and opinions. In early times, movies and shows inaccurately portrayed mental illness and influenced public thought and their approach towards it. But in recent times one can witness a lot of positive changes that have come about in the thought process of people. Books, television shows, and web series present mental illness more realistically now. “It’s becoming less rare to have accurate portrayals of mental illness....There are plenty of people who live and work and raise families and have mental illnesses like bipolar disorder. It’s good to show this break-in stigma to show people with mental illness are not outcasts or violent, but it also breaks the tropes of portrayals of mental illness in entertainment” (Sifferlin).

Shows like *Shameless*, *Homeland*, *Girls*, etc. portray mental disorders like bipolar, paranoia, impulsivity, etc. realistically. These shows can influence public opinion very easily by normalizing the thoughts that they are propagating. Mental illness must be portrayed more realistically so that people can identify through these television characters and seek help for themselves. Normalizing mental illness in this way by creating more public awareness, will help psychological disorders from being further stigmatized.

Chapter 2

The Yellow Wallpaper and the Victorian Woman

The Yellow Wallpaper, by Charlotte Perkins Gilman, written in the year 1892, is a work that explores the life of a mentally disturbed woman in the nineteenth century. As the writer herself has gone through a phase of postpartum depression and diagnosis, the novella can be called semi-autobiographical. Though the novella is about the eventual mental breakdown of a young lady suffering from postpartum depression, it indirectly criticizes the way of diagnosing female mental illnesses in the late nineteenth century. The story traces the life of the protagonist in a rest-cure home, her struggles, confusion about her mental health, and gradual mental breakdown.

Charlotte Perkins Gilman herself suffered from postpartum depression and was diagnosed by Dr. Silas Weir Mitchell, who was the then famous American physician. Dr. Silas Weir Mitchell, who is also mentioned once in the novella, proclaimed in his book *Wear and Tear: or, Hints for the Overworked*, that women doing jobs ‘unsuited’ for their gender are more prone to nervous collapse. The Victorian society which is the background of this work was undergoing a huge shift to modern and was witnessing strong feminist mass actions like suffrage movements. And labeling rebellious women who refused to conform to the prescribed gender roles as mentally ill was a way to repress these movements. The writer herself has experienced Mitchell’s “rest-cure” method of treatment and has found it very difficult to cope with this enforced idleness.

The ‘unnamed’ protagonist of the story is a woman suffering from postpartum depression, temporary nervous breakdown, and hysterical tendency. She is prescribed rest-cure

by her husband John, who is a physician. The protagonist of the story, who is a lady, has no name and the husband has a name that can symbolically represent that woman has no identity of her own. The story is narrated by the wife almost in the style of her writing a journal. John, her husband, and a physician rents an isolated abandoned house for the treatment of his wife. He used the method of rest-cure prescribed by Dr. Silas Mitchell, and made the house seem like a 'reformed asylum'. In the essay, "Victorian Women and Insanity", Showalter refers to this type of private licensed houses that madwomen owned. "...women were often the licensed proprietors of private madhouses or inherited their supervision from a father or husband" (164). John, as a part of the rest cure, constricts her within the room not allowing her to socialize with others, and leaves for work early and often comes back late. The rest cure method and the lack of social life, instead of improving the protagonist's mental health, worsen it. John is unable to see the real problem of his wife. Even though he is a physician, he is unable to find a proper diagnosis method for his wife and thereby restricts her in his 'private madhouse' as a madwoman. The protagonist of the story has a brother who is also a physician and she says that her brother would also choose the same diagnosis for her as her husband. This reflects the nineteenth-century male tendency to misinterpret the female mind and madness.

In the story, John is a husband who asserts complete control over his wife and the protagonist is his wife with no choice or opinions of her own. Initially, she was a woman of creativity and imagination. But as part of her treatment, John forbids her to engage in any sort of intellectual activities. This includes writing which she enjoys a lot. She manages to write a little journal in his absence. The story is narrated from the perspective of this lady writing her journal. John also did not allow anybody to come and visit his wife. She wishes that he would let her go and visit her cousins Henry and Julia. But he does not. Even then she believes John "loves me so

dearly, and hates to have me sick” (Gilman 25). She misreads John’s tyranny as his love and compassion for her and praises him for being a good husband and a good physician. Neither the husband nor the wife sees the fact that this way of diagnosis is not helping her.

One time John’s sister comes to visit her. But the wife is not that happy to see her and is doubtful whether the sister will tell John that she is keeping a journal. This points to so many things. How much the protagonist is afraid of John and afraid to go against his orders. She is unable to question the authority that is acting upon her and she is silently suffering. She is a silent victim of society and male authority here. But the fact is that she can’t even share her real thoughts with a female friend. This shows how women were also influenced and propagated the patriarchal ideologies and power, and a woman is too afraid to be her true self because of that.

At this point, the journal was the only thing that kept her alive. John is unable to realize the fact that the actual cure for his wife is social integration. Someone to talk to, at least John. In the story, there are instances of the wife being agitated about John's absence as she wanted to talk to him. But he is not there with her. He goes to work early in the morning and if he has a serious case to deal with, he will come home late. And she understands that he is a busy physician and he has important cases to handle. She says “I am glad my case is not serious” (10). In the novella we can see at certain points she feels like she is extremely ill and other times she says her case is not serious. This reveals that she is going through an internal conflict and confusion about her, mental health. She doesn't even know what is going on with her. She is unable to figure it out. Even when she is angry at John, she is blaming herself and says “I think it is due to this nervous condition” (5).

John is not with her all the time. But when he is with her, she tries to open up about how

she feels. But John refuses his wife's concern about her mental state because he couldn't see anything wrong with his wife. She has been behaving so well he says that she is going to recover soon. And the wife is helpless when her husband ignores her concerns. We can see that when she says "he does not believe I am sick!" (Gilman 2). As far as she is obeying him, he thinks there is nothing wrong with her and he is doing the right method of treatment. This shows the traditional attitude towards female mental illness and how men mismanage it.

The room that they stay in has dusty yellow wallpaper on the walls. Torn, smelly, and dull wallpaper. The wife's delusional mind thinks there is a woman, sometimes many women, behind that wallpaper, trying to get out. This scars her. So first she wanted to change the room and move to the room downstairs which has windows opening to the nursery. But John rejects it. He says the room downstairs is small and the room they are staying in right now is big with more windows and air circulation which will only do her good. Here also we can see John is unable to direct the real issue and is pushing her into an even worse situation. When she asks him to change the wallpaper, he says it is not worth changing the wallpaper of the house you are staying in for some time. Here also we can see John rejecting his wife's concerns and managing to misunderstand what she needed. More than that he is establishing his control over her and whatever she is demanding for her, he mercilessly rejects. Yet the wife thinks he loves her dearly is the paradox here. The power of male dominance results in the wife staying in the room day and night without having anybody to talk with, staring at the wallpaper, hallucinating about the woman that is trying to escape.

But then she adjusts to the wicked reality she created in her mind. She finds herself occupied with a motive to help the lady escape. This is symbolic of how she feels. Trapped, like the lady that she hallucinates in the wallpaper. She wants to break all these shackles and get

away. Deep inside she wants that. But in the patriarchal society, she can't do that, she can't even think about that. So, in her dream world, she creates this woman who is trying to escape a 'prison' and she helps her to do it. She is trying to liberate herself in the little fantasy world that she has created.

The narrator represents the condition of every woman in that time who desired liberation from the oppressive gender expectation. And that created psychological damage in them just like the narrator of the story. Every step towards emancipation was also a step towards a total mental breakdown for the woman in the story. When John is away and at night when he is sleeping, she tears the wallpaper to let the lady out. This shows her urge to get free and deceive the established system of control that pulls her down from achieving liberation. There is a dreadful joy that fills in her while she is tearing the wallpaper. The joy when she realizes she is helping another woman to come out of the barriers. In the end, when she succeeds in tearing the wallpaper completely, she says "I've got out at last, in spite of you and Jane? And I've pulled off most of the paper, so you can't put me back" (Gilman 55).

Tearing the wallpaper symbolically represents that she is freeing herself from the rigid rules that her husband and society had put on her. She is now free and fearless. She is having the next level of mental breakdown here maybe from the overwhelmed joy of setting the woman free. The very thought of freedom is filling joy in her. It is something that she hasn't experienced till now and she is unable to carry it. Ironically, the moment she thinks that she has embraced the ultimate freedom is the moment that she reached the utmost of the mental breakdown.

When John sees his wife as an entirely new character, he is unable to figure out what is happening and he faints. The novella ends with the line "Now why should that man have fainted?"

But he did, and right across my path by the wall so that I had to creep over him every time!” (Gilman 55). This can be seen as the power of women that the patriarchy can't bear. The patriarchy has always controlled the women, but her real power, which he has not seen or experienced, is something that they can never match. The breakdown of John can be symbolic of that fact. However, the story traces the female illness and the societal and patriarchal attitude towards it in Victorian society.

Chapter 3

The Awakening: Madness as a Social Construction

In Victorian society, women were considered to be more susceptible to get ill. Along with that, there was a male tendency of forcefully imposing mental illness on innocent women who protested against the gender stereotypes. Accusing such women as mentally unstable was the only way for men to reinforce and retain their power in society. The novel *The Awakening*, written in the nineteenth century, is a realistic portrayal of the struggle of women of ambition in that time and the control that the male participants and the patriarchy had over them which caused severe mental trauma.

The novel *The Awakening*, by Kate Chopin, portrays the story of a young mother, Edna Pontellier who desires to create a self-identity and achieve sexual emancipation in an oppressive Victorian society. As it was written in the nineteenth century, the novel is a proper depiction of the rigid gender roles and stereotypes of Victorian society. First published in 1899, the novel depicts a young woman who struggles with the gender expectations and stereotypes of society and her quest to find her authentic self. The novel also has an underlying theme of the male tendency to portray women who reject the traditional gender roles as mad or mentally ill.

Edna Pontellier is a twenty-eight years old woman, married to Leonce Pontellier, and has two children Etienne and Raoul. At the beginning of the novel, we can see that Edna is not happy in her marriage. This is visible from her behaviour itself. Unlike an 'ideal' wife and mother, Edna is seen as not wearing her engagement ring, not taking care of her husband and children. Even though she loves her children she finds it a huge relief when they are not around her. And when the ladies say "Mr. Pontellier was the best husband in the world" (Chopin 12), Edna feels

like she is forced to admit it. Later in the novel, we can see Edna questioning her existence. A lot of changes happen in Edna's thoughts and her character throughout the novel.

Several characters influence Edna and effect a change in her perspective. First one is Madame Ratignolle. She is considered as the ideal 'mother-woman', who has devoted her life to her family. She has children every two years and she says that she would give her life for her children. Madame Ratignolle was respected by everyone and was an 'ideal' model for every woman. But instead of influencing her positively, Madame Ratignolle makes her question her own identity. When Madame Ratignolle declares that she would give her life for her kids, Edna realizes that she won't do the same. That means she won't act according to the normal societal expectations of a mother. This can be seen as the first part of her 'awakening', she realized how much she gives importance to herself and how much to her family. Other characters are Robert Lebrun, Alcee Arobin, and Mademoiselle Reiz who influence Edna in one way or the other and make her rethink her true self.

As the story progresses, we can see a drastic change in Edna's character. In the beginning, she was someone who did not express her feelings and emotions well. But slowly she starts to voice her hunger for self-emancipation. She recognizes her desires and tries to achieve them by breaking the boundaries of submissive gender roles. As a painter she starts to paint again, she buys a small house of her own, she learns how to swim without caring about her husband's disapproval. She wanted to be financially independent and build an identity of her own. She actively rebels and voices her rights as well as her inner desires. She is not aware that she is taking huge steps while doing these though. It was her innocent act of fulfilling her deep desires.

At the same time, we can see society hugely influencing her thoughts. Inner debates are happening in Edna. As any other woman in Victorian society, she also is expected to internalize and perform the norms and roles of society. When she is in pursuit of her independence and self-awareness, at the next moment Edna is seen being doubtful of what she is doing. There is a conflict developing in her mind. At times she thinks that she is committing a sin and she is not being faithful. There is pressure laid upon women that they must match with their male counterparts. So, women are trained to be efficient to satisfy the male dominance. But within these social guidelines or framework of how to behave, women can neither reject nor accept. Here Edna also faces the same pressure. It is like the two sides of the same coin. On one side she wants to liberate herself, on the other side, she is doubtful about that. This symbolically represents that it is hard to get out from the labyrinth of a strict social system.

This novel was written at the end of the nineteenth century. At the end of the nineteenth century and the beginning of the twentieth century, there was a shift in society and the female thought processes. There was a shift from Victorian to modern. Edna can be considered as a representation of this shift and the inner conflict that women struggled with during the period. There is a huge conflict happening inside her mind about what is right and what is wrong. She doesn't want to live in a man's world being a man's right. She doesn't want to be surrounded by men and be regulated by them. She says "One of these days, I am going to pull myself aside for a while and think-trying to determine what character of woman I am; for, candidly, I don't know. By all the codes with which I am acquainted with, I am a devilishly wicked specimen of sex. "But somehow I can't convince myself I am. I must think about it" (Chopin 87). She is facing an identity crisis. She feels that her identity existed somewhere out of these realms of wife and mother. So her journey towards self-liberation is a purposeful one.

Leonce, Edna's husband, is not happy about Edna's new behaviour. He is rather scared of this change. From the beginning of the novel, we can see that Leonce is a 'caring' husband. He takes care of Edna all the time even if she doesn't want to be taken care of. At a specific point, we can see Leonce dragging Edna inside the house because it is cold outside while she wanted to sit outside. We can consider him as a 'protective' husband model, but symbolically the writer is implying the male tendency to drag women into the typical social guidelines without allowing them to be liberated. The male tendency to decide what is right and wrong for a woman. Edna's deviation evokes concerns in her husband about her mental health. When Leonce sees the changes happening in Edna, he quickly jumps to the conclusion that she is mentally ill. This can also be considered as the insecurity of Leonce's male ego that his wife is no longer under his control. Leonce is a representation of the male population of the society of that time. He stands for the male tendency to misunderstand the female mind and misinterpret the deviation of women from the socially accepted gender roles, as mental instability.

In chapter XXII we have a new character, Dr. Mandelet coming in. "The doctor was a semi-retired physician, resting, as the saying is, upon his laurels. He bore a reputation for wisdom rather than skill-leaving the active practice of medicine to his assistance and younger contemporaries-and was much sought foreign matters of consultation. A few families, united to him by bonds of friendship, he still attended when they required the services of a physician. The Pontelliers were among these" (Chopin 69).

Leonce went to consult Dr. Mandelet about his wife's illness without her presence or knowledge. This is a clear violation of medical privacy. They conclude that Edna is physically alright, but mentally not. The writer's inclusion of a male physician can be considered as a deliberate movement to comment about the male tendency to misinterpret female illness. They

are the only characters in this story who discuss Edna's ailment. They hypothesize Edna's failure to perform the roles of a mother and a wife as a mental imbalance. Here we can see that maternal and marital incapability is directly linked to mental instability. This is a bit ironic. The one who performs the specific gender roles well, even if they are mentally ill or depressed, the society or the male eye considers them as the ideal woman. On the other hand, the one who deviates from all the gender guidelines and is trying to find their own identity is considered to be mentally unbalanced. When Edna steps out of her boundaries and the roles that she has to fulfill, she is considered ill and needs diagnosis. In the essay "Victorian Women and Insanity", Showalter says, "It was easy for fathers, brothers, and husbands to find doctors willing to certify that sexually rebellious women were lunatics" (173-174).

The novel also indicates how both the institutions of marriage and medicine are dominated by men. There is an interplay between these two and they completely lack women's perspective when they talk about Edna's diagnosis. It also shows how male opinions and decisions decide social standards as there is no single woman included in this conversation about Edna's illness, not even Edna herself. In the book *Women and Madness*, Phyllis Chesler talks about how women were dragged by men to the asylums.

HOW DID AMERICAN WOMEN GET INTO ASYLUMS IN THE PAST? The answer is: against their will and without prior notice. Here is what happened.

Suddenly, unexpectedly, a perfectly sane woman might find herself being arrested by a sheriff; removed from her bed at dawn, or "legally kidnapped" on the streets, in broad daylight. Or: her father or husband might ask her to accompany him to see a friend to help him with a legal matter. Unsuspecting, the woman might find herself before a judge or a physician, who certified her "insane" on her husband's

say-so.

The only remedy for Edna's illness is to make her perform the socially accepted gender roles. At the end, when the doctor sees Edna behaving differently after Madame Ratignolle's disease, he asks her to get consulted. But neither Leonce nor doctor Mandalet can see Edna's mind, what she wanted. This symbolically shows how the institutions of marriage and medicine misinterpret female illness and try to diagnose that as mental insanity.

In the end, Edna embraces her liberation through death. She undresses in the seashore and swims to the distance where no women have ever swum. The tragic ending of Edna's life brings the perfect climax to the novel. She lives in a society where she can never ask for anything of her own. A society where she has no identity as her own, no place of her own. The only way she could embrace liberation is by embracing death. This final act of embracing death can be interpreted in different ways. It can be considered as death as society's verdict for those women who deviate from being society's ideal female bodies of obedience and conformity. But apart from that death can be considered as Edna's last attempt to take control of her life which she was not allowed when alive and attain the absolute freedom that she yearned for.

Chapter 4

Next to Normal: Tracing the Changes

When the time changes, the social perspective also changes. In this twenty-first century, as the medical and research areas have progressed so much, the way of handling mental illness also has changed a lot from what it was during the Victorian period. The stereotypes about hysteria have changed; it is no longer classified as a female disease as it did during the Victorian age. The changes that happened in the field of medical science, the influence of new media all are factors that contributed to this.

Next to Normal is an American rock musical, written by Brian Yorkey and composed by Tom Kitt that talks about the life of a lady who is suffering from bipolar disorder. The factor that distinguishes this from the other rock musicals is that it discusses the stigma of mental illness. It doesn't support any stereotypes that exist in society about mental illness, on the other hand, the musical is trying to break those stereotypes by creating a positive inclusive attitude towards mental illness and diagnosis. Discussing a very serious topic in a rock musical is a challenge. Yet it won three Tony Awards in 2009 Best Original Score, Best Orchestration, and Best Performance by a Leading Actress in a Musical for Alice Ripley and also won the Pulitzer Prize for drama in 2010. In *The New York Times*, Ben Brantley writes that: "This brave, breathtaking musical focuses squarely on the pain that cripples the members of a suburban family, and never for a minute does it let you escape the anguish at the core of their lives. *Next to Normal* does not, in other words, qualify as your standard feel-good musical. Instead, this portrait of a manic-depressive mother and the people she loves and damages is something much more: a feel-everything musical, which asks you, with operatic force, to discover the liberation in knowing

where it hurts.”

The musical is the story of a suburban mother, Diana Goodman, who is suffering from bipolar disease. When the story begins, we can see that she is an ordinary woman, living with her husband- Dan, and her two children Natalie and Gabe. It seems to be a happy family until we find out that her son Gabe died nearly six years ago. She hallucinates Gabe has broken a curfew and stays up late expecting her son to come back, and when Gabe, in her imagination, tells her to flush her medicines, she does so, he even convinces her to commit suicide. Her illness is revealed when she brings cake for her dead son’s birthday. What she is seeing is just her hallucination and everyone is shocked by it. This is the point where we realize that Diana is mentally unwell. She seeks comfort by recreating the past with her son and creating an illusionary world where she is happy. But in fact, she is mentally unstable and under medication. She visits Dr. Madlen and the medicine that he prescribes numbs her and takes her pain away for a while and the doctor proclaims her as ‘stable’ after giving her the medicines and sends her back. This is a bit ironic. The memories of her happier past are something that is making her unstable, and the medicine that makes her forget about it makes her stable.

But she can’t get over the hallucinations about Gabe. Medicine can’t keep her numb all the time. The fact is that her illness is affecting her family as well. Even though her husband loves her and is ready to help, there is uncertainty in their relationship. So is in her relationship with daughter Natalie. Natalie thinks her mother doesn’t love her enough. This is expressed in the songs “you don’t know”, about Dan and Diana’s relationship, Dan unable to understand her pain, and “I love you as much as I can”, about Natalie and Diana’s relationship. Diana says that when Natalie was born, she was unable to hold the baby. Gabe had died almost sixteen years ago. From this, we get a vague idea of for how long she has been struggling with her mental

health. We can see in these songs that Diana is unable to keep up with this relationship because she is mentally exhausted and she is pretty upset about that too. This can be considered as a realistic portrayal of people who are mentally disturbed struggling to keep real relationships.

Medicines, talk therapy, and hypnosis are the treatments that are prescribed for Diana. The song about the pills in different colours brings an element of humour to the musical. “The pink ones are taken with food but not with the white ones. The white ones are taken with the round yellow ones but not with the triangle yellow ones. The triangle yellow ones are taken with the oblong green ones with food but not with the pink ones...” (Yorkey and Kitts 16). But later, when her disease got worse, when Diana attempts suicide and failed, the Doctor recommends electro-convulsive therapy. But Diana gets angry and tells the staff that she has watched the movie *The One Flew Over the Cuckoo's Nest*. She is well aware of the horrors of shock therapy. But later they convince her and she receives a couple of shock treatments in two weeks. This washes away the memories of the past nineteen years from her, including the memories of her dead son, which is a ‘common side-effect’ of ECT.

Dan is helping her to cope with the situation. Dan is, in fact, angry about the fact that his family is falling apart. But he is trying to help his wife amid everything. He wants to support her. When he realizes that his wife has serious hallucinations about their dead son and has stopped taking medications, he tries to sympathize. He tells her that he will do anything that would help. She tells him he won’t know what she is going through but he tells her to believe him and let him help. He, apart from the Victorian patriarchal husband figures, has a greater understanding of his wife’s mental health and supports her through it. Another male figure we see in this musical is Natalie’s boyfriend Henry, who is also by her side in her ups and downs. When she becomes addicted to drugs, he is the one who brings her back. Also, when she is concerned about whether

she will end up in a situation like her mother, he promises to stand by her no matter what.

The musical *Next to Normal* shows how much society has progressed and is trying different treatments other than rest-cure. In the musical, it is evident that they are trying different methods of diagnosis to see which one will suit and will help her the most. Only at the end when she is having a serious breakdown and attempts suicide, do they are using ECT. But the treatment methods are inadequate and Diana chooses to reject it and take some time of her own to figure it out. She leaves the house temporarily and goes to her parent's house for a change of environment. In the musical, Diana is a woman who enjoys the freedom to choose what is good for her. In the modern world, she has the freedom to choose for herself. She is a woman with choices and options.

In the end, when Diana leaves the house for her mental wellbeing and her family, we can see the shift that has happened in society. When Diana felt unwell and wanted to leave, she could completely do that. Apart from the Victorian or ancient society, the gender roles are not so rigid in the modern world, and when Diana wanted to leave, she could without the permission of others. When Diana leaves, Dan and her daughter try to figure out how to live on their own by letting his wife take some time for herself. Here, Dan is not like a typical husband who controls and forces his power over his wife. He let his wife go for everyone's good.

All the time Diana was the only one seeing the psychologist. But in the end, something more liberating happens. We can see Dan accepting to receive mental help from the doctor, thereby breaking all the stereotypes that framed mental illness as a female illness. The musical ends with the song 'there will be light' giving hope that they can build a life that is 'next to normal' as they say in the musical.

The musical *Next to Normal* is not portraying madness in any stereotypical ways. It doesn't stigmatize mental illness and portrays it as a women's disease. Rather, it provides a better understanding of mental health and mental illness. It creates a healthy attitude towards what is considered "unhealthy". Rock-musical is usually not a genre that deals with serious subjects in a serious manner. Presenting the topic of mental illness in a rock-musical without losing its seriousness is a challenging task. Yet Brian Yorkey and Tom Kitt have succeeded in it.

Conclusion

The covid lockdown was a time when we were all concerned and talked about mental health. The suicide of a lady bank employee due to occupational burnout, and many similar cases, made us all take mental illness and mental health more seriously. It was a time when we all were isolated from one another and were struggling with a lot of stress and pressure from work, academics, etc. As a result, we all started talking about mental health and well-being.

But the history of mental illness and trauma is really twisted and stigmatized. Only when we look into the history of mental illness, we can see the deep-rooted gendered stereotypes and myths that were prevalent in it. For a major part of our history, mental illness remained typecasted and the diagnosis remained barbaric. Over the period of time, this tendency of considering mental instability or hysteria as a totally female illness has slowly changed.

Charlotte Perkins Gilman's *The Yellow Wallpaper*, published in 1892, can be considered as one of the earliest works to talk about mental illness, especially from a feminine perspective. A novella written in gothic style, it reflects the male approach towards female illness, how they misunderstand the situation, and how women were helpless in a male-dominated society. The novella is a semi-autobiographical text grounded in reality, as the writer Gilman herself has gone through all the pains of rest-cure. Gilman, by not naming the wife in the story, symbolically suggests how the wife represents every Victorian woman who is reduced into the role of a wife in the society of the time and how they always lacked an identity of their own. And as the writer has gone through all the evils of rest-cure we can say that the writer identifies herself through this unnamed protagonist. The end is also double layered because she thinks she has liberated herself, where, in reality, she had a severe nervous breakdown of anxiety and depression.

The Awakening is a clearer depiction of the actual Victorian society and the rigid gender roles that existed in the society then. The life of the suffering Edna and her eventual suicide clearly reveals the amount of pressure the society puts on Victorian women to be the ideal models of perfection, that they were left with no choice but suicide. Chopin through the male characters in the novel represents the stereotypical male gaze of that period which always misinterprets women as mad when they failed to contain themselves within the ideals of femininity. It also shows the insecurity of the male community who cannot withstand the notion of losing control over their women.

Next to Normal is a contemporary rock musical about a woman with bipolar disorder in the twenty-first century. We can see the changes that have happened in society as well as in the mindset of people from the nineteenth century. The greatest change is that Diana is able to realise that she is sick and she needs help and unlike the protagonist from *The Yellow Wallpaper*, she is receiving help from everywhere. Even though her husband is angry about the fact that his family is falling apart, he is there for his wife, to help her. Also in the book, the physician is a male, but in many adaptations, we can see the physician being a woman, which shows the inclusion of females into the institution of medicine. In the end, when Dan is accepting medical support for his mental health, we can say that mental illness is not a female illness anymore.

From these three books, we can trace the changes that have happened in society in regards to mental illness. It has come out of the label 'female illness'. Also, the approach and diagnosis of psychiatry and modern medicine have progressed a lot. But there is still a mass population that doesn't consider mental illness as something to be diagnosed for and taken care of. A majority of the population is still not aware of the importance of this and stays reluctant to seek help. We should change this stigma and create a healthy approach towards mental health.

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A study on
**IMPACT OF COVID-19 ON TRAVEL AND TOURISM SECTOR IN INDIA WITH
SPECIAL REFERENCE TO ALLEPPEY DISTRICT**

Project Report

Submitted by

VARSHA JYOTHI: (SB19BCOM023)

NIYA PRINCE: (SB19BCOM016)

AMRUTHAVARSHA KANNAN: (SB19BCOM025)

Under the guidance of

Ms. NAMITHA NA

In partial fulfillment of the requirement for the Degree of

BACHELOR OF COMMERCE



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CERTIFICATE

This is to certify that the project titled " IMPACT OF COVID-19 ON TRAVEL AND TOURISM SECTOR IN INDIA WITH SPECIAL REFERENCE TO ALLEPPEY DISTRICT " submitted to Mahatma Gandhi University in partial fulfillment of the requirement for the award of Degree of Bachelor in Commerce is a record of the original work done by MS.VARSHA JYOTHI, MS.NIYA PRINCE, MS.AMRUTHAVARSHA KANNAN, under my supervision and guidance during the academic year 2019-22.

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Assistant Professor

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Viva/Voice Examination held on....

Smt. Jini Justin D'Costa

(Head of the Department)

Department of Commerce (SF)



External Examiner(s)

DECLARATION

We, Varsha Jyothi, Niya Prince and Amruthavarsha Kannan, final year B.Com students. Department of Commerce (SF), St Teresa's College Autonomous do hereby declare that the project report entitled **IMPACT OF COVID-19 ON TRAVEL AND TOURISM SECTOR IN INDIA WITH SPECIAL REFERENCE TO ALLEPPEY DISTRICT** submitted to Mahatma Gandhi University is a bonafide record of the work done under the supervision and guidance of Ms. NAMITHA NA , Assistant Professor of Department of Commerce (SF), St. Teresa's College Autonomous) and this work has not previously formed the basis for the award of any academic qualification, fellowship, or other similar title of any other university or board.

PLACE: ERNAKULAM

VARSHA JYOTHI



DATE: 30.04.22

NIYA PRINCE

AMRUTHAVARSHA KANNAN

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VARSHA JYOTHI

NIYA PRINCE

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CONTENTS

CHAPTERS	CONTENT	PAGE NUMBER
Chapter 1	Introduction	1-4
Chapter 2	Theoretical Framework	5-8
Chapter 3	Literature Review	9-20
Chapter 4	Data Analysis and Interpretation	21-40
Chapter 5	Findings, Suggestions and Conclusion	41-43
	Bibliography	44
	Annexure	45-47

LIST OF TABLES

SL NO.	CONTENTS	PAGE NO.
4.1	Cancellation of trip due to covid19	21
4.2	Satisfaction of accommodation facilities provided by agencies	22
4.3	Level of disappointment	23
4.4	Change in travelling mentality	24
4.5	Budget as a barrier for the trip	25
4.6	Mode of ticket booking	26
4.7	Preferable kind of trip post covid	27
4.8	Taking off face masks and face shields while travelling to enjoy fresh air	28
4.9	Effect of covid 19 on tourism sector in future	29
4.10	Rating of travelling experience before pandemic situation	30
4.11	Safety and comfort in sharing close spaces with strangers while travelling	31
4.12	Dissatisfaction among travelers due to proof of covid testing prior 72hrs	32
4.13	Factors influencing decision in travelling post covid	33
4.14	Visiting India to explore healthcare facilities	34
4.15	Overnight stay at hotel within next six months of pandemic	35
4.16	Preference on mode of transportation during the pandemic	36
4.17	Reasons for travelling	37
4.18	Spending power of tourists post covid 19 pandemic	38
4.19	Postponing the trip with new defined date	39
4.20	Level of comfort in attending conventional shows post pandemic travel restrictions being lifted	40

LIST OF FIGURES

FIGURE NO.	TITLE	PAGE NO.
4.1	Cancellation of trip due to covid19	21
4.2	Satisfaction of accommodation facilities provided by agencies	22
4.3	Level of disappointment	23
4.4	Change in travelling mentality	24
4.5	Budget as a barrier for the trip	25
4.6	Mode of ticket booking	26
4.7	Preferable kind of trip post covid	27
4.8	Taking off face masks and face shields while travelling to enjoy fresh air	28
4.9	Effect of covid 19 on tourism sector in future	29
4.10	Rating of travelling experience before pandemic situation	30
4.11	Safety and comfort in sharing close spaces with strangers while travelling	31
4.12	Dissatisfaction among travellers due to proof of covid testing prior 72hrs	32
4.13	Factors influencing decision in travelling post covid	33
4.14	Visiting India to explore healthcare facilities	34
4.15	Overnight stay at hotel within next six months of pandemic	35
4.16	Preference on mode of transportation during the pandemic	36
4.17	Reasons for travelling	37
4.18	Spending power of tourists post covid 19 pandemic	38
4.19	Postponing the trip with new defined date	39
4.20	Level of comfort in attending conventional shows post pandemic travel restrictions being lifted	40

CHAPTER – 1
INTRODUCTION

1.1 INTRODUCTION

Tourism is travel for pleasure or business; also the theory and practice of touring, the business of attracting, accommodating, and entertaining tourists, and the business of operating tours. Tourism can be domestic (within the traveller's own country) or international, and international tourism has both incoming and outgoing implications on a country's balance of payments. Tourism numbers declined as a result of a strong economic slowdown (the late-2000s recession) between the second half of 2008 and the end of 2009, and in consequence of the outbreak of the 2009 H1N1 influenza virus, but slowly recovered until the COVID-19 pandemic put an abrupt end to the growth.

Tourism brings large amounts of income into a local economy in the form of payment for goods and services needed by tourists. It also generates opportunities for employment in the service sector of the economy associated with tourism. It is also claimed that travel broadens the mind. The hospitality industries which benefits from tourism includes transportation services (airlines, cruise, ships, transits, trains and taxi cabs), lodging (including hotels, hostels, homestays, resorts and renting out rooms) and entertainment venues (such as amusement parks, restaurants, casinos, festivals, shopping malls, music venues and theatres). This is an addition to goods brought by tourists including souvenirs.

India is a country known for its lavish treatment to all visitors, no matter where they come from. Its visitor-friendly traditions, varied life styles and cultural heritage and colourful fairs and festivals held abiding attractions for the tourists. The other attractions include beautiful beaches, forests and wild life and landscapes for eco-tourism; snow, river and mountain peaks for adventure tourism; technological parks and science museums for science tourism; centres of pilgrimage for spiritual tourism; heritage, trains and hotels for heritage tourism. Yoga, Ayurveda and natural health resorts and hill stations also attract tourists.

Alappuzha (Alleppey) is known as 'the Venice of the East'. Offering the best tourist places in Alleppey, this charming place is the hub of Kerala's backwaters and is home to a huge network of backwaters and more than thousand houseboats. The houseboats you find in the backwaters of Alappuzha are in fact a reworked version of the Kettuvallams of olden times. Kettuvallam is a Malayalam word, 'Kettu', means living structures and 'Vallom'

means boat. In the olden days, kettuvallam or boat with a thatched roof that covers over wooden hulls was used to carry tons of rice and spices.

The modern houseboats are equipped with all the comforts of a good hotel room like air conditioners, modern toilets, cozy living rooms, a kitchen and even a balcony for angling. An uninterrupted view of life in the backwaters fringed with coconut trees can be enjoyed from a houseboat. A perfect place to unwind with its laidback canals and lush greenery. The Alappuzha beach with a 137-year-old pier extending into the sea and an old 17th-century lighthouse built by the Portuguese add to the magic of the place. It is famous for its boat races, marine products, and coir industry.

So get ready to wander around this small but chaotic city centre and bus-stand area, with its modest grid of canals. Head west to the beach or in practically any other direction towards the backwaters and Alleppey becomes elegant and greenery-fringed, waning into a watery world of hamlets, punted canoes, toddy shops and, of course, houseboats. Float along and gaze over paddy fields of succulent green, curvaceous rice barges and village life along the banks. Indeed, it is here that nature has spent upon the land her richest bounties. Come and explore the best tourist places in Alleppey.

1.2 SIGNIFICANCE

Tourism is a dynamic and competitive industry that requires the ability to adopt constantly to customer's changing needs and desires, as the customer's satisfaction, safety and enjoyment are particularly the focus of tourism businesses. By the early 21st century, tourism had recognized as one of the world's most important economic activities. Kerala, referred to as 'God's Own Country', is famous for its tourism and Alleppey being one of the attractive tourist destination of the state. An equable climate, tranquil stretches of backwaters, the rejuvenation therapy in Ayurveda and exotic cuisines are the major attractions of this land. Tourism as a growing sector contribute 10% of state GDP and 23.5% of the total employment to the Kerala's economy.

The covid19 pandemic poses a great challenge for tourism sector resulting from an unprecedented decline in revenue. In this study, we focus on key effects of Covid-19 on tourism and other allied activities such as Transportation, Hotels and Accommodations etc.

1.3 OBJECTIVES OF THE STUDY

1. To identify the causes for the downfall of tourism due to covid19.
2. To address the pandemic effect on tourism.
3. To know the tourist behaviour towards travel and tourism post covid19.
4. To understand the new trends in tourism due to covid19.
5. To make suggestions on the roadmap of recovery for tourism.

1.4 STATEMENT OF PROBLEM

It is obvious that the tourism sector all over has been badly hit by the outbreak of the Covid-19 Virus. The lockdown, travel restrictions and social distancing have apparently led to the decline in tourist operations in many parts of the world. The income, employment and livelihood of those engaged in tourism have been badly affected. The visitors have been deprived of opportunities to visit the places of their interests. The reopening of the tourism sector to local and regional tourists has become succour for the tourism sector which would at least help the sector to cover its running costs. However, the satisfaction of the visitors with regard to the Covid-protocol measures matter a lot in sustaining tourism at these difficult times. The present study conducted with reference to Alappuzha in the Kerala State of India reveals that more concrete steps need to be taken by the stakeholders of the tourism sector to make it more attractive and comfortable to the visitors.

1.5 SCOPE OF THE STUDY

The study is regarding the causes and effects of covid19 in tourist's behaviour towards travelling before and after pandemic. This research is extended to the concerns of tourists about travelling during and after the pandemic. The research studies the reasons and effects causing people to refrain from exploring places, ways to make their travel experiences better and there by benefit the entire tourism sector and allied activities.

1.6 RESEARCH METHODOLOGY

The present study was made on the basis of both primary and secondary data. Primary data was collected from the tourists, by administrating a questionnaire which was specially prepared for this study. The population of the study includes the tourists in Alleppey Town. Given the lock down, the use of an online medium for conducting the survey was found to be the most appropriate to capture the people's perceptions. The sample size of the study

was 63. We used Google form to create the questionnaire and social media sites like WhatsApp to circulate the same. Secondary data needed for the study were collected from books, journals, articles and reports. The different types of tools used in analysing the data includes Tables, Pie Charts and Bar Diagrams.

1.7 LIMITATIONS

1. As the present study is a sample study it is likely to be affected by all the limitations of sample study.
2. Respondents may not feel encouraged to provide accurate and honest answers.
3. Surveys with closed-ended questions may have a lower validity rate than other question types. Respondents may not feel comfortable providing answers that present themselves in an unfavourable manner.
4. Thereby presenting with biased statements. This study can only be measured in its qualitative aspect therefore the conclusions may not be accurate.

1.8 CHAPTERISATION

The research work runs into five chapters. The first chapter includes introduction, significance of the study, objectives, scope, methodology of the study and limitation. Chapter two consist of literature review. Chapter three is the theoretical framework part of the study. Analysis and discussion are done in chapter four. Findings and conclusion are discussed in chapter five, followed by bibliography and reference.

CHAPTER – 2
LITERATURE REVIEW

Tourism is a vital industry. A few researchers have conducted research on this subject and related areas. This chapter is an overview of the research that has been carried out on the subject. Some of the most relevant articles have been reviewed here as a part of my research work.

2.1 Pavithra Shetty, 2021, Inspects the effect of COVID-19 on the travel industry and travel industry and furthermore Recommends Government to a) engage in advancing the adaptability administrations b) control security conventions would be one more essential instrument to draw in likely individuals and offering limited rates, undoing strategy.

2.2 Patel J., & Kulkarni, V, 2020, Recommends Tourism industry to use innovation to further develop visitor experience, reception of green practices, customized administration for explorers, development in last-minute booking, and expanded spotlight on wellbeing and health offering.

2.3 Dogra T., 2020, Endorses the travel industry organizations to recapture the trust of voyagers is to guarantee sanitizing significant vacationer locations, including inns and eateries, to recover individuals' trust that traveler locations and facilities are on the whole protected from Covid-19.

2.4 Rajeev Ranjan Mishra, 2020, Recommends to restore the travel industry government should approach, without which it is hard to conquer the monetary crunch. Government should give certain unwinding on charges forced on the travel industry, or to give certain delicate credits least loan costs and should give extra assets for the advancement of the travel industry sooner rather than later.

2.5 Kumar V., 2020, Prescribes government to give certain decrease on extracts forced on the travel industry.

2.6 Jaipuria S., Parida, R., & Ray, P., 2020, Highlighted Foreign Exchange Earnings (FEE) has diminished due to unfamiliar sightseers' less appearances in this pandemic flare-up. In this way, rather than putting more in adding new assets, policymakers and partners can ponder making the current asset more productive and powerful.

2.7 Bakar N., & Rosbi, S., 2020, Proposed the mathematical modelling which assists the Government with managing the amazing behaviour of monetary region in the movement business. In a comparable time, government system needs to address a

suitable course of action in preventing the spreading of COVID-19 and lifting the circumstance with economy development in the movement business.

- 2.8 Folinas, S., & Metaxas, T., 2020**, Archived the travel industry phenomenal conversion of risks -contained an overall prosperity alert; the lack of plane due to the crisis of the Boeing 737 Max; the social belittling of development; distorted and shockingly sham media offensives; climate fiascoes; region charges; liquidations of directors and transporters; and the political uncertainty and money related respite in the colossal business areas.
- 2.9 RuchikaKulshrestha, Kunal Seth., 2020**, provides a brief background.on the transmittable disease flare-up, named COVID-19, and checks out the effect of the infection in India's travel industry and proposes plans to recuperate the travel industry.
- 2.10 Pravin Kumar Patel, Jaya Sharma, Shivali Kharoliwal, & Prashant Khemariya, 2020**, Highlighted the extreme harm pandemic made on the economy of the nation and the globe too simultaneously and furthermore suggests governments and monetary establishments continually re-survey the travel industry after pandemic.
- 2.11 Muhammad Khalilur Rahman, Md. Abu Issa Gazi, Miraj Ahmed Bhuiyan, Md. Atikur Rahman (2021)**. Effect of Covid-19 pandemic on tourist travel risk and management perceptions. This study uses the concept of pathogen-stress theory to evaluate the travel risk and management perception due to the Covid-19 uncertainty and determining human behaviours in societal issues. Some authors have explored the influence of pathogen theraet in the context of Covid-19 epidemics. The personality traits are predicted by a parasite-stress theory of human sociality that highlights the infection risks related to the interaction with conspecifics. The travel risk and management perception refer to the risk of human-to-human transmission. The infection risks are connected to the openness of human contact. The increased contact with many group members implies a higher risk of human-to-human transmission. According to this theory, when people develop in a parasite-infested environment, they become less open to visitors, less curious, less exploratory and reduce their chance of infection. This theory is not only emphasized cultural differences but also cultural difference over space such as between different human populations. Generalizing the concept of pathogen-stress theory, this study explores the effect of Covid-19 epidemic and its impact on travel risk and management perceptions.

2.12 Parvinder Kour, Aruditya Jasrotia, Sudhanshu Gupta. International Journal of Tourism Cities (15th October 2021). The findings of this study agree with Çakar (2015), who point out that because of the pandemic situation and the crisis, the guest–host relationship abruptly disrupts leading to future critical consequences in tourism and a drastic transformation in consumer trends including their behaviour. The study carves out of guest–host relationship being affected by different prevailing normal situations and critical/pandemic situations and also analyses the scenario from the perspective of the tourists and their perceptions regarding the hosts, the destination, guest–host interactions and their future travel intentions. In this study, three major impacts of pandemic on guest–host relationships were identified; a sense of mistrust amongst the host community toward tourists; generation of negative emotions in the mind of visitors toward the destination and lack of willingness to interact with host community.

2.13 AbhaLakshmi Singh, SalehaJamal, WaniSuhail Ahmad. Impact assessment of lockdown amid COVID-19 pandemic on tourism industry of Kashmir Valley, India. (December 2021). The outcomes of this study reveal that the tourism industry of Kashmir Valley is very sensitive and easily affected by any crisis, whether at the national or international level. Although the Kashmir tourism industry was already facing a crisis of political turmoil, the magnitude of COVID-19 is not comparable with previous crises and creates further pressure to strengthen its roots. The study illustrates that any type of disturbance has negative impacts on the tourist flow in the valley and paves the way for unemployment and poverty. During the pandemic, all tourist spots resemble graveyards, and the negative effects percolate down to each and every household associated with it directly or indirectly. The findings of the study provide an assessment of the reported impacts of COVID-19 on Kashmir tourism all through to the end of 2020 with a rapid decrease of tourist arrivals following travel restrictions. This scenario of grief resulted in a decline of –93% of tourist flows in July 2020 compared with July 2019. The population dependent on tourism was forced to find new occupations, and the economic development of Kashmir Valley is seriously in jeopardy. Thus following the COVID-19 protocols at each tourist centre helps to limit the consequences of virus spread. Alternate sub-tourist centres should be developed at each local tourist centre where people can visit during such disasters when transportation system is halted.

2.14 Divya Vasant Jagdale, Dr Heena Ganatra. Impacts of Covid-19 Pandemic on Tourism Industry of India (15th October 2021). The tourism sector has enormously affected by the wide-spread of COVID-19 and may remain for a longer time. This research paper has examined the greater impact that is being created by the virus on tourism and showcase the ultimate damage it created on the economy of the country and the globe too at the same time. There has been a depletion in the number of domestic travellers as people with business purpose or emerging essentials are only travelling. The Archaeological Survey of India (ASI) has 3691 sites registered with it, of which 38 are world heritage sites. The Covid-19 outbreak has also started showing its impact on the domestic tourism sector and summer bookings to leisure destinations like Rajasthan and the hills. Summer travel is the peak travel in India. Considering that most domestic travellers book their flight tickets 2-3 weeks before the travel date, the travel companies saw a more than 30% drop in domestic travel this summer compared with last year. Maximum impacted summer destinations are Leh, Guwahati, Coimbatore, Srinagar and Amritsar where more than 40% drop has been recorded. This is after airline fare drop by 20% for domestic routes.

2.15 Pravin Kumar Patel, Dr. Jaya Sharma, Dr. Shivali Kharoliwal, Dr. Prashant Khemariya. The Effects of Novel Corona Virus (Covid-19) in the Tourism Industry in India. This research work has also showcased the ultimate damage it created on the economy of the country and the globe too at the same time. It is being thought that the impact will continue for some more time and that is of much more concern in recent times. The travelling agencies are seen to be impacted by Covid-19 as the lockdown situation is established by the governments for prohibiting the spread of Covid-19. The Corona virus as also enabled the tourism industry to face the huge threat as well as the economic slowdown is seen. The impact is also seen on the sales as well as the current achievements. Due to this reason, the group of hotels and the other tourism activities are not gaining the opportunity to fully stop the services.

2.16 Vikas Gupta, Garima Sahu, Reviving Tourism in India Post COVID-19 Pandemic. This research is based on domestic tourism that offers primary opportunity for driving recovery and supporting the tourism sector in India. Domestic tourism flows have been heavily affected by the restrictions on the movement of people, but are expected to recover more quickly once containment measures are lifted.

CHAPTER - 3
THEORETICAL FRAMEWORK

3.1 TOURISM IN ALLEPPEY

If Kerala is the 'Backwater Capital of India', Alleppey should be called as the 'Backwater Paradise in God's Own Country'! Located around 62km from the stunning city of Cochin and around 115km from Trivandrum, Alleppey or 'Alappuzha' is among the most coveted tourist destinations in Kerala. Located on the banks of turquoise Vembanad Lake, this tourist plays a host most of the house boat cruises in Kerala.

Fondly called the 'Venetian Capital of Kerala' or the 'Venice of the East', this picturesque city is known for its enchanting backwaters, scenic beauty, azure lagoons, evergreen coconut groves, intricate network of canals, and other natural bounties. Whether you are a nature lover, searching for romantic destinations, planning for a family or solo trip, Alleppey in Kerala can be your next destination!

3.2 HOW TO REACH ALLEPPEY

BY ROAD: KSRTC has regular buses to Alleppey from almost all the major cities in God's Own Country, visitors can easily avail luxury, premium or regular buses to reach Alleppey. Regular buses are also available from nearby cities like Bangalore, Chain Mysore, and Coimbatore.

BY TRAIN: Alleppey has its own railway station, and is well connected with cities like Trivandrum, Cochin, and other major cities. The station also offers passage to several passenger mails plying from cities outside the state.

BY AIR: Cochin International Airport is less than 100km away from Alleppey and well connected with major Indian cities through regular flights. Visitors from within the country and several international destinations can book a flight to this airport, and hire private taxis or cabs to reach Alleppey.

3.3 MUST PLACES TO VISIT IN ALLEPPEY

1. **Alleppey Beach:** Beach goers on a Kerala trip will surely fall in love with this stunning beach in Alappuzha! Quiet, calm, serene, and pleasant, Alleppey Beach is known for its favourable ambience, epic sands, and a myriad list of beach activities. If luck favours, visitors can also enjoy dolphin sighting while in Alleppey Beach.
2. **Krishnapuram Palace:** An 18th century palace, Krishnapuram Palace was built during the reign of MarthandaVarma and is a major landmark in Alleppey. Built in typical

Kerala architecture, this 2-storeyed palace is also the abode of the largest mural paintings in God's Own Country: the painting is known as 'GajendraMoksham' and measures around 14x11ft.

3. **Marari Beach:** Fringed with lush coconut grooves, Marari Beach is around 11km from the heart of Alleppey, and is reserved as one of the most appealing and tranquil beaches in Kerala. While on a visit to this remarkable beach, visitors can enjoy and rejuvenate themselves with Ayurvedic massages and therapies.
4. **Vembanad Lake:** While booking a Kerala tour package to Alleppey, visitors don't have to ask for a visit to the Vembanad Lake: it is one such tourist spots in Kerala that is included in all the tour packages! Touted as the longest lake in India and the largest lake in God's Own Country, it is the paradise for the houseboat cruisers.
5. **Kuttanad:** Also called the 'Rice Bowl of India', Kuttanad boasts of its scenic countryside and shimmering beauty. Located within the heart of Kerala backwaters, the evergreen outlook and enchanting charm of this village offers an amazing experience to its visitors.

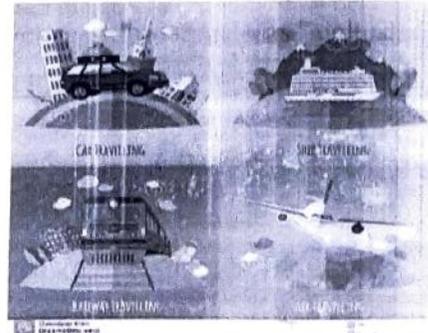
3.4 THINGS TO DO IN ALLEPPEY

1. **Houseboat Cruises:** this should be the first thing to do in Alleppey! Framed as the 'Backwater capital' of Kerala, Alappuzha is the home to these amazing boats that take the visitors for a fun-filled and exciting cruise over the silent backwaters and introduce them with the enchanting beauty of God's Own Country.
2. **Beach Tours:** Alleppey has all the reasons to be called as a stunning beach destination in the country. Visitors on their Kerala trip can revel in the imposing beauty and tranquillity that exists on the Alleppey and Marari beaches and make their holidays a fun-frolic affair.
3. **Ayurvedic Therapies:** Kerala itself is a synonym to Ayurveda! And while visiting Alleppey, visitors must experience the essence and aura of Ayurveda with some of the most relaxing and rejuvenating massage therapies and treatments.
4. **Village Tours:** While enjoying a heart-warming stay in the houseboats, visitors in Alleppey can also embark on exciting village tours. Connected through an intricate network of canals, some of the villages are only accessible by boats or are hidden from the rest of the world.
5. **Enjoy Snake Boat Race:** If you happen to visit Alleppey during the month of august (or harvesting season in Kerala), you can witness the much-coveted Snake Boat Race.

Alleppey also serves as an important access point to the enthusiastic 'Nehru Trophy Boat Race' in Kerala.

3.5 TOURISM AND KERALA

Tourism has emerged as a lead sector of the Kerala economy, with its impact increasing in terms of economic growth and employment generated (GOK, 2002). The state government views tourism as one of the few alternatives available to develop the economy, especially in the context of limited prospects of the manufacturing sector, problems in the agricultural and traditional sectors, and the uncertainties facing expatriate employment in the Persian Gulf (Pushpangadan, 2003). Kerala is now considered to be a tourism model for other states in India to emulate its growth. The tourism industry in Kerala witnessed considerable growth during nineties and beyond and is expected to grow further in the future. Kerala's share of international tourists coming to India has increased from 5.54 percent in 1994 to 8.85% percent in 2005 making it a leading state for tourism in the country. Earnings from tourism is also projected to grow at a record level of more than 23.5 percent which is very high compared to earnings growth projected for India and world average which is 14.3 percent and 6.5 percent, respective. During this same period, tourism receipts from international tourists also grew considerably, from 1.16 billion rupees in 1994 to 19.89 billion rupees in 2006 (GOK, 2006a). International tourist arrivals to Kerala had reached almost half million in 2006, and is expected to cross 500 000 by 2007. For the domestic tourism, the arrivals had crossed 6 million in 2006. This almost meets the prediction of world Travel and Tourism Council (WTTC) that with an average annual arrival growth rate of 18% for domestic tourists and 12% for international tourists Kerala is becoming one of the fastest growing destinations in the world (WTTC, 2002)



3.6 TOURISM AND INDIA

Tourism in India is important for the country's economy and is growing rapidly. India is a country with multicultural experiences, natural beauty, and rich heritage and has always been an attractive tourist destination. Mountains, beaches, forests, deserts, deltas, and architectural marvels give the country a distinct geographical entity. Yoga, Ayurveda, and

natural health resorts also attract tourists. In India total of 38 world heritage sites were recognized by UNESCO as of August 2019, which is the sixth-highest in the world. Apart from all these, the medical tourism industry has great potential due to the low cost of treatment. Over 17.9 million foreign tourists arrived in India in 2019 compared to 17.4 million in 2018, representing a growth of 3.5%. This makes India the 22th most visited nation in the world and 8th in Asia and Pacific. The Indian tourism industry is one of the significant and vital contributors to the economy of the country. India ranked ten among 185 countries in terms of travel and tourism's total contribution to GDP in 2019, which was almost US\$ 194.30 billion. About generating employment and income, the tourism industry seems to be more effective than other sectors. International tourism is an invisible export that creates foreign exchange as other export industries create. Tourism creates a new channel for young people to provide a large number of employment opportunities. Also, the Government yields high tax revenue. In every ten jobs, travel and tourism industries support one position. Travel and tourism worldwide support 330 million jobs and keep 182.2 million jobs in the Asia Pacific, of which 5.56% under direct employment and 7.19% under indirect employment. During the year 2014 to 2019, India gets the first position in terms of creating tourism jobs. In this period Indian travel and transport industry created 6.36 million jobs (Report WTTC 2019).

India's tourism industry is one of the crucial sectors of the Indian economy. India attracts a large number of foreign tourists every year. India is famous for its warm welcome, hospitality, different lifestyles, cultural heritage and varied geography. The attraction for foreign tourists is heritage buildings; temples and other religious buildings; coastal areas and beaches; yoga, Ayurveda and natural health resorts; and spiritual and religious tourism (Annual Report, 2019–20). As many religious shrines in India are visited regularly; with industrialization and economic growth, domestic tourism sees a rise in sightseeing and adventure sports. Tourism is a sector that uses minimum natural resources and optimum use of workforce and expertise. The travel and tourism industry is a sector that strengthens the country's economy to help other sectors like transportation, food, beverage, culture, sports, and more. Tourism helps promote cultural diplomacy, connects the people, and promotes friendship and cooperation between India and other countries.

As a measure to boost tourism, the Indian Government implemented a new visa policy in November 2014, allowing tourists and business visitors to obtain a "visa on arrival" at 28 international airports, by acquiring an Electronic Travel Authorisation (ETA) online before

arrival, without having to visit an Indian consulate or visa centre. In April 2015, the "visa on arrival" scheme was renamed "e-Tourist Visa" (or "e-TV") to avoid confusion. These are places of importance of cultural or natural heritage as described in the UNESCO World Heritage Convention, established in 1972. India first introduced its "visa on arrival" facility on 27 November 2014.

<i>Year</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2015</i>	<i>2016</i>	<i>2017</i>	<i>2018</i>	<i>2019</i>	<i>2020</i>
<i>Arrivals (millions)</i>	5.78	6.31	6.58	6.97	7.68	8.03	8.8	10.04	10.56	10.93	2.74
<i>% change</i>	11.8	9.2	4.3	5.9	10.2	4.5	9.7	14	5.2	3.5	74.9

3.7 DIFFERENT SECTORS UNDER TOURISM

1) TRANSPORTATION

The transportation sector is concerned with helping tourists to get where they need to go, via the provision of transport. This may include providing them with the means to get to their intended holiday destination in the first place, but may also include assisting them with getting around after they arrive at their destination.

Included within this sector are services related to road, rail, air and sea travel.

Airline Industry

The airline industry plays a vital role in the modern travel industry, providing passengers with access to both domestic and overseas flights, allowing them to quickly reach their intended destinations via commercial aircraft. Airline services are generally divided into scheduled and chartered flights.

Water Transport

As the name suggests, the water transport sub-section is concerned with movement across the water. This includes things like ocean liners and ferry transport, where the objective is usually to get passengers from A to B, but also includes cruise liners, where being on the cruise liner itself forms the main part of the travel experience.

Coach Services

Coach and bus services are an important part of the tourism industry, offering long-distance travel, assisting airport passengers with travel to their accommodation, taking groups of tourists on day trips to local attractions or popular tourist destinations, and offering access to other nearby towns and cities.

Railway

Rail travel has played a key role in the tourism industry since the 19th century and continues to do so. Railways not only provide a means for travellers to get to their destination, but over ground and underground rail services also provide options for navigating many of the major towns and cities that tourists visit as well.



2) ACCOMMODATION

The accommodation sector is central to the travel and hospitality industry, because people travelling to different areas require somewhere to stay, rest, sleep and unwind. In fact, by many definitions, a tourist is only classed as such if their stay exceeds 24 hours and they use some form of overnight accommodation.

Within this subsection, there are a number of different components, ranging from the hotel industry to camping, hostels and cruises. These sub-sections are explained in greater detail below:

Hotels

Hotels are the most obvious and popular form of accommodation for tourists and the hotel industry is inextricably linked to the tourism industry. Put simply, hotels provide paid lodgings for guests. With that being said, aside from beds and other essential facilities, the services they provide can vary quite drastically.

Shared Accommodation

In more recent times, shared accommodation has emerged as a major option for tourists. One of the most popular services offering shared accommodation is Airbnb, where users are able to

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Shared Accommodation

In more recent times, shared accommodation has emerged as a major option for tourists. One of the most popular services offering shared accommodation is Airbnb, where users are able to

list spare rooms and rent them out to travellers on a short-term basis. These could be individual, private rooms, or common areas shared with others.

Camping

Camping is the practice of staying outdoors overnight, in a tent or similar type of shelter. While tourists may opt to camp in public areas, commercial campsites are extremely popular and often more convenient. These commercial sites will typically charge for access, but will also provide additional facilities or utilities.

Bed & Breakfast

B&B accommodation offers a small number of rooms for guests and offers overnight stays and breakfast in the morning. In most cases, guests will have a private bedroom and bathroom, although bathroom facilities are sometimes shared. The owners or hosts of these establishments will often live in the bed & breakfast too.

3) FOOD AND BEVERAGE

The food and beverage sector has an interesting role within the tourism industry, providing tourists with essential refreshments at all stages of their travel experience, including during travel, when spending time in their chosen accommodation, and when they are out and about exploring the location they have travelled to.



In addition to catering for travellers' basic requirements, however, the food and beverage sector also offers them opportunities to socialise, meet new people and enjoy themselves.

Restaurants

Restaurants or eateries provide one of the main ways in which tourists eat food and socialise on their travels. This category includes everything from fast-food restaurants like McDonald's and KFC, to family restaurants, and luxury restaurants offering high-end cuisine.

Catering

Catering is usually recognised as the provision of food services at more remote locations. Within this sub-section would be the various food and drink offerings found at hotels and other

accommodation types, as well as on planes, cruise ships or trains. It also includes offerings at many tourist attractions or entertainment sites.

Bars & Cafés

Bars and cafés are an important part of the local economy in many travel destinations, offering tourists a more relaxed location to consume refreshments, drink alcohol and socialise with locals or other tourists. They tend to be smaller than restaurants and may have a theme or serve a fairly general range of products.

Nightclubs

Nightclubs are one of the single most essential parts of the food and beverage sector, providing travellers with entertainment during the night and actually attracting many tourists to some destinations in the first place. Indeed, some travel hotspots base their entire industry around the nightlife that is on offer there.

4) ENTERTAINMENT

Some tourists travel to new locations in the pursuit of entertainment. Such travellers may be drawn to entertainment options that are not available in their home location, or they may simply require more general entertainment, which would be accessible almost anywhere in the world, as part of their trip.



Entertainment attractions or venues are sometimes the main things drawing travellers to a particular tourist location. On the other hand, many other entertainment offerings are set up to capitalise on existing tourism.

Casino

Casinos are entertainment facilities centred on gambling activities. The majority of these activities are games of chance, although casinos do also offer games where there is some element of skill involved. Additionally, casinos are commonly connected to hotels and may offer further entertainment, such as music or comedy performances.

Tourist Information

In the modern travel and hospitality industry, tourist information exists both online and offline. Examples of online tourist information include informational websites highlighting local attractions, tourist sites or facilities. Meanwhile, offline services include tourist information centres and literature produced by the tourist board.

Shopping

The retail industry and the travel industry are closely connected and most major tourist destinations will also provide shopping facilities. Shopping can even, in some cases, attract tourists in the first place, while the shopping sub-section of the entertainment sector also includes things like duty-free shopping and local market trading.

Tourist Guides & Tours

Tourist guides provide tourists with access to organised tours of local attractions, landmarks, educational buildings and other places of interest. In doing so, they are able to offer assistance, expert insight, and context, often making the experience more enjoyable, convenient and worthwhile for the tourists.

5) CONNECTED INDUSTRIES

Finally, there are also a number of industries that are either directly or indirectly connected to the tourism industry. These include industries based on actually connecting customers with travel services, as well as industries based on providing customers with important information that can assist them in their travels.

Some of the most notable related industries are detailed in greater depth below:

Financial Services

Financial services can be linked to the travel industry in a number of ways, with the most obvious being the provision of insurance products, which offer financial protection in emergency situations, or in cases where medical treatment is needed. Additionally, financial services may be connected to things like currency exchanges.



Travel Agents

Travel agents sell travel or tourism-related products to customers on behalf of suppliers. They generally receive a commission from suppliers and also offer travellers advice on the best travel products to suit their particular needs or preferences. Some travel agents also offer business travel services.

Tour Operators

Tour operators tend to sell package holidays, which combine multiple travel and tour services into a single product. A package holiday might, for example, include charging tourists for flights, airport transfers, a hotel stay, and services from a local rep. It could also include holiday experiences or a set itinerary.

Online Travel Agencies (OTAs)

Online travel agencies, or OTAs, offer similar services to other travel agents, although these services are delivered over the internet, providing more of a self-service experience. Some of the most popular OTAs include Expedia, Booking.com, Kayak and lastminute.com. These OTAs may also double as metasearch engines.



Medical Value Travel

Medical value travel, which includes patients travelling to India for treatment both in modern medicine and AAYUSH. India has become a hub for medical tourism, especially for neighbouring countries, Middle East, central Asia and Africa. The number of people coming to India for medical treatment has grown annually at about 55%. According to Ministry of Tourism, the medical tourism space was valued at around \$3 billion (US\$) in 2015 and at \$9 billion in 2020.¹³ Industry experts peg the loss to the industry due to COVID-19 at about \$ 2.5 billion if the situation persists for the next six months. Considering the fact that with highly restrictive travel regimes that are expected to be in place in the coming few months, the industry will take at least a year to show signs of recovery.

3.8 TOURISM IN INDIA during Covid-19

The Indian tourism industry was all set to accelerate growth towards the beginning of the year 2020, but in the month of December 2019, India was completely unaware of the impact of a biological disaster called Coronavirus in Wuhan city of China. On January 30, the first case of covid-19 was confirmed in Kerala in the context of India. The state of Kerala is one of the favourable state for foreign tourist, which is also called 'God's own country'. Because in January 2020 covid-19 spread to all the states and union territories of India. That is why the lockdown was announced by the Prime Minister in India for 21 days on 24 March 2020, banning all modes of transport, domestic and international arrivals and departures. Due to which the hotel industry was also badly affected, because new booking and checking in them had stopped. This lockdown adversely affected all sectors of the Indian tourism industry in order to prevent the impact of Covid-19. Tourism industry is an industry that cannot be stored and sold later. Due to this feature, revenue generation from the ecotourism industry suffered heavily. This has been one of the worst crises affecting the Indian tourism industry.



From November 2020, news of Covid-19 virus started picking up and gradually it has reached all the regions of India. If WTTC (2020) data is analysed, the current covid-19 outbreak has severely affected the tourism and tourism sectors and due to this around 50 million jobs globally have also been at risk. The tourism industry is a world class industry and this will adversely affect employment. Tourism industry is also a major source of employment in India. And it is difficult to emerge from this pandemic without government policies and intervention, which is the major source of livelihood of Indians, who are directly and indirectly connected with the tourism industry. And it is also correct to say that the 21st century is going through the worst phase of the tourism industry. Where some communities have to compromise for their prosperity due to the seriousness of the decline of tourism revenue due to the tourism industry.

There is a fall in foreign tourists' arrival rate by 68% from February to March 2020 and hence fall in foreign exchange earnings (FEE) by 66.32% which has a significant impact on the economy. Therefore, accurate forecasting of the number of foreign tourists and FEE is crucial

in managing tourism activity. Researchers studied different forecasting models to predict the tourism demand which includes both inbound and outbound tourists, however predicting foreign tourist arrivals in India and its impact on the revenue in terms of FEE are scarce. Low numbers of foreign tourist arrivals has impacted business of luxury hotels in Udaipur, Goa and Kerala, as room rates in Indian hospitality sector in India have tanked by nearly 18 per cent.

The travel industry turned out to be exceptionally cutthroat; thus, exact the travel industry request estimating is critical to settle on a fitting key and functional choice. To decrease the spread of the covid-19 government of India -imposed lockdown in all the states including union territories, travel restrictions, national international flight restrictions which made worst effect on Indian tourism industry. Coronavirus basically influenced the vehicle business since the travel industry, inn business, and transportation becomes to stop on account of lockdown. Individuals are trying not to head out to the jam-packed spots to be protected. Lockdown is bit by bit influencing the way of life of people and embracing to the basic lifestyle.

This paper considers the different scenarios of the impact of Covid-19 which increases the impact of global tourism reduction on the income and employment of the country using the normal and equilibrium model.

CHAPTER- 4
DATA ANALYSIS AND INTERPRETATION

CHAPTER-5
FINDINGS, SUGGESTIONS AND CONCLUSION

5.1 FINDINGS

- Majority of the tourists cancel their trips due to pandemic (risk of virus spread) which resulted into the downfall of tourism sector.
- Travelling mentality of majority of the tourists have changed as some of them are willing where some others are unwilling to travel amidst the pandemic.
- Majority (53%) of the travellers book their travelling tickets on online.
- According to tourist behaviour, most of the people who travel are willing to risk their safety by removing mask to enjoy fresh air.
- Post covid, 44% of the travellers prefer group travelling rather than solo trip, it shows the behaviour of travellers.
- The travellers are not willing to stay at hotel within next six month of pandemic which in turn affects the hotels and accommodation sector adversely.
- Due to covid outbreaks majority of the travellers prefers private mode of transportation rather than public. This indicates that covid has an adverse effect on the transport sector too.
- It is found that those who are travelling only for pleasure keep on travelling pre and post covid.
- Even before the pandemic the tourists rate their travelling experiences as average rather than good, which indicates the need for improvement in the respective sector.
- Safety became a main barrier since majority of the tourists are not feeling comfortable in sharing close spaces with strangers.
- After the pandemic the spending behaviour of all people have found reduced and controlled. Say spending power for travelling post pandemic is only up to 5000.

5.2 SUGGESTIONS

1. Sanitize hotel rooms in front of the tourists to help them make sure it's properly hygiene before the next use.
2. Develop user friendly mobile apps to ensure quick and easy booking of tickets and hotel stays.
3. Provide proper disposal facilities for used face masks and shields in order to control virus spread.
4. Make new marketing strategies by providing advertisements and brochures to attract tourists, highlighting the adherence to covid protocols.
5. Provide properly hygiene and sanitized caravan facilities to tourists. (Kerala is set to have around 353 caravans and 120 caravan parks as part of Caravan Kerala, the government's caravan tourism initiative, giving a major thrust to tourism post-pandemic and enhancing the state's reputation as a global destination.)
6. Mandate Antigen Testing before checking into the hotel. Even covid-19 Rapid Antigen Self-Test Kits can be made available for hotel guests.
7. Reschedule the number of trips of transport modes with limited number of travellers travelling at a time.
8. Ensure the transportation facilities provided are abiding by the covid protocols while taking in tourists from different places.

5.3 CONCLUSION

In this study an attempt had been made to learn the effect of covid-19 on tourism industry and other allied activities like transport sector, hotel and accommodation sectors. The COVID-19 pandemic has caused a severe economic, social, cultural and psychological impact on various stakeholders in the tourism industry. Travel and tourism companies will have to recuperate the trust and confidence of people in the recovery period to travel again after the pandemic. This study indicates that people are interested to travel to places like Alleppey one of major tourist attraction in our State, but refrain themselves due to the situation of covid 19 pandemic.

Even if the covid-19 restrictions are lifted or if any new viruses or pandemic situation arises in the future, it is advisable for the tourism and allied sectors to maintain maximum safety protocols to retain the confidence of the tourists and gain a brand loyalty thereby ensuring a steady growth of the industry.

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- Simon Hudson "Covid-19 & Travel Impacts, Responses and Outcomes" Page No: 95 - 98

ANNEXURE

QUESTIONNAIRE

1. Have you ever cancelled the trip completely or postponed the trip due to covid-19 pandemic?
 - a) Yes
 - b) No
 - c) Maybe
2. In this kind of situation the accommodation facilities provided by the agencies are satisfactory?
 - a) Extremely satisfied
 - b) Satisfied
 - c) Dissatisfied
 - d) Extremely dissatisfied
3. Have you ever been disappointed with the service rendered by the staff during post covid trip?
 - a) Yes
 - b) No
 - c) Maybe
4. Did your travelling mentality became changed due to covid-19?
 - a) Highly
 - b) Moderately
 - c) Not at all
5. Is budget became a barrier for your travelling after covid-19?
 - a) Always
 - b) Sometimes
 - c) Never
6. Which mode of booking would you prefer for booking your tickets?
 - a) Online
 - b) Offline
7. In this situation of pandemic which kind of trip you prefer?
 - a) Individual
 - b) Group
8. Would you risk in taking your mask and face shields off to enjoy the fresh air and views?
 - a) Yes
 - b) No
 - c) Maybe
9. Do you expect covid to adversely impact the tourist sector in in near future?
 - a) Yes
 - b) Rarely

e) No

10. How would you rate traveling experience as compared to before the pandemic situation?

- a) Poor
- b) Average
- c) Good
- d) Excellent

11. Do you feel safe or comfortable while sharing close space with stranger in this situation?

- a) Yes, I do
- b) Somewhat
- c) No
- d) Not sure

12. Is the proof of covid testing within 72 hours of travel making dissatisfaction among travelers?

- a) Always
- b) Sometimes
- c) Never

13. What would be the main factor that influence your decision in this time of of covid in in travelling?

- a) Price
- b) Safety against virus
- c) Flexibility to change or cancelled
- d) Others

14. With the trips you have for this year did you

- a) Postponed them with new defined date
 - Yes
 - No
- b) Consider postponing with open date
 - Yes
 - No
- c) Cancelled the trip entirely
 - Yes
 - No

15. Apart from leisure travel do you think you would be visiting India to explore the health care facilities?

- A) Yes
- B) No
- C) Maybe

16. After the covid outbreak ends and travel restrictions are lifted how comfortable will you feel?

- a) Stay at hotel
 - Comfortable
 - Uncomfortable

- b) Dine at restaurant
 - Comfortable
 - Uncomfortable
- c) Attend sporting events
 - Comfortable
 - Uncomfortable
- d) Attend conventional show
 - Comfortable
 - Uncomfortable

17. Do you have any plan that include an overnight stay at hotel within the next 6 months of covid?

- a) Yes
- b) No
- c) Plan to travel for private purpose
- d) Plan to travel for business purpose

18. If you get a chance to choose, which mode of transportation would you prefer at this present condition of covid-19 in India?

- a) Shared
- b) Public
- c) Private

19. Why would you travel during the pandemic?

- a) Stress relief
- b) For pleasure
- c) Other reason

20. How much would you willing to spend for the trip after the covid-19 lockdown

- a) Upto 5000
- b) 5000 to 15000
- c) 15000 to 25000
- d) Above 25000

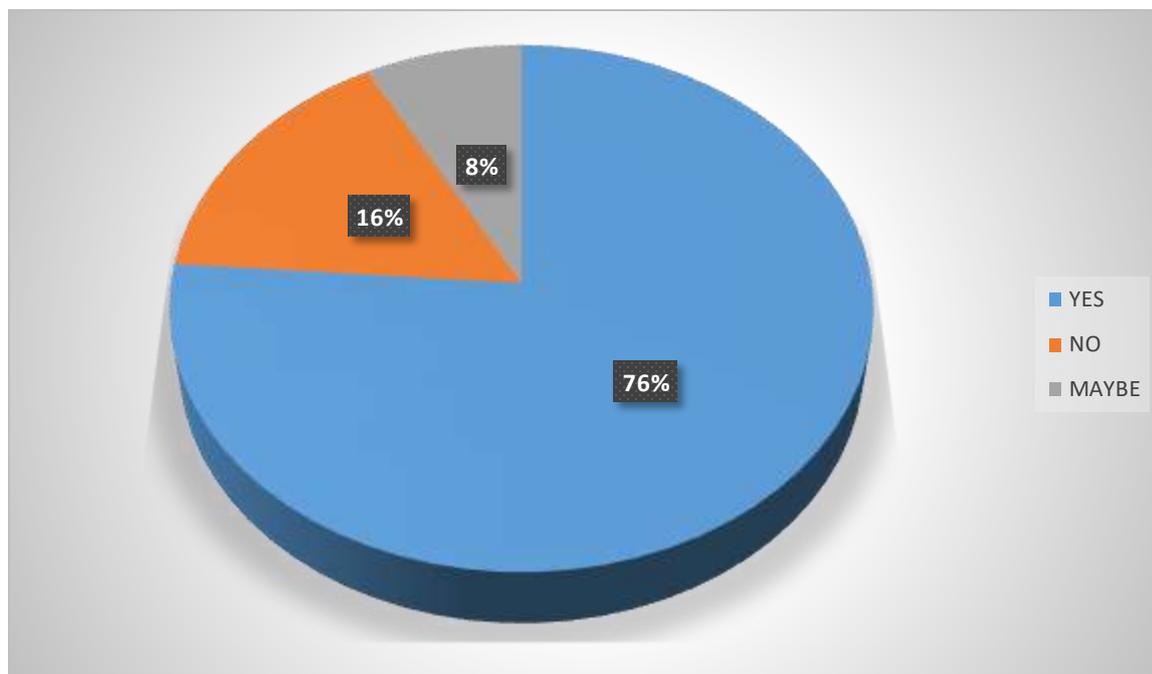
4.1 CANCELLATION OF TRIP DUE TO COVID 19

Table 4.1: On the basis of cancellation or post ponding of the trip due to covid 19.

BASIS	NO OF REPDONDENTS	PERCENTAGE
YES	48	76.2
NO	10	15.9
MAYBE	5	7.9
TOTAL	63	100

(SOURCE: Primary Data)

Fig. 4.1: Respondents opinion on the basis of cancellation or post ponding of the trip due to covid 19.



Interpretation:

From the above table and pie chart it shows that 76.2% of the respondents have cancelled the trip due to the pandemic, 15.9% have not considered cancelling and the remaining 7.9% have expressed their views as they will probably cancel the trip.

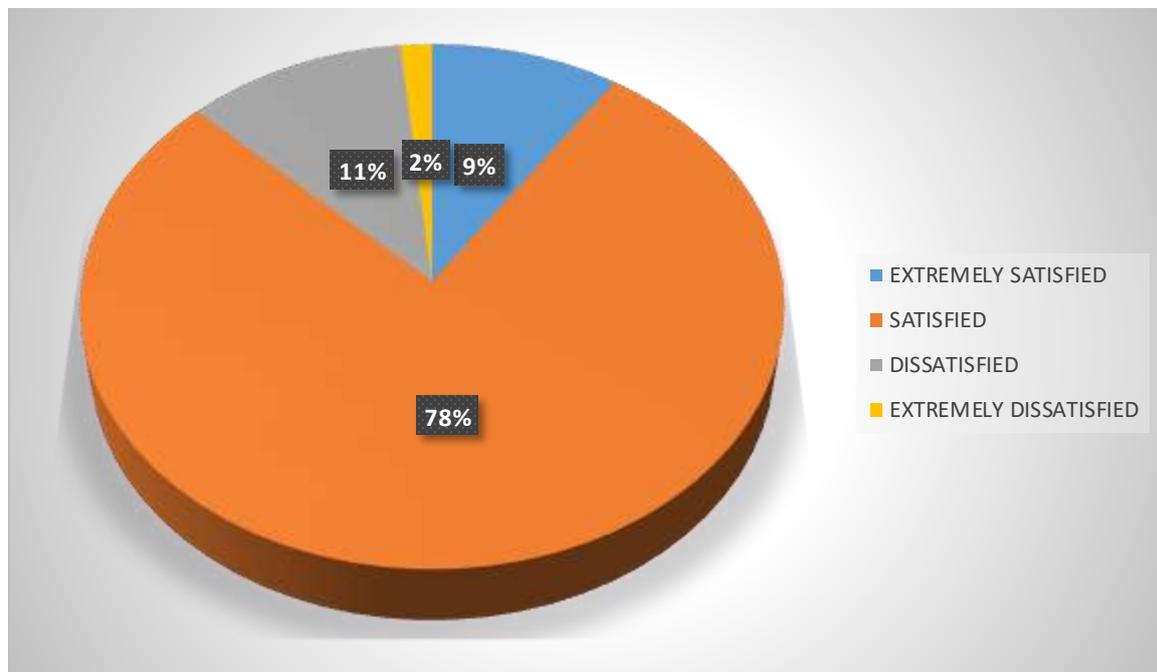
4.2 SATISFACTION OF ACCOMODATION FACILITIES PROVIDED BY AGENCIES

Table 4.2: Respondents satisfaction on accomodatipon facilities provided by agencies.

BASIS	NO OF RESPONDENTS	PERCENTAGE
EXTREMELY SATISFIED	6	9.5
SATISFIED	49	77.8
DISSATISFIED	7	11.1
EXTREMELY DISSATISFIED	1	1.6
TOTAL	63	100

(SOURCE: Primary Data)

Fig.4.2: Respondents satisfaction on accomodatipon facilities provided by agencies.



Interpretation:

The above table and pie chart interprets that majority of the tourists (77.8%) are satisfied with the accomodation facilities provided by the agencies as compared to the others.

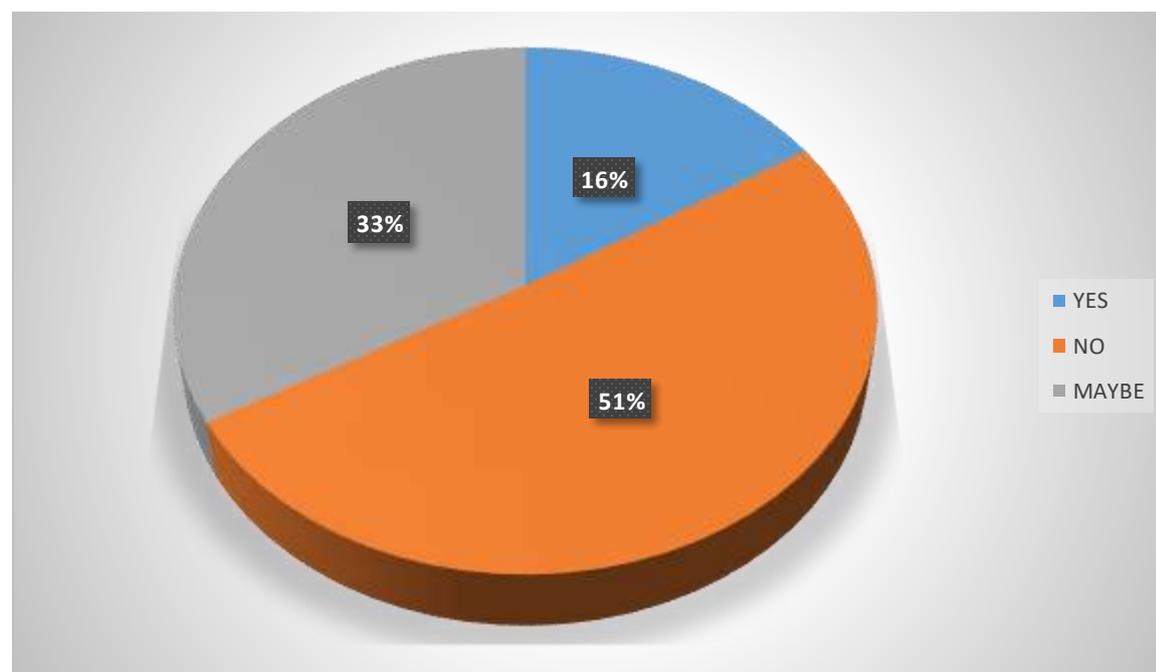
4.3 LEVEL OF DISSAPOINTMENT

Table 4.3: Respondents opinion on the level of disappointment of tourists with regard to the services rendered by staff in service sector post pandemic.

BASIS	No of Respondents	Percentage
YES	10	15.9
NO	32	50.8
MAYBE	21	33.3
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.3: Respondents opinion on the level of disappointment of tourists with regard to the services rendered by staff in service sector post pandemic.



Interpretation:

From the above table and chart it shows that (15.9%) of people are satisfied with the services rendered by the staff during post covid trips, (50.8%) of the people are dissatisfied and the remaining 33.3% are neither satisfied nor dissatisfied.

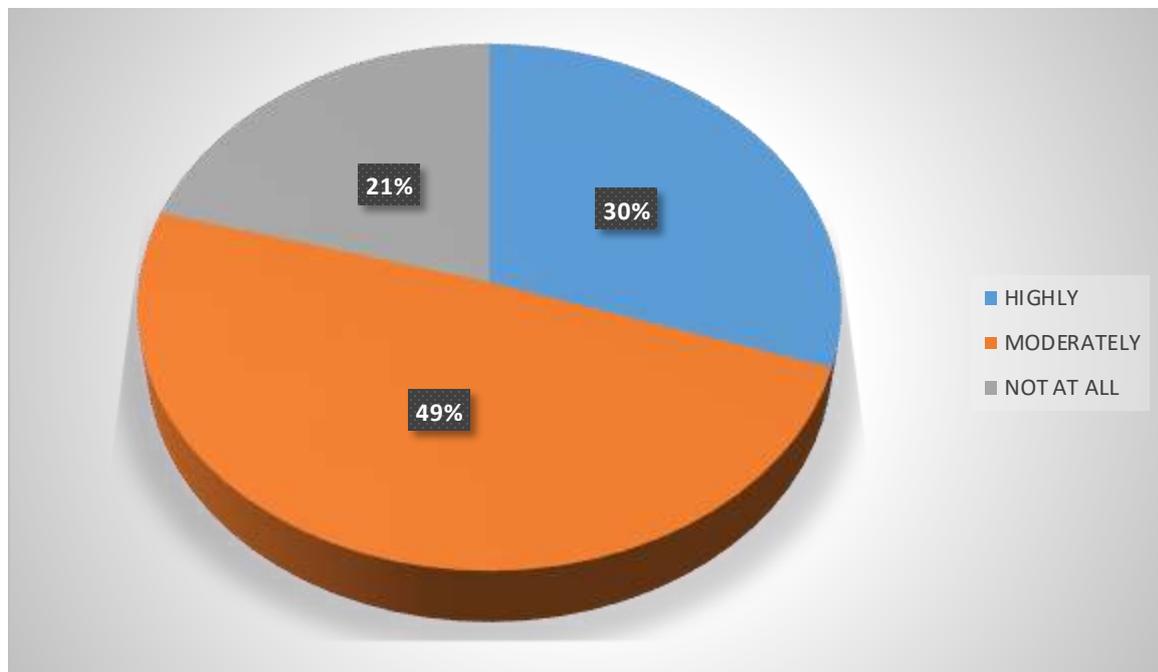
4.4 CHANGE IN TRAVELLING MENTALITY

Table 4.4: Respondents opinion on change in travelling due to the pandemic.

BASIS	NO OF RESPONDENTS	PERCENTAGE
HIGHLY	19	30.2
MODERATELY	31	49.2
NOT AT ALL	13	20.6
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.4: Respondents opinion on change in travelling due to the pandemic.



Interpretation:

As per the above table and chart, the travelling mentality of 19 of the respondents are high, 31 are moderate and the remaining 13 are not affected.

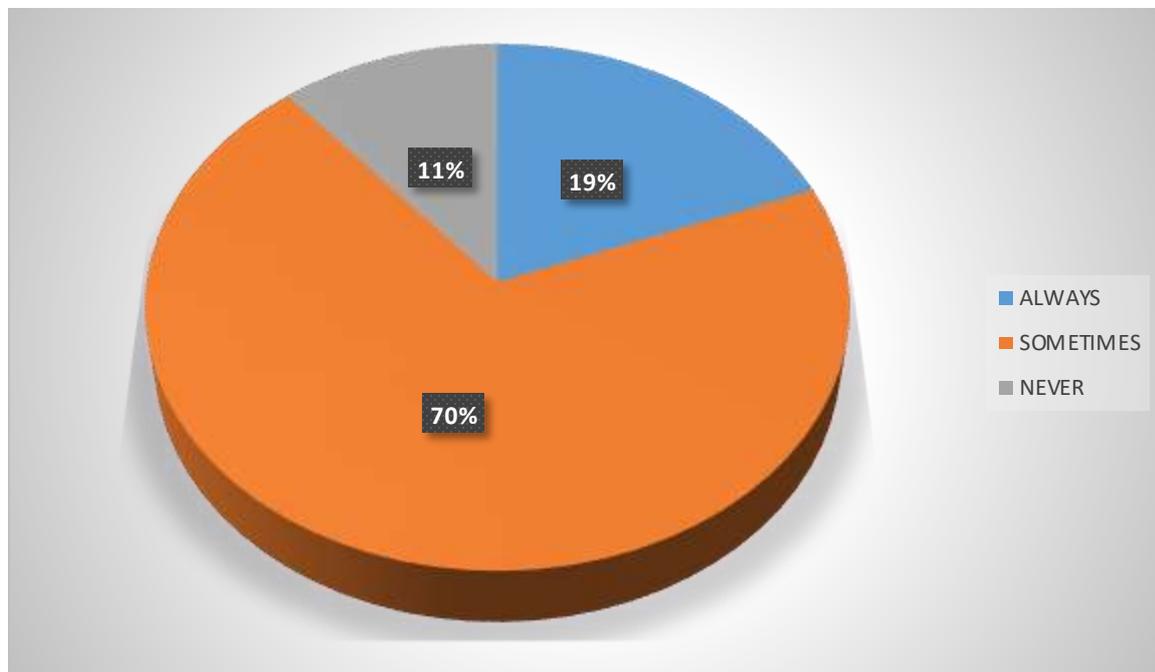
4.5 BUDGET AS A BARRIER FOR THE TRIP

Table 4.5: Respondents opinion on budget as a barrier for the trip on pandemic.

BASIS	NO OF RESPONDENTS	PERCENTAGE
ALWAYS	12	19
SOMETIMES	44	69.8
NEVER	7	11.2
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.5: Respondents opinion on budget as a barrier for the trip on pandemic.



Interpretation:

The above table and chart helps us analyse the budget acting as a barrier for the travellers as 19% of them are more willing to travel as compared to a proportion of 69.8% of them.

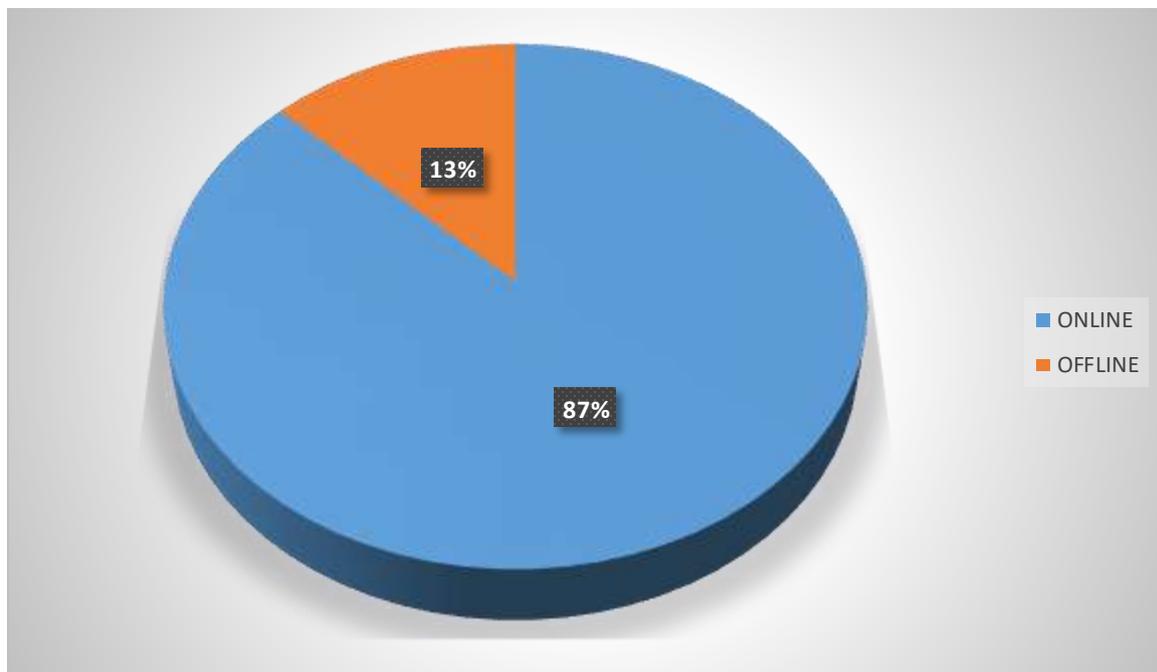
4.6 MODE OF TICKET BOOKINGS

Table 4.6: Response on mode of ticket booking.

BASIS	NO OF RESPONDENTS	PERCENTAGE
ONLINE	55	87.3
OFFLINE	8	12.7
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.6: Response on mode of ticket booking.



Interpretation:

This table and pie chart indicates that 87.3% of the respondents prefer online mode of payment as compared to the offline method (12.7%).

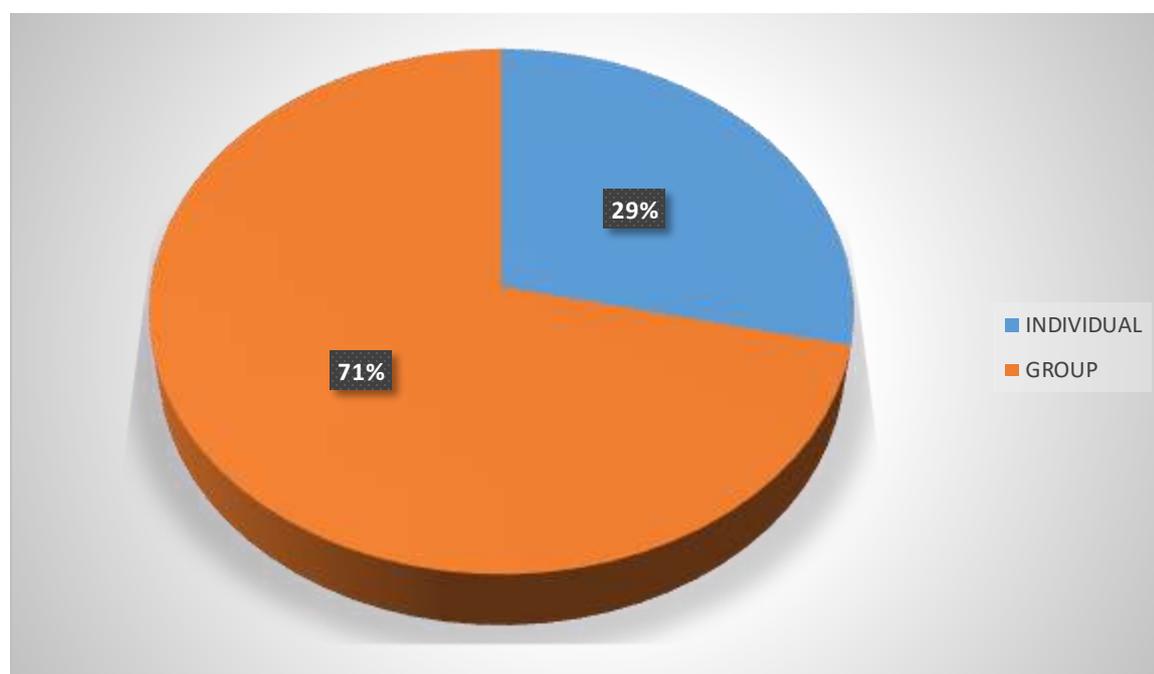
4.7 PREFERABLE KIND OF TRIP POST COVID

Table 4.7: Respondents opinion about the most preferred kind of trip post covid 19 pandemic.

BASIS	NO OF RESPONDENTS	PERCENTAGE
INDIVIDUAL	18	27.4
GROUP	45	72.6
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.7: Respondents opinion about the most preferred kind of trip post covid 19 pandemic.



Interpretation:

As per the above table and pie chart, post pandemic most of the respondents prefer travelling in groups (72.6%) rather than solo trips (27.4%).

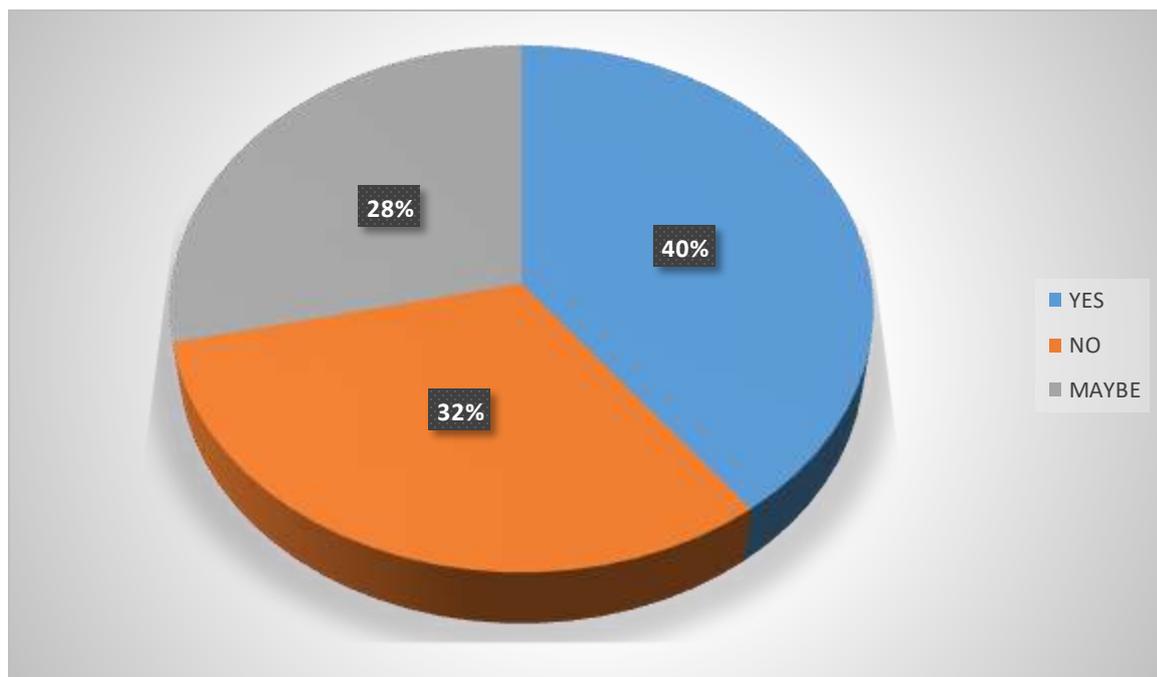
4.8 TAKING OFF FACE MASKS AND FACE SHIELDS WHILE TRAVELLING TO ENJOY FRESH AIR

Table 4.8: Respondents opinion on taking off face masks and face shields while travelling to enjoy fresh air.

BASIS	NO OF RESPONDENTS	PERCENTAGE
YES	25	39.7
NO	20	31.7
MAYBE	18	28.6
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.8: Respondents opinion on taking off face masks and face shields while travelling to enjoy fresh air.



Interpretation:

From the above table and pie chart we can conclude that 39.7% of the respondents are willing to risk their safety by removing masks and face shields off to enjoy fresh air as compared to the others (31.7%) who are not willing to take such risks.

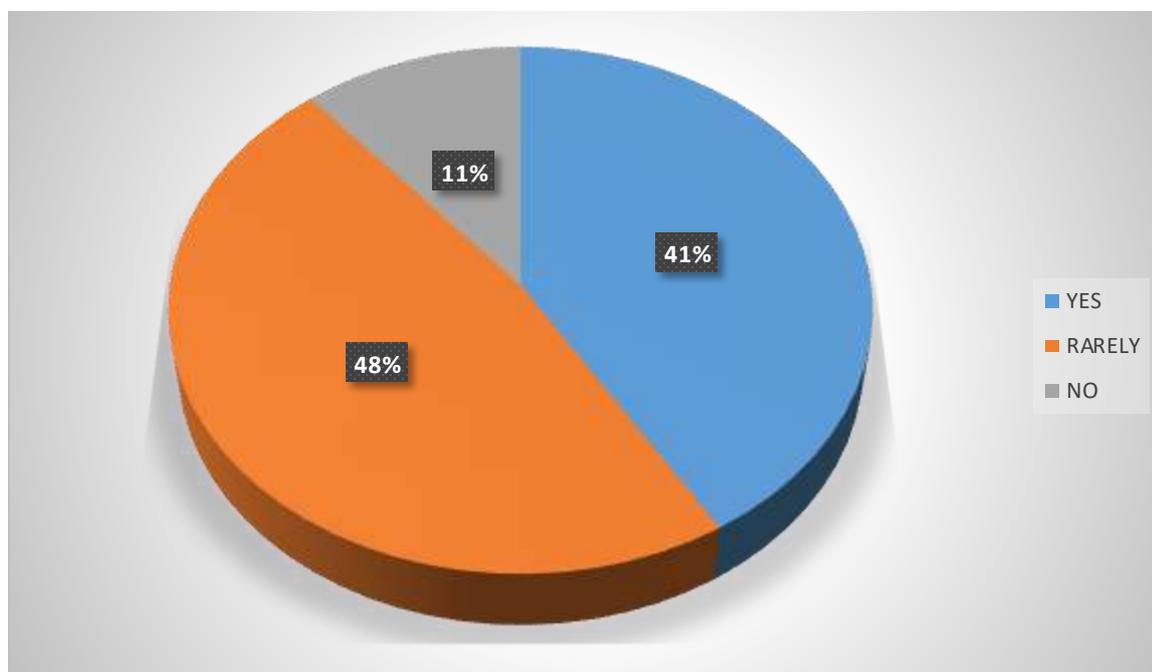
4.9 EFFECT OF COVID 19 ON TOURISM SECTOR IN FUTURE

Table 4.9: Respondents opinion on effect of covid 19 on tourism sector in near future.

BASIS	NO OF RESPONDEDTS	PERCENTAGE
YES	26	41.3
RARELY	30	47.6
NO	7	11.1
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.9: Respondents opinion on effect of covid 19 on tourism sector in near future.



Interpretation:

According to the table and fig. shown above, majority (YES: 41.3%, RARELY: 47.6%, NO: 11.1%) of the respondents believe that the pandemic will have an adverse effect on the tourism sector in near future.

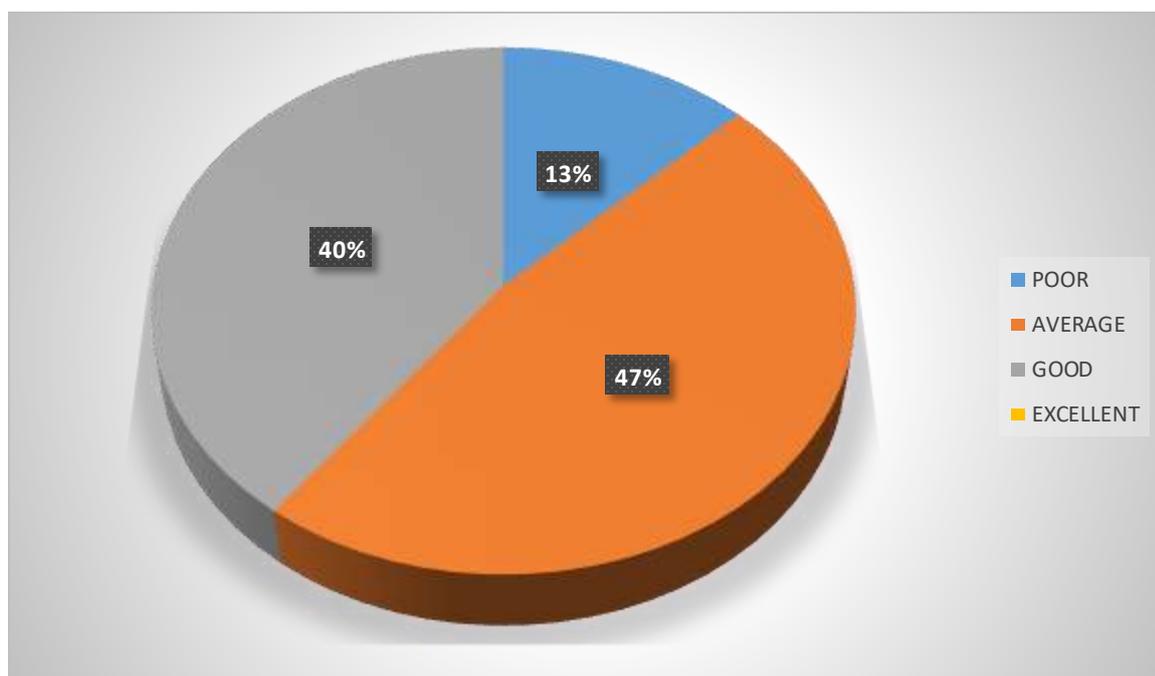
4.10 RATING OF TRAVELLING EXPERIENCE BEFORE PANDEMIC SITUATION

Table 4.10: Respondents opinion on rating travelling experience before the pandemic situation.

BASIS	NO OF RESPONDENTS	PERCENTAGE
POOR	8	12.7
AVERAGE	30	47.6
GOOD	25	39.7
EXCELLENT	-	-
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.10: Respondents opinion on rating travelling experience before the pandemic situation.



Interpretation:

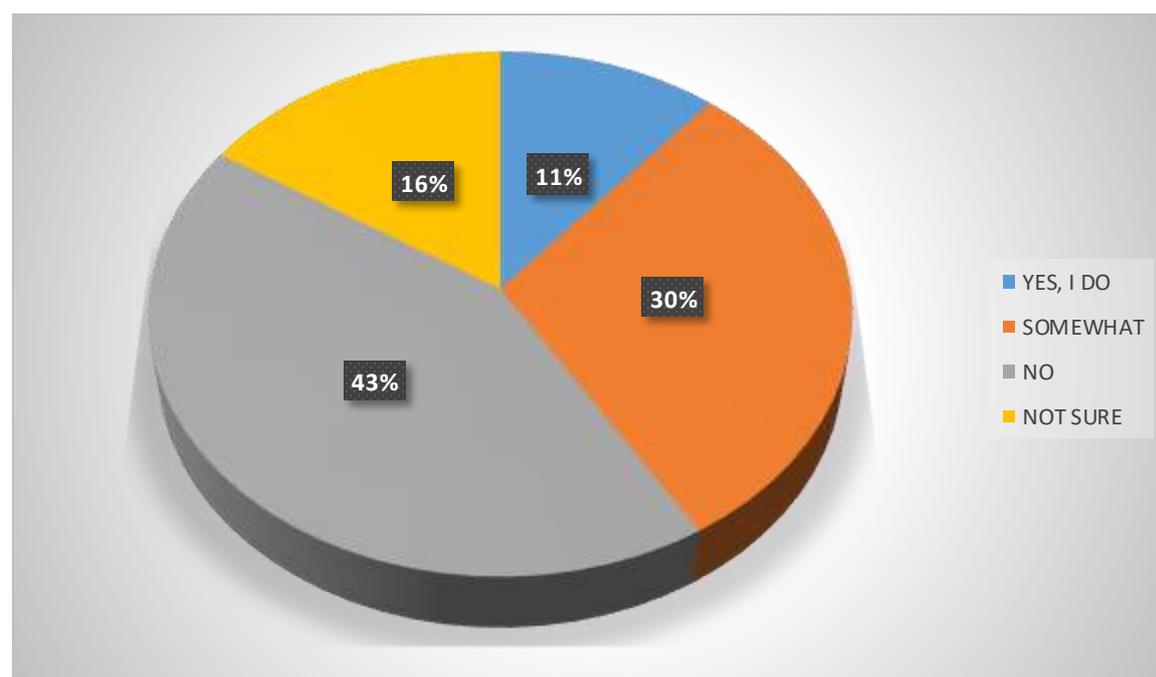
From the above table and data we can conclude that majority of the respondents have rated their travelling experience as (47.6%) which is average, (39.7%) as good and the rest (12.7%) as not good rating.

4.11 SAFETY AND COMFORT IN SHARING CLOSE SPACES WITH STRANGERS WHILE TRAVELLING

Table 4.11: On the basis of safety and comfort in sharing close spaces with strangers while travelling during the pandemic.

BASIS	NO OF RESPONDENTS	PERCENTAGE
YES, I DO	7	11
SOMEWHAT	19	30.2
NO	27	42.9
NOT SURE	10	15.9
TOTAL	63	100

(SOURCE: Primary Data)



Interpretation:

As per the table and pie chart shown above, we can interpret the data as majority of the respondents do not feel comfortable while sharing close space with strangers while travelling (59%) (Assuming that 16% of responses as 'not sure' to be 'no') while the remaining (41%) of them to feel comfortable (assuming that 30% of responses as 'somewhat' to be 'yes').

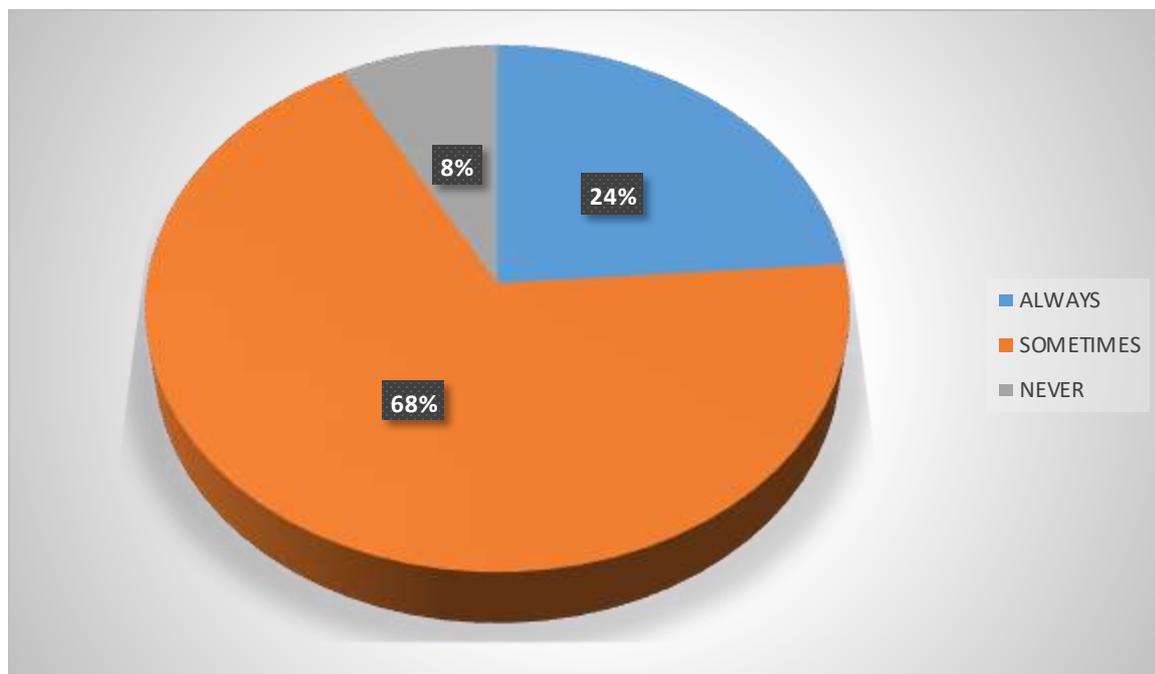
4.12 DISSATISFACTION AMONG TRAVELLERS DUE TO PROOF OF COVID TESTING PRIOR 72HRS

Table 4.12: Respondents opinion on proof of covid testing within 72hrs of travelling during pandemic.

BASIS	NO OF RESPONDENTS	PERCENTAGE
ALWAYS	15	24.2
SOMETIMES	43	69.4
NEVER	5	6.4
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.12: Respondents opinion on proof of covid testing within 72hrs of travelling during pandemic.



Interpretation:

From the above table and graph it shows that 24.2% of them have dissatisfaction in covid testing within 72 hours. But some of them (69.4%) have opinions that sometimes they are dissatisfied and the remaining 6.4% are not affected.

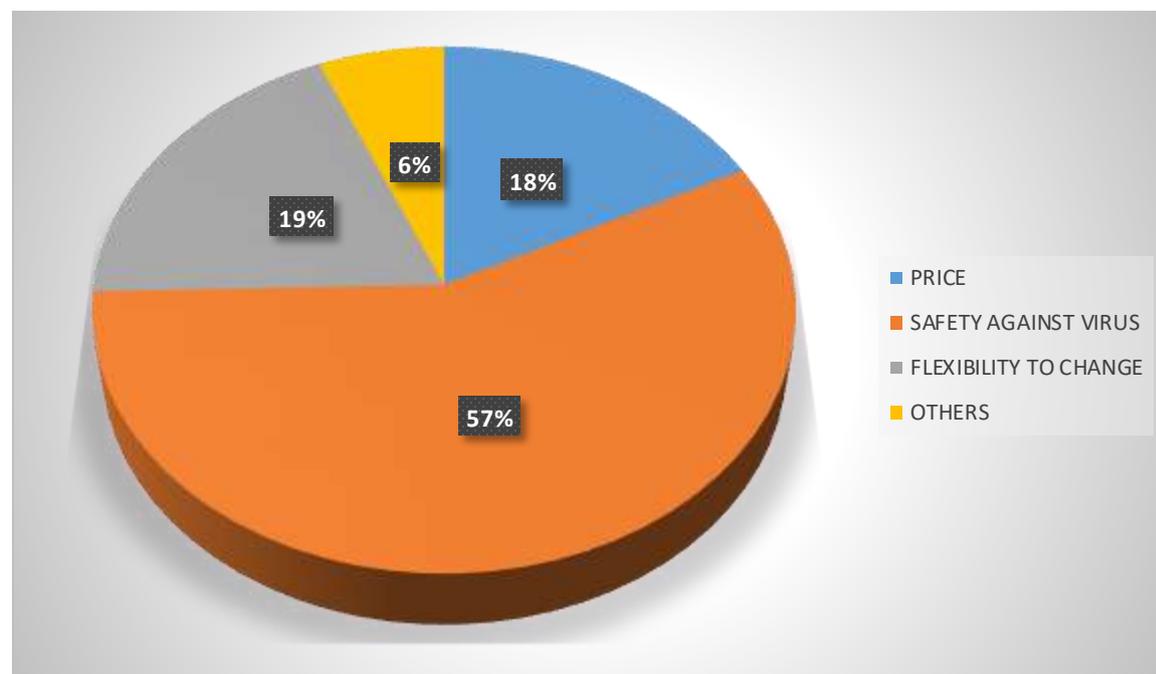
4.13 FACTORS INFLUENCING DECISION IN TRAVELLING POST COVID

Table 4.13: Respondents opinion on factors influencing the decision in travelling post covid

BASIS	NO OF RESPONDENTS	PERCENTAGE
PRICE	11	17.5
SAFETY AGAINST VIRUS	36	57.1
FLEXIBILITY TO CHANGE	12	19
OTHERS	4	6.4
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.13: Respondents opinion on factors influencing the decision in travelling post covid



Interpretation:

From the above table and graph majority of them are unwilling to travel due to the risk of safety against the virus (57.1%) as compared to the other factors as price (17.5%), flexibility to change (19%) and other (6.4%).

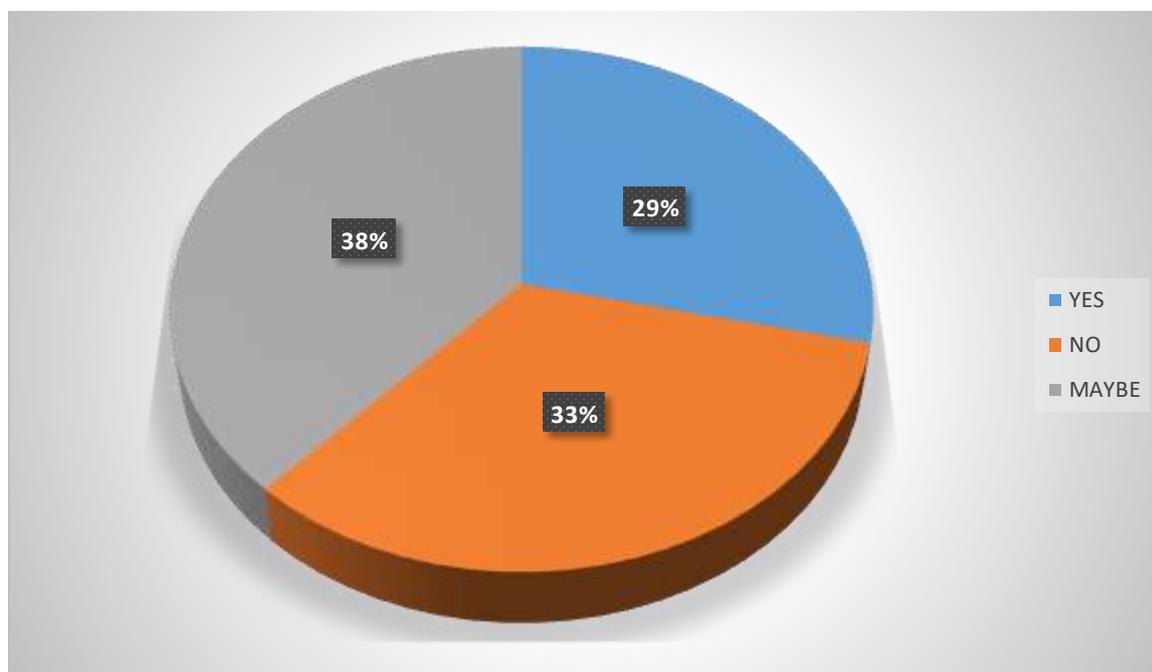
4.14 VISITING INDIA TO EXPLORE HEALTH CARE FACILITIES

Table 4.14: Opinion of respondents on visiting India to explore health care facilities.

BASIS	NO OF RESPONDENTS	PERCENTAGE
YES	18	27.4
NO	21	33.9
MAYBE	24	38.7
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.14: Opinion of respondents on visiting India to explore health care facilities.



Interpretation:

From the above table and chart we can interpret that (38.7%) of the respondents are visiting India to explore the health care facilities as part of their leisure travel as compared with exploring India for health care facilities (27.4%).

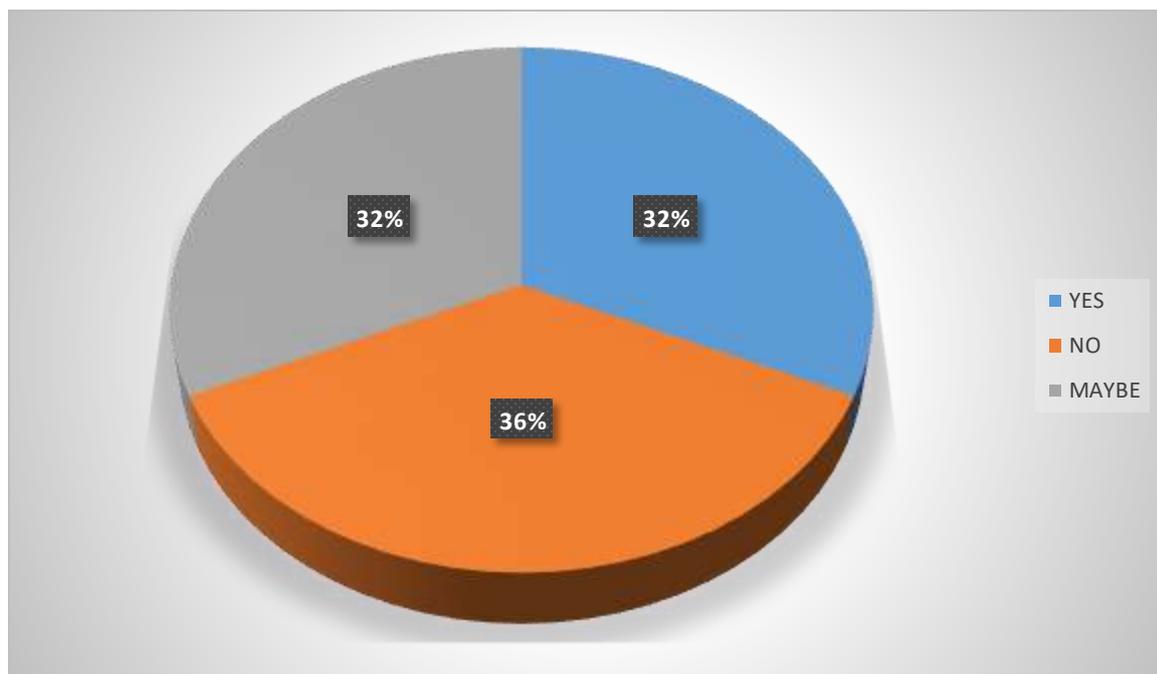
4.15 OVERNIGHT STAY AT HOTEL WITHIN NEXT SIX MONTHS OF PANDEMIC

Table 4.15: Respondent opinion about overnight stay at hotel within next six month of pandemic.

BASIS	NO OF RESPONDENTS	PERCENTAGE
YES	20	32.3
NO	23	37.1
MAYBE	20	30.6
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.15: Respondent opinion about overnight stay at hotel within next six month of pandemic.



Interpretation:

Most of them are not willing to stay at hotels overnight within next six months of travelling post pandemic (37.1%) as compared to those willing to stay (32.3%).

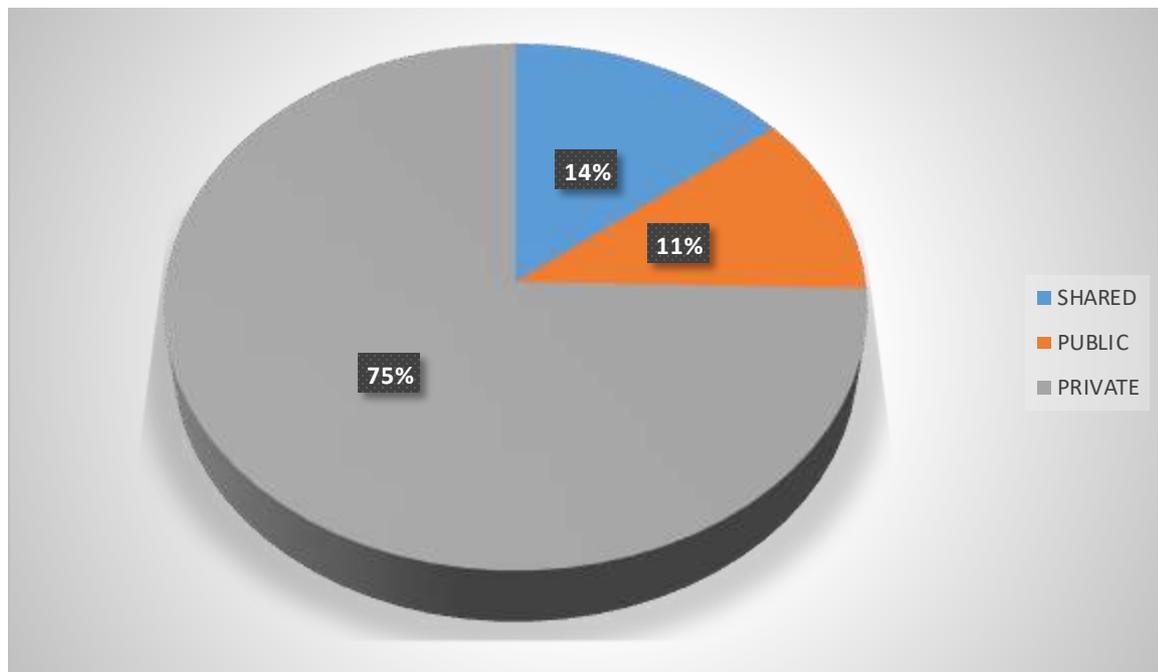
4.16 PREFERENCE ON MODE OF TRANSPORTATION DURING THE PANDEMIC

Table 4.16: Responses on preferred mode of transport during the pandemic situation.

BASIS	NO OF RESPONDENTS	PERCENTAGE
SHARED	9	14.3
PUBLIC	7	11.1
PRIVATE	47	74.6
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.16: Responses on preferred mode of transport during the pandemic situation.



Interpretation:

The above table and chart interprets that most of the travellers prefer private mode of transport (74.6%) when compared with public and shared modes of transport (11.1% & 14.3%).

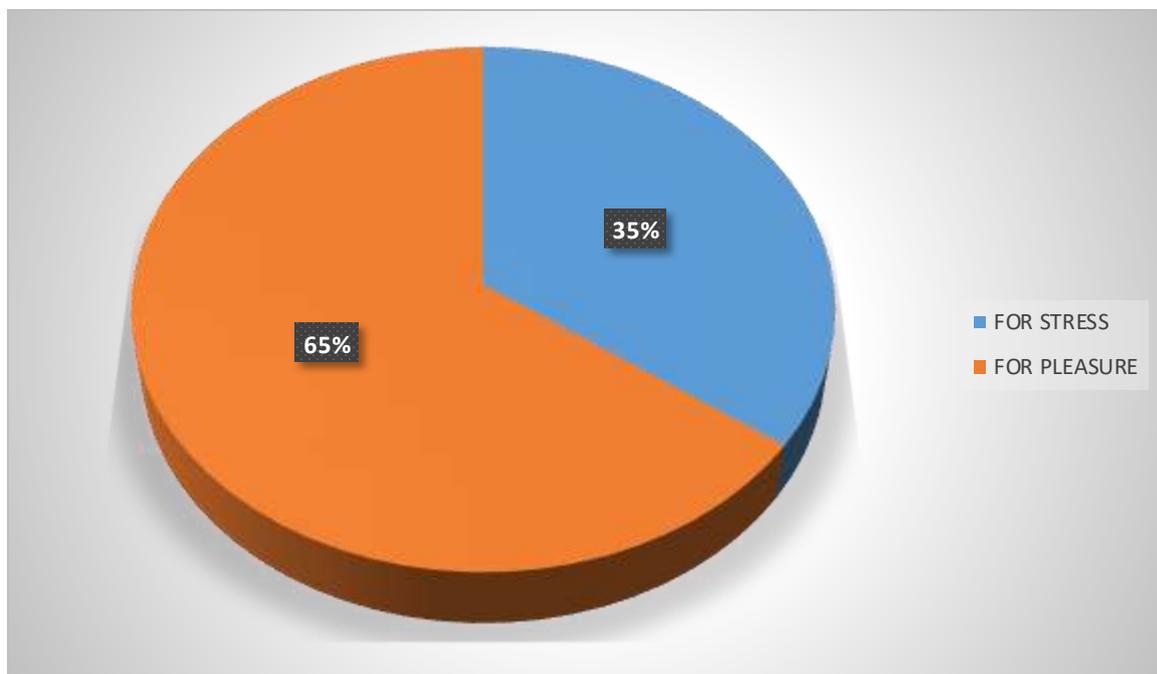
4.17 REASONS FOR TRAVELLING

Table 4.17: Respondents reasons for travelling amidst the pandemic.

BASIS	NO OF REPENDENTS	PERCENTAGE
FOR STRESS	22	35.5
FOR PLEASURE	41	64.5
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.17: Respondents reasons for travelling amidst the pandemic.



Interpretation:

Using the above table and chart we can interpret that 41 of the respondents are travelling for pleasure and the rest 22 for stress relief.

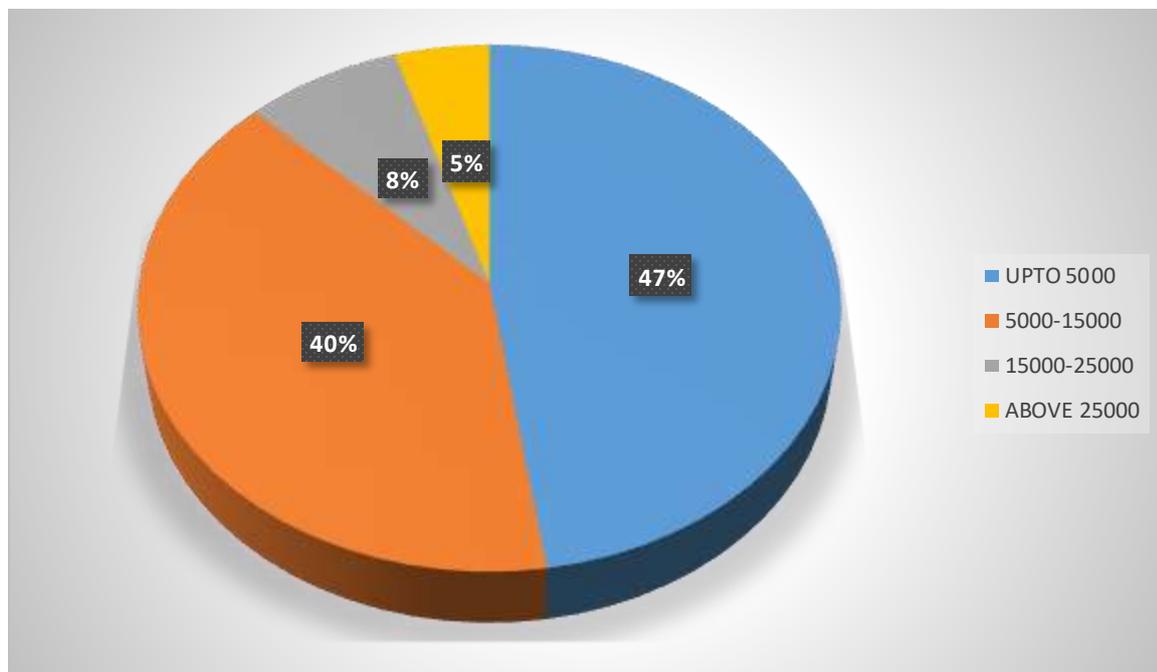
4.18 SPENDING POWER OF TOURISTS POST COVID 19 PANDEMIC

Table 4.18: Respondents spending power in travelling post covid

BASIS	NO OF RESPONDENTS	PERCENTAGE
UPTO 5000	30	47.6
5000-15000	25	39.7
15000-25000	5	7.9
ABOVE 25000	3	4.8
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.18: Respondents spending power in travelling post covid



Interpretation:

From the above table and chart it interprets that majority of the tourists are not willing to spend more than Rs.5000 for travelling post the pandemic situation.

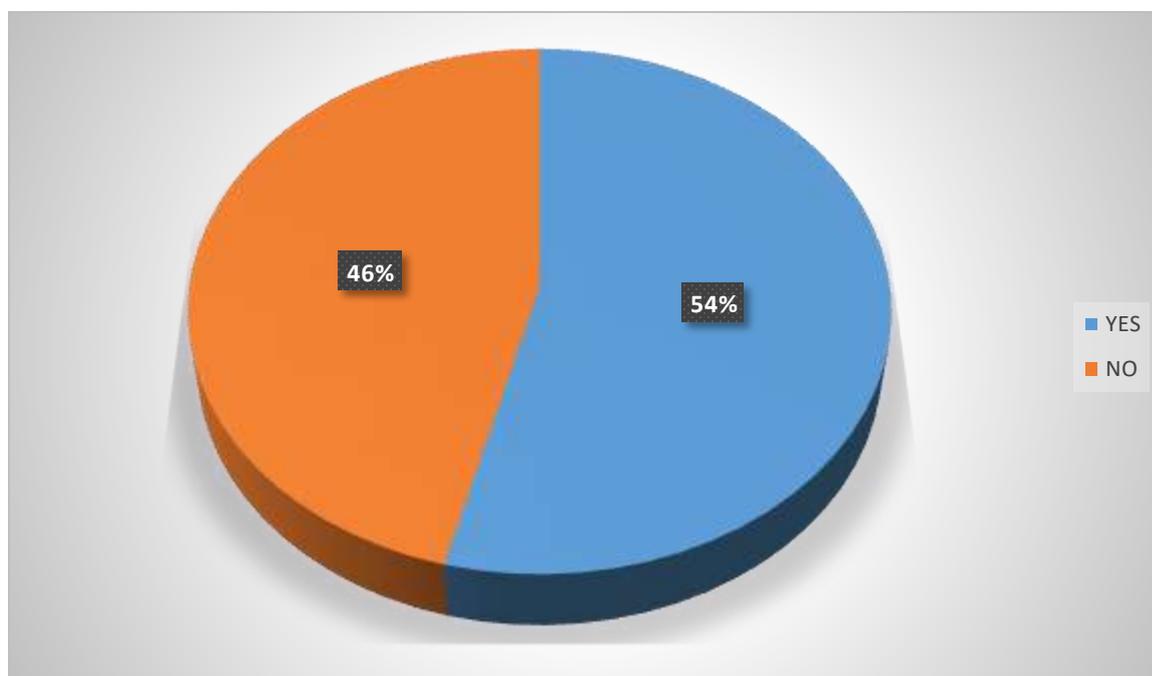
4.19 POSTPONING THE TRIP WITH NEW DEFINED DATE

Table 4.19: Respondent opinion on post ponding their trips with new dates due to covid.

BASIS	NO OF RESPONDENTS	PERCENTAGE
YES	34	54
NO	29	46
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.19: Respondent opinion on post ponding their trips with new dates due to covid.



Interpretation:

A total of 54% of the tourists have postponed their trips with new defined dated due to the covid 19 pandemic.

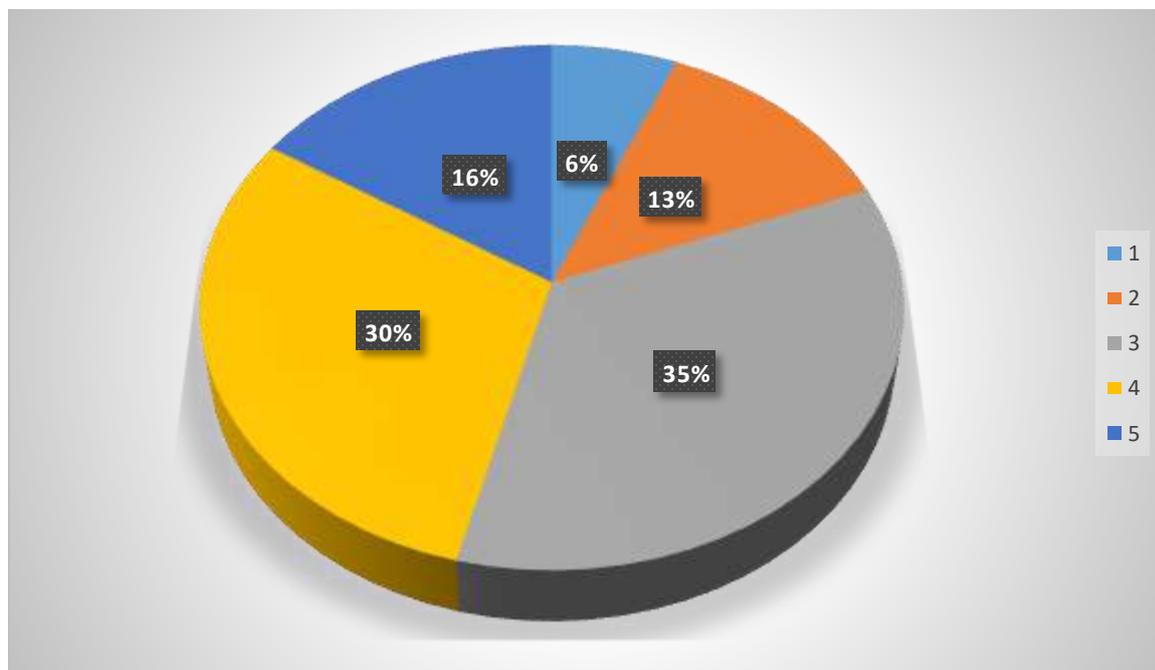
4.20 LEVEL OF COMFORT IN ATTENDING CONVENTIONAL SHOWS POST PANDEMIC TRAVEL RESTRICTIONS BEING LIFTED

Table 4.20: Opinion of respondents on their comfort level in attending conventional shows post pandemic once the travel restrictions are lifted.

BASIS	NO OF RESPONDENTS	PERCENTAGE
1	4	6.3
2	8	12.7
3	22	34.9
4	19	30.2
5	10	15.9
TOTAL	63	100

(SOURCE: Primary Data)

Fig 4.20: Opinion of respondents on their comfort level in attending conventional shows post pandemic once the travel restrictions are lifted.



Interpretation:

The above table and pie chart helps in interpreting that almost 34.9% of the respondents are only moderately comfortable in attending conventional shows in comparison to 30.2% who are highly comfortable.

DEVELOPMENT OF HEMP ICECREAM USING PAPAYA AND WOODAPPLE

Dissertation

Submitted by

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*In partial fulfillment of the requirements for the award of the degree of Bachelor of
Vocational studies*

B. Voc. FOOD PROCESSING TECHNOLOGY



ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM

COLLEGE WITH POTENTIAL FOR EXCELLENCE

Nationally Re-Accredited at 'A++' Level (4th cycle)

Affiliated with Mahatma Gandhi University

Kottayam – 686560

2022

Dissertation submitted in partial fulfilment of the requirements for the award of
Master of Science in Psychology

By

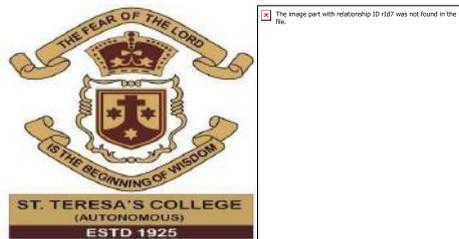
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ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM

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MARCH 2022

CERTIFICATE

This is to certify that the dissertation entitled, “A study on personality as a determinant of innovative behaviour in workplace.”, is a bonafide record submitted by Ms. Varsha S, Reg.no. SM20PSY022, of St. Teresa’s College, Ernakulam under my supervision and guidance and that it has not been submitted to any other university or institution for the award of any degree or diploma, fellowship, title or recognition before.

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Ms. Jisha Sekhar
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Department of Psychology
St.Teresa’s College, Ernakulam

Date: 30/05/2022

External Examiner 1:

External Examiner 2:

Internal Examiner:

DECLARATION

I, Varsha S, do hereby declare that the work represented in the dissertation embodies the results of the original research work done by me in St. Teresa's College, Ernakulam under the supervision and guidance of Ms. Jisha Sekhar, Assistant Professor, Department of Psychology, St. Teresa's College, Ernakulam, it has not been submitted by me to any other university or institution for the award of any degree, diploma, fellowship, title or recognition before.

Varsha S

Place: Ernakulam

Date: 3/05/2021

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Thanking you
Varsha S

Chapter 1

PERSONALITY AS DETERMINANT OF INNOVATIVE BEHAVIOUR IN WORKPLACE

Introduction

The ability to continuously innovate and improve products, services and work processes is nowadays crucial for organisations (De Jong & Den Hartog, 2007). Innovation and creativity has been used as synonyms by many scholars, while some were able to distinguish the two concepts. Mumford & Gustafson, (1988) said Creativity has to do with the production of novel and useful ideas and innovation has to do with the production or adoption of useful ideas and idea implementation (Kanter, 1988; Van de Ven, 1986). Though creativity is often described as doing something for the first time anywhere or creating new knowledge, while innovation covers the adaptation of products or processes from outside an organisation, in practice idea generation is only one stage of the multistage process of innovation. Thus Scott & Bruce, (1994) viewed innovation as a multistage process, with different activities and different individual behaviors necessary at each stage.

Researchers have worked on several factors that predict innovative behaviour, for example organisational climate (Abbey & Dickson, 1983). This represents signals individuals receive concerning organisational expectations for behaviour and potential outcomes of behaviour. A conducive psychological climate in an organisation that promotes innovative behaviour among employees (Scott & Bruce, 1994), Leadership was also found to be a predictor of innovative behaviour (Waldman & Bass, 1991, cited in Scott & Bruce 1994), the leadership style adopted by the manager goes a long way to how innovative the subordinates will be. Seer, (1989) in his study found that work- group can also be a predictor of innovative behaviour; group cohesion and communication were some of the variables that signalled work-group as a

factor that promotes innovative behaviour. Problem-solving style of an individual was also found to be a determinant of innovative behaviour; this is the cognitive ability of individualism an organization to solve issues that has to do with innovation (Kirton, 1976).

Since innovative behaviour is expected of employees, and a major factor that predict employer's delivery and performance in their personality, therefore it will be important to know whether certain personalities in an individual can predict innovative behaviour in the work place. Personality has been studied by many researchers to be the predictor of so many work factors, for instance Hlatywayo, Mhlanga & Zingwe (2013) found that neuroticism was positively and weakly correlated to job satisfaction. Hence low neuroticism is positively related to job satisfaction, and less likely to be distracted easily, which has less behavioural risks.

The focus of this work is on innovation. Innovation drives and sustains the success of organizational motives; it helps to continually make an organization relevant even in a competitive environment. Self-esteem and self-efficacy were also found to be related to job satisfaction (Cleare 2013). Other phenomena in work place where personality has been studied as a predictor includes job performance (Alharbi & Wan Khairuzzaman 2012) and organisational commitment (Hoffmann, Ineson & Stewart, 2008)

NEED AND SIGNIFICANCE OF STUDY

The study is expected to contribute to scientific knowledge and also provide practical ways of enhancing innovative behaviour using employees' personality traits. This work is also expected to direct the organisation during recruitment process, so that they will be able to select individuals that possess the right personality traits that will promote innovation in the organisation. Lastly the significance of this study to the targeted population is to help them identify personality traits inherent in them that support innovation and be able to increase the exhibition of such traits.

Therefore, as with all case study designs, the present study would have external validity, as the findings from this research might readily apply to other organisation. This is because the organisation is made up of individuals with their own uniqueness and the organisation herself has unique culture, values and norms.

Chapter 2

Review of Literature

Hodson (1989) conducted study of gender difference in the determination of job satisfaction found that minor difference occurs in men and women job satisfaction especially in a job that is peculiar to a particular gender. At least some women do not like complex work as men. Women also express slightly greater job dissatisfaction than men they have children under six years of age.

Watson & Hubbard (1996), Bakker et al., (2002) conducted study The intelligence and curiosity are the traits associated with openness to experience. They noted that people with high on openness to experience reflect a more flexible, imaginative, and intellectually curious approach in situations characterized with stress.

Blickle (1996) found that openness to experience is related academic performance. Based on the previous studies, Patterson et al., (2009) asserted that openness to experience is the most salient personality dimension to predict the propensity for innovation (Batey&Furnham, 2006) and noted that there is a great deal of empirical studies with evidence of positive relationship between openness to experience and innovation. Patterson et al., (2009) further noted that some studies reflected that this relationship might be moderated by the contextual factors (Burke & Witt, 2004).

Anderson et al. (2004), conducted study in the main organisational, team, job and individual level factors, were found to influence employee innovativeness. These factors play a central role in influencing both individual innovativeness and that they are borne through interaction among employees. All these factors need to be considered when encouraging and supporting innovativeness in contemporary organisations. It has to be acknowledged that person, job and team-related factors such as personality characteristics, autonomy, goals and relationships with colleagues and line managers may play a more direct role in influencing the initiation phase of the innovation process characterised by creativity, than organisational level factors such as the structure or culture of the organisation.

Patterson et al., (2009) conducted study that although individuals are the source of innovations, innovations rarely occur in isolation. In order to innovate, employees often need

to relate and interact with other individuals - inside or outside the organisation-hence the importance of communication, articulation, and social networking skills. They further looked at the previous empirical studies and noted that there are inconsistent results regarding whether extraversion or introversion affect innovation. They concluded that introversion is related to real life artistic endeavour, while extraversion is good predictor of creativity and innovation.

De Spiegelaere (2011), conducted study to determine the relationship between job design and innovative work behaviour. The study was conducted using 952 employees from 17 different companies from various sectors. The surveys were distributed to all employees that would participate in the upcoming project of organisational innovation. The findings from this study show that the relation between the job design and innovative work behaviour differs significantly for blue-and white-collar employees. Job resources, such as organizing tasks, have a more positive relation with innovative work behaviour for white-collar workers in comparison with blue-collar workers. This finding can be linked to previous literatures which identified routine tasks both as potential obstacle and a driver for innovative behaviour.

, Subramaniam (2012) in a study to determine the relationship between selected predictor variables and innovative behaviour in the workplace. The predictor variables are leader member relationship, leader role expectation, demographic variables and problem-solving style. Using questionnaire to collect data from 79 teacher educators, He found that only leader-member exchange correlated significantly with support for innovation. Leader-member exchange, leader role expectation and intuitive problem-solving style correlated significantly with individual's perception of adequacy of resource supply for innovation. Leader member exchange is the only variable that correlated significantly with psychological climate for innovation. He also found a significant relationship between psychological climate and innovative behaviour. Leader-member exchange, leader-role expectation, systematic problem-solving style and intuitive problem-solving style correlated significantly with innovative behaviour. He concluded that psychological climate for innovation is influenced by leader-member exchange and that support for innovation without resource supply will not result in innovative behaviour.

Oukes (2013), found a positive relationship between innovative stimulating leadership and innovative work behaviour among workers, this implies that when supervisors display innovative stimulating behaviour to a large extent, employees will be more motivated.

Hlatywayo, Mhlanga & Zingwe (2013), conducted study where they investigated if neuroticism was a determinant of job satisfaction among bank employees. They used members of staff of a bank comprising of male and female, permanent and contract staff. They found that employees with low level of neuroticism experience higher level of job satisfaction. Hlatywayo et al concluded that the banking environment requires employees with low levels of neuroticism due to the nature of services they offer.

Ajitoni Sunday, Jitoni Sunday, Carew Oluwakemi, Adalumo Foluke, Adesanya Damilola, Adegunopeymi, Alabi Kayode (2013) conducted study among 60 participants about personality and innovative behaviour in workplace. In their study it was found that the personality trait as Extraversion, Conscientiousness, Openness to experience, Agreeableness show positive relation to innovative behaviour. The neuroticism has negative relation with innovative behaviour. Stephen Anthony Woods, Michael James Mustafa, Neil Robert Anderson, Benjamin Sayer. Conducted study among 146 participants about personality and innovative behaviour in workplace.

Chapter 3

Aim

The personality as determinant of innovative behaviour in work place.

Statement Problem

There is a significant relationship between personality and innovative behaviour of individual.

Objective of study

- 1) There is a relationship between personality and innovative behaviour
- 2) There is a significant difference between innovative behaviour in Males and Females

Hypothesis

- 1) H0: the personality determines the innovative behaviour of the individual
- 2) H1: the personality doesn't determine the innovative behaviour of the individual

Operational Defination

Personality

Personality refers to individual differences in characteristic patterns of thinking, feeling and behaving. The study of personality focuses on two broad areas: One is understanding individual differences in particular personality characteristics, such as sociability or irritability. The other is understanding how the various parts of a person come together as a whole. Personality, a characteristic way of thinking, feeling, and behaving. Personality embraces moods, attitudes, and opinions and is most clearly expressed in interactions with other people. It includes behavioural characteristics, both inherent and acquired, that distinguish one person from another and that can be observed in people's relations to the environment and to the social group.

The term personality has been defined in many ways, but as a psychological concept two main meanings have evolved. The first pertains to the consistent differences that exist

between people: in this sense, the study of personality focuses on classifying and explaining relatively stable human psychological characteristics. The second meaning emphasizes those qualities that make all people alike and that distinguish psychological man from other species; it directs the personality theorist to search for those regularities among all people that define the nature of man as well as the factors that influence the course of lives. This duality may help explain the two directions that personality studies have taken: on the one hand, the study of ever more specific qualities in people, and, on the other, the search for the organized totality of psychological functions that emphasizes the interplay between organic and psychological events within people and those social and biological events that surround them. The study of personality can be said to have its origins in the fundamental idea that people are distinguished by their characteristic individual patterns of behaviour. Although other fields of psychology examine many of the same functions and processes, such as attention, thinking, or motivation, the person places emphasis on how these different processes fit together and become integrated so as to give each person a distinctive identity, or personality. The systematic psychological study of personality has emerged from a number of different sources, including psychiatric case studies that focused on lives in distress, from philosophy, which explores the nature of man, and from physiology, anthropology, and social psychology

Innovative Behaviour

Innovative behaviour refers to the introduction and application of new ideas, products, processes, and procedures to a person's work role, work unit, or organization. Innovative behaviour can be carried out both by an individual organizational member or groups of individuals within an organization. It is a broader concept than creativity and encompasses a variety of behaviors involved in the generation, promotion, and implementation of new ideas. Management research on innovative behaviour focuses on the human aspect, rather than the technical aspect, of innovation. With its focus on human behaviors and processes, this body of work applies theories from disciplines such as psychology and sociology to understand situations and factors that influence the innovative behaviour of individual employees and groups of employees in the organizational setting. Different theoretical perspectives are reflected in this literature and can be evaluated to understand the vantage points through which management scholars' study innovative behaviour. A great amount of research has been focused on identifying factors that may encourage and enable employees to demonstrate innovative behaviour at work. Frequently studied topics include individual

characteristics, motivation, and affect, as well as contextual antecedents such as organizational culture, job characteristics, leadership, and social relationships. Innovative behaviour can also occur at the group level, which led to a stream of research on team innovation. Studies on team innovation shed light on innovative behaviors and processes that are unique to the team environment. Moreover, studying innovative behaviour cross-culturally provides critical knowledge in a global economy and yet, at the same time, presents its own challenges. In this bibliography, we review major research studies on each of these important issues

Sample

There are 300 sample collected from working employees in organization.

Population

The data is collected from working employees in a company to understand their personality and innovative behaviour.

Sample design

Simple random sampling.

Inclusion criteria

Those who have or above age 25 who are working in the are included.

They should be working in the organization.

Exculsion criteria

Those who are below the age of 25 are excluded.

Those who are not working are also excluded.

Tests/ tools used for data collection

BIG FIVE PERSONALITIES THEORY

The Big Five is so named because the model proposes that human personality can be measured along five major dimensions, each of which is distinct and independent from the others. The Big Five model is also sometimes called OCEAN or CANOE, both acronyms of the five traits.

In the Big Five model, people are understood to have varying levels of key personality factors which drive our thoughts and behavior. Although personality traits cannot specifically predict behavior, differences in the Big Five factors help us to

understand why people may react differently, behave differently, and see things differently from others in the same situation.

Openness

This trait features characteristics such as imagination and insight.¹ People who are high in this trait also tend to have a broad range of interests. They are curious about the world and other people and eager to learn new things and enjoy new experiences. People who are high in this trait tend to be more adventurous and creative. People low in this trait are often much more traditional and may struggle with abstract thinking.

Conscientiousness

Standard features of this dimension include high levels of thoughtfulness, good impulse control, and goal-directed behaviors. Highly conscientious people tend to be organized and mindful of details. They plan ahead, think about how their behavior affects others, and are mindful of deadlines.

Extraversion

Extraversion (or extroversion) is characterized by excitability, sociability, talkativeness, assertiveness, and high amounts of emotional expressiveness.¹ People who are high in extraversion are outgoing and tend to gain energy in social situations. Being around other people helps them feel energized and excited. People who are low in extraversion (or introverted) tend to be more reserved and have less energy to expend in social settings. Social events can feel draining and introverts often require a period of solitude and quiet in order to "recharge."

Agreeableness

This personality dimension includes attributes such as trust, altruism, kindness, affection, and other prosocial behaviors. People who are high in agreeableness tend to be more cooperative while those low in this trait tend to be more competitive and sometimes even manipulative.

Neuroticism

Neuroticism is a trait characterized by sadness, moodiness, and emotional instability.¹ Individuals who are high in this trait tend to experience mood swings, anxiety, irritability, and sadness. Those low in this trait tend to be more stable and emotionally resilient.

Procedure

The data is collected through online platform in google form. The data are collected randomly from an individual. The google form sent it into online such as WhatsApp, or through email.

Reliability

The reliability of test is 0.91 to 0.85.

Validity

The test is most valid and can be used in all the organization and it can be done to working employee

Scoring

The scoring is done to 50 questionnaire . The scoring is done 1-strongly disagree,2-disagree,3-neutral,4-agree, 5strongly agree. There is also reverse scoring. That is 5-strong disagree, 4- disagree, 3-neutral, 2- agree,1_strongly agree

Individual innovative behaviour

It is defined as “the intentional creation, introduction and application of new ideas within a work role, group or organization, in order to benefit role performance, the group, or the organization” (Janssen 2000, p. 228). Janssen innovative behaviour identify three type , idea generation, Idea promotion, idea realization. It consist of 9 items. Idea generation or ideation is the act of forming ideas. It is a creative process that encompasses the generation, development and communication of new thoughts and concepts, which become the basis of your innovation strategy. Idea Realization is a way of creating new or improved services and products, sustainable cost savings and process improvements. Capitalizing on an idea is a serious matter but overlooked still. Many ideas die an early dead or even worse never get born. Idea promotion refer to further or encourage the progress or existence of. 2 to raise to a higher rank, status, degree, etc. 3 to advance (a pupil or student) to a higher course, class, etc. 4 to urge the adoption of; work for. to promote reform.

Reliability

It has good reliability. It is 0.95to 0.96. it is internal consistency

Validity

It is most valid tool used in research purpose

Scoring

It has 9 item. It is scored 1_ slightly disagree,2_ disagree, 3_neutral, 4-agree,5_strongy agree.

Data Analysis technique -

The Pearson correlation test is used for analysing the test

Chapter -4

		Innovative score	Extraversi on	Agreeablene ss	conscientiou sness	Neurotism	Openn ess
Innovative score	Pearson Correlation	1	.814	.657	.791	0.582	0.828
	Sig.(2-tailed)		.000	.000	.000	.000	0.000
	N	57	57	57	57	57	57
Extraversion	Pearson Correlation	.814	1	.586	.726	.504	.854
	Sig.(2-tailed)	.000		.000	.000	.000	.000
	N	57	57	57	57	57	.57
Agreeableness	Pearson Correlation	.657	.586	1	.726	.532	.680
	Sig. (2-tailed)	.000	.000		.000	.000	.000
	N	57	57	57	57	57	57
Conscientiousness	Pearson Correlation	0.791	0.767	0.726	1	0.663	0.757
	Sig.(2-tailed)	0.000	0.000	0.000		0.000	0.000
	N	57	57	57	57	57	57
Neuroticism	Pearson Correlation	0.582	0.504	0.532	0.483	-1	0.501
	Sig.(2-tailed)	0.000	0.000	0.000	0.000		0.000
	N	57	57	57	57	57	57
Openness	Pearson Correlation	0.828	0.854	0.757	0.501	0.501	1
	Sig.(2-tailed)	0.000	0.000	0.00	0.000	0.000	
	N	57	57	57	57	57	57

Result and discussion

The personality trait show high in character of extraversion, consciousness, openness to experience show high level of innovative behaviour in their life. In this table shows the innovativeness and personality trait score. The value of correlation value from

-1 to+1. In this table the correlation between innovativeness and extraversion score is 0.81 to0.84. It is a positive correlation. So those who possess character as extraversion also possess innovative behaviour. The p-value (0.00). The level of significance is small. In this table there is significant correlation between innovativeness and agreeable score0.726 to 0.726. It is a positive correlation. The level of significance is small .the p-value (0.00) .In this table there is significant correlation between innovativeness and Consciousness score 0.814 to 0.814. It is a positive correlation. So those who possess character as Consciousness also possess innovative behaviour. In the level of significance is small. The p-value (0.00). The correlation for innovation and neuroticism personality trait score is0.483. Since 0.423 is personality trait is negative correlated. The level of significance is small .the p-value (0.01) then the correlation is significant and the two variables are highly linear related. the correlation coefficient for innovation and openness personality trait is 0. 828.Since 0.828 is this indicates that innovative and openness personality trait is highly positively correlated. The level of significance is small. the p-value (0.00) .

Chapter 5

Conclusion

it was to understand the personality factor influencing the innovative behaviour of individual . it was found that extraversion, agreeableness, Conscientiousness', openness to experience show high in innovative behaviour.

Findings

- 1) Those who possess characters such as consciousness, extraversion, agreeableness and open to experience show innovative behaviour.
- 2) Those who possess neuroticism character does not have innovative behaviour.

Limitation of study

- 1) There is lack of Availability of resource
- 2) There is few or very limited number of studies are available
- 3) There is need to conduct study which personality traits determine the individual innovativeness and group innovativeness
- 4) There is limited amount of time is given for doing the research

Suggestion for future studies

- 1) They need to identify whether other personality test Except big five theory and proactive personality Test to identify innovative behaviour of individual
- 2) They need to identify which personality trait assess whether individual innovative behaviour or group innovative behaviour
- 3) They depth analysis are need to be conducted to identify the relationship between personality trait and innovative behaviour of individual

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Appendices

Big five theory

Test

Rating	Item	Rating	Item
	1. Am the life of the party.		26. Have little to say.
	2. Feel little concern for others.		27. Have a soft heart.
	3. Am always prepared.		28. Often forget to put things back in their proper place.
	4. Get stressed out easily.		29. Get upset easily.
	5. Have a rich vocabulary.		30. Do not have a good imagination.
	6. Don't talk a lot.		31. Talk to a lot of different people at parties.
	7. Am interested in people.		32. Am not really interested in others.
	8. Leave my belongings around.		33. Like order.
	9. Am relaxed most of the time.		34. Change my mood a lot.
	10. Have difficulty understanding abstract ideas.		35. Am quick to understand things.
	11. Feel comfortable around people.		36. Don't like to draw attention to myself.
	12. Insult people.		37. Take time out for others.
	13. Pay attention to details.		38. Shirk my duties.
	14. Worry about things.		39. Have frequent mood swings.

15. Have a vivid imagination.	40. Use difficult words.
16. Keep in the background.	41. Don't mind being the center of attention.
17. Sympathize with others' feelings.	42. Feel others' emotions.
18. Make a mess of things.	43. Follow a schedule.
19. Seldom feel blue.	44. Get irritated easily.
20. Am not interested in abstract ideas.	45. Spend time reflecting on things.
21. Start conversations.	46. Am quiet around strangers.
22. Am not interested in other people's problems.	47. Make people feel at ease.
23. Get chores done right away.	48. Am exacting in my work.
24. Am easily disturbed.	49. Often feel blue.
25. Have excellent ideas.	50. Am full of ideas.

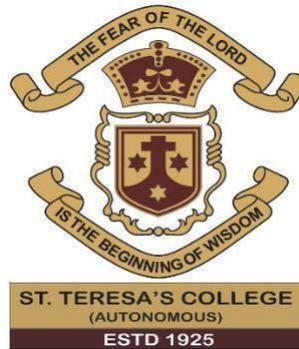
Innovative work behaviour scale

1 – Never; 2 – Rarely; 3 – Sometimes; 4 – Often; 5 – Always

Sl. No.	Statements	Never (1)	Rarely (2)	Some times (3)	Often (4)	Always (5)
1	I create new ideas for difficult issues.					
2	I search out new working methods techniques or instruments.					
3	I generate original solutions for problems.					
4	I mobilize support for innovative ideas.					
5	I acquire approval for innovative ideas.					
6	I make important organizational members enthusiastic for innovative ideas.					
7	I transform innovative ideas into useful applications.					
8	I introduce innovative ideas into the work environment in a systematic way					

9	I evaluate the utility of innovative ideas.					
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Doreamon the Soul of Japan: A Cultural Diplomacy Analysis of Doreamon Series



Project submitted to St. Teresa's College (Autonomous) in partial fulfillment of the requirement for the degree of BACHELOR OF ARTS in English Language and Literature

By

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Kerala March 2022

I hereby declare that this project entitled “Doreamon the Soul of Japan: A Cultural Diplomacy Analysis of Doreamon Series” is the record of bona fide work done by me under the guidance and supervision of Ms. Lakshmipriya P Santhosh, Assistant Professor, Department of English.

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March 2022

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I hereby declare that this project entitled “Doreamon the Soul of Japan: A Cultural Diplomacy Analysis of Doreamon Series” by Varsha Venugopal is a record of bona fide work carried out by her under my supervision and guidance.

Lakshmipriya P Santhosh

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March 2022

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An Abstract of the Project entitled

Doreamon the Soul of Japan: A Cultural Diplomacy Analysis of Doreamon Series

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BA English Language and Literature St Teresa's College (Autonomous) Ernakulam

Register Number: AB19ENG043 (2019-22) March 2022

Supervising Teacher: Lakshmpriya P Santhosh

Japan is a country well known for its enormous production of manga and anime. Japanese culture can be seen in many anime TV shows. Anime has become one among the simplest resources nowadays to inform stories in an animated form, with freedom of expression in any genre and for any audience. This study is an inquiry into the construction and communication of culture through Doraemon, one of the examples from many kinds of Japanese anime that have a popularity and is famous worldwide as Japan's tool of soft power which has the ability to persuade through culture, values and ideas. Specifically, the representation of Japanese culture in Doraemon mangas and television series. The Doraemon character has been viewed as a Japanese cultural icon, and was appointed as "anime ambassador" in 2008 by the country's Foreign Ministry. This popular manga and TV series which has been taken by Disney in the year 2005, in every angle Japanese culture has been portrayed from its family relationship, varieties of food, school environment and other cultural factors. The government of Japan hopes that Doraemon will attract foreign society towards Japanese culture, tradition, music and technology. This project discusses how Japanese Doraemon anime as their soft pow

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CONTENTS

	Introduction	1
Chapter 1:	Cultural Diplomacy : Theoretical Framework	4
Chapter 2:	Doraemon and cultural diplomacy	8
	Conclusion	21
	Works Cited	22

Introduction

In this new era of globalization where progress is fast paced and widespread, the global presence and value of countries are determined not only through military and economic strength. The strength of the state can come from small points that are often forgotten, one of which is culture. Culture is now a part of diplomacy that is engaged in approaching soft power. Japan is one of the countries that carry out this cultural diplomacy until it has successfully spread public diplomacy. Japan's success in its cultural sector has made the public's attention stronger. The culture displayed by Japan is not only traditional culture but the culture that follows the times and technology such as the presence of "Anime". Anime presents various positive effects on the Japanese states from a public perspective besides improving the economic sector, and projecting its culture, thus initiating the successful achievement of the interests of Japan. Doraemon is one example from several types of Japanese anime that are popular and famous worldwide. Doraemon was written and illustrated by Fujiko F. Fujio and was initially circulated only in print, appearing for the first time in 1969 in Japan's Children's Monthly Magazine. Before its inception as the television series, the English translation came out in comic versions. The Animated series on television debuted in 1973 on Nippon Television. Today, it is established that the soft power potential of nations is often used to create impact in a global context. The countries now impress others with their soft power potential. Modes of soft power include employment of science, art, culture, sports, and education, among other things. An analysis of the anime series Doraemon reveals deliberations of Japanese culture from all major aspects in a society, including family structure, food, educational environment and the ethos of Japan. This image is portrayed as a representative image of Japan to the international world. With the appointment of Doraemon as the anime ambassador, the Japanese government hopes that the

world community will recognise the positive side of Japan through its anime. In addition, it could promote and introduce Japan to the world since it is one of the successful examples of a creative global industry. The government of Japan also hopes that the presence of Doraemon raises the attractiveness of foreign society towards Japanese culture, tradition, music and technology. All this then formed a fans community that also spread in Asia and America. This study discusses how Japan uses Doraemon anime as their soft power.

Doraemon is a Japanese cultural anime figure that is the protagonist of the series of the same name. It is a fictional futuristic robotic cat. The series portrays the relationship between the robot and a young schoolboy named Nobita and how the robot helps him in his everyday struggles and conflicts. Doraemon has sold over 170 million copies worldwide and is one of Japan's most iconic series of all-time. The manga was created by two artists of the name of Fujiko and Fujio. The series has good educational value, and imparts many important values through innocent and comical stories. The popularity has reached such heights that the iconic blue and white robot is considered the first anime ambassador. The wide impact of the show also led to global recognition for Japanese culture and tradition.

Doraemon is the story of a futuristic robot from the 22nd century in present day and its adventures with the boy Nobita. Nobita often lands up in trouble and Doraemon eventually the robot comes to his rescue using a gadget from the future. The show explores many relevant themes like courage, over-indulgence and issues such as global warming, deforestation and so on. The character has already been elected as an international ambassador for Japan worldwide.

Doraemon has also surpassed the popular figure Godzilla in terms of ticket sales. The Doraemon film series had sold over 100 million tickets as of 26 March 2013, compared to the 99 million by Godzilla.

In 2008, Doraemon was selected by Japan's Ministry of Foreign Affairs to be an international mascot and cultural promoter. The character endorses and provide a view into Japanese culture and its traditions to different.

Doraemon's image has been used extensively for product promotion, marketing and related business. The Doraemon phenomena has resulted in such dominance worldwide that its commercial and cultural contributions are expected to grow further and beyond again in future.

In this project, chapter one will discuss the theory of cultural diplomacy. Second chapter deals with analysis of Doraemon series with different cultural factors like food, clothing, art and craft, architecture, school discipline etc. Third chapter deals with conclusion of the analysis.

Chapter 1

Cultural Diplomacy: Theoretical Framework

The purpose of the study is to look at the outcome of Japan's cultural diplomacy through Doraemon. The study demonstrates to what extent Doraemon – anime presents the cultural values of Japan and how those elements have been presented to promote and introduce Japan to the world. Primary perceptions of the series was gained by directly viewing it's episodes on Disney+ Hotstar, an Indian streaming platform. Certain categories have been identified for study using content analysis, including social affairs, culture specific food, traditional clothes, rituals, religious symbols and folkloric melodies and dances.

Cultural diplomacy, which focuses on “the exchange of ideas, information, art and other aspects of culture among nations and their people to foster mutual understanding” (Waller 11) is basically considered as a component and linchpin of public diplomacy. Compared to public diplomacy, cultural diplomacy requires long-term relationship building. (Feigenbaum 22). The term "Soft Power" was coined by Joseph S. Nye, an American scholar in 1990 (Nye 7) and since then cultural diplomacy has usually been connected with soft power, because the soft power theory provided a theoretical interpretation for the validity of cultural diplomacy in a general way.

Soft power is defined as “the ability to get what you want by attracting and persuading others to adopt your goals” and hard power on the other hand is the ability to “use the carrots and sticks of economic and military might to make others follow your will” (Nye 12-13). The theory highlights the huge function of soft power in influencing people and creating a favourable atmosphere overseas to help attain desired outcomes in the long run rather than conquer or

coerce people. Nye thinks that seduction works more effectively than coercion and is also cheaper than the latter. Especially since the values like democracy and individualism, which are deeply seductive, require to be rooted in mind by mind power (Nye 18). Therefore, in a global information age countries who fully utilize their soft power in their foreign policies tend to win hearts and minds relatively easier. One of the hypotheses put forward by the theory is that a country's soft power primarily arises from its attractiveness which includes three resources. These three resources are the country's culture including high culture and popular culture; its political value; its foreign policy (Nye 11-12). One of the prime reasons for spreading the country's soft power in the world is cultural diplomacy.

Cultural diplomacy has been one of the reasons for promoting an atmosphere that favours tolerance and respect which in turn led to eliminate prejudices and strengthen common interests with its peaceful cultural interaction. In promoting mutual understanding, it seeks to provide circumstances within which certain country's interests and policies can be acknowledged by foreigners. Cultural diplomacy is also involved in the process of shaping people's ideology and viewpoints through the diffusing culture with certain values. Cultural diplomacy's major difference from traditional diplomacy is that it targets individuals rather than governments. Moreover, its ability to reach out to young people, to non-elites, to broad audiences makes it unique. Along with this, it helps foster a favourable public opinion. Especially, if youth appreciate the culture of a certain foreign country, they may someday implement favourable decisions towards that country if they come into power. Similarly, Former Secretary of State of the United States George Schultz's comment on diplomacy is particularly applicable to cultural diplomacy, "You get the weeds out when they are small. You also build confidence and understanding. Then, when a crisis arises, you have a solid base from which to work" (Arndt 10).

Therefore, popular culture plays an important role because of its prominent attractiveness to young people, as Japanese Minister for Foreign Affairs Taro Aso said, “I think we can safely say that any kind of cultural diplomacy that fails to take advantage of pop culture is not really worthy of being called ‘cultural diplomacy’ (Iwabuchi 12).

Primarily, government, private sector and NGOs consist of the main actors in the cultural diplomatic field. The function of government is that it provides institutional support for cultural exchange projects and in principle draws a contour of cultural policy. Programs in cultural diplomacy are often strongest if they have a firm institutional base, grounded in legislation, and when they have strong support at the top of the federal government (Cumming 6). The attractiveness of that country will be discounted if one country implements one-way propaganda, so successful cultural diplomacy ultimately must focus on equal and two-way communication with foreigners. Globalization has brought a new atmosphere for cultural flows; cultural diplomacy is certainly gaining new ground in the conduct of modern diplomacy. Firstly, advancement technology facilitates information transportation and communication, which undoubtedly provides technological possibilities which paves way for cultural diplomacy further involving in international affairs. At the same time, any culture and its cultural agenda are confronting unprecedented challenges from the outside world in the globalized era, and the cultural products cannot help increasingly participate in the transnational cultural flows to survive in fierce competitiveness (Cummings 15). In this sense, under the background of economic liberalization and cultural diversification, cultural diplomacy will be less efficient since the attractiveness of a certain country’s culture may be reduced due to worldwide competition. On the whole, globalization has produced both opportunities and pressures for cultural diplomacy.

Despite the above-mentioned points on cultural diplomacy, the limits of cultural diplomacy must also be taken into consideration as considering the factor of time shows how investment in cultural diplomacy is long-term and it may take many years or even several decades to bring some effect. So, cultural diplomacy will not be a good choice for certain policies that require immediate outcome, from the perspective of the extension of cultural diplomacy's influence, it is particularly relevant to realize "milieu goals" that cultivate favourable public opinions for other specific goals. Cultural diplomacy is more likely to have an impact on the general goals that a country seeks (Lord 10), public insight may change quickly, so it is difficult to capture changes in public opinion brought by cultural diplomacy. Even if opinion polls are essential ways to measure the changes, Nye nonetheless points out that such volatility of opinion cannot be caught by any one transient poll, unless the same questions are asked consistently over some period (Nye 12). Above all, cultural diplomacy is not supreme, and its power depends on context, who relates to whom under what circumstances, so we have to take the existence of willing interpreters and receivers into consideration (Nye 13-14). Moreover, military and economic power sometimes strengthens cultural diplomacy and sometimes opposes it, so if cultural diplomatic strategies get proper influence from military and economic forces, cultural diplomacy could largely show efficiency. So, to speak, wise diplomacy will not neglect any one of the three kinds of diplomacy strategically, and it incorporates them well, as Nye said, "smart power is neither hard nor soft. It's both" (Nye 10-11).

The next chapter will be the analysis of factors of cultural diplomacy and the Doraemon series within the framework of theories.

Chapter 2

Doraemon and Cultural Diplomacy

This chapter will analyze how the Doraemon series makes use of different cultural factors to become a cultural diplomat. The first cultural factor taken is food.

Food is one of the important factors in people's lives and strongly influences the impact on their culture. It doesn't matter how you eat or how you cook it, as long as it represents your culture, it is an authentic dish. There's a robust connection between culture and food and that includes one's religion, tradition and other cultural sectors.

Food is depicted as a quintessential part of Anime which quite naturally comes from the fact that the Japanese take their food very seriously and they hold the same very close to their heart. Japan offers a number of the foremost delicious and interesting dishes around the world. The series portrays characters who love certain sorts of food, or meal times as common settings for conversations to take place. To have the ability to cook well is regarded as a positive character trait, according to Japanese culture.

Of course, it is important that Western audiences understand what the food actually is, without which it will make things a touch awkward. Since anime are made for Japanese audiences, the idea is that the viewer will know the food in question. After all, they eat food like so on a day to day basis.

Ramen is one among the popular dishes of Japan and it has been shown in the Doraemon series. Ramen comes in a massive variety of sorts, but at its most elementary it consists of Chinese-style wheat noodles plunged into a broth. Miso ramen has been popular since the mid-60s, but there also

are other meat and vegetable broths that will be used for a more traditional take. The good thing about ramen, aside from the noodles soaked in a delicious broth, is the inclusion of a spread of ingredients. Boiled eggs, nori, cuts of pork or beef, vegetables, calamari, and more can find their way into a ramen bowl.

Ramen is certainly a dish one would hear about time and time again. It's famously known as the favourite dish of Uzumaki Naruto, the star of the eponymous manga and television show.

Ramen made its appearance on Doraemon in 2016 Season – Episode 1, looking as delectable as one can remember. See Fig.1

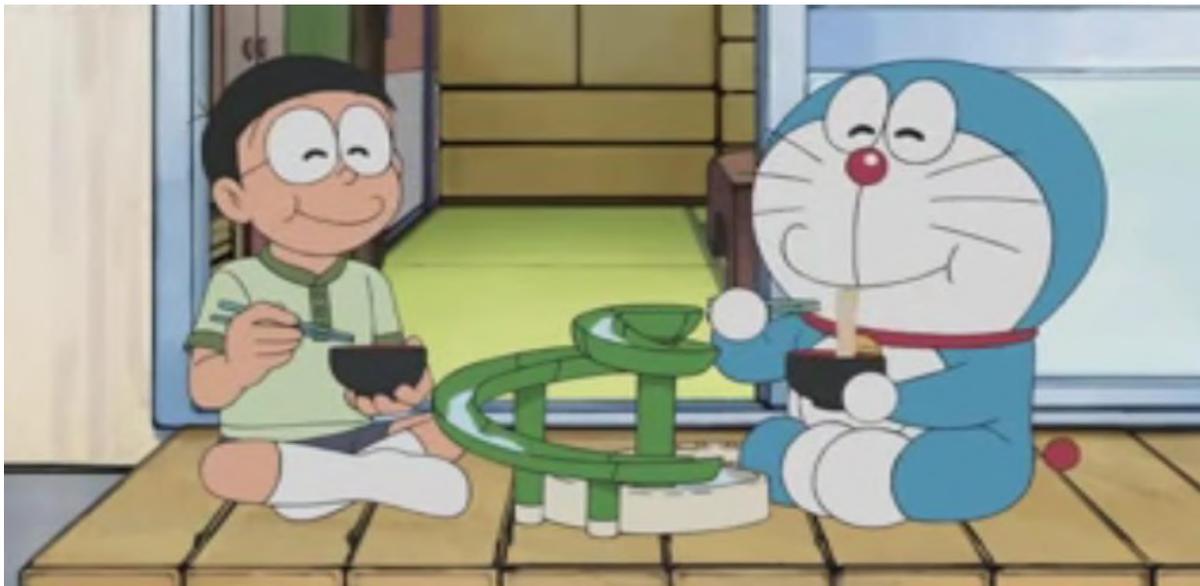


Fig. 1. Doraemon Episode 1 (00:00:56-60)

Sushi is another popular dish of Japan. Sushi exists in a kaleidoscopic range of designs, forms, and varieties for consumption, of which several entails a group of delicate and sometimes confounding set of etiquettes. Sushi has become a world phenomenon and is easily one the Westerners know the best. The process of sushi's globalization and migration started slowly and deliberately within the large Japanese immigrant communities along the Pacific Rim: western and southern America, Brazil, and Australia.

Sushi eateries are available almost everywhere you go and flavours aplenty to choose from, but to qualify as sushi one has to use vinegared sushi rice. Toppings and fillings are left to the creator's imagination. However, raw salmon, tuna, and various vegetables are considered to be the most traditionally used ingredients.

A common misconception about an ingredient of sushi is that the fish is uncooked. While it is true that raw, uncooked fish is employed in sushi, that doesn't mean the meat is unprepared. Modern sushi is frozen in special freezers where the meat could be frozen for as long as two years in some cases. Yet typically it's usually between 15 hours and seven days, counting on the freezer temperature. Since the meat cannot be cooked, it is left in the freezer to obviate parasites like nematode worms. Some sorts of tuna, farmed fish, and shellfish are exempted from this need because the prospect of parasites is pretty low.

The bottom line suggests that good sushi is one among the foremost appetizing things around the world. With reasonable pricing, Sushi is easily accessible to most classes in a community. In the big picture of a worldwide economy of consumption, the unique brand of sushi as Japanese cultural

treasure adds to the cachet of both the country and the control over the cuisine still remains unshakable in Japan.

Sashimi is a common dish found to be consumed in Japan. It is a dish brought together with raw seafood or another ingredient, sliced into bite-sized pieces and eaten with a condiment like soy. Within the broad sense of the word, sashimi doesn't need to contain seafood, it refers to savouring an ingredient on its own.

Surrounded by the ocean, Japan has had quick access to cannon fodder throughout history. To be ready to enjoy good sashimi, the fish has to be fresh and in-season. As sashimi is uncooked, using cannon fodder is additionally a requirement for hygiene and safety reasons.

As sushi and sashimi started gaining popularity across the globe, there are now many sushi variants that have evolved completely outside of Japan. A number of these ideas make it back to the Japanese shores and begin an entire new process of innovation.

Sushi and Sashimi made its appearance on Doraemon in Season 17 – Episode 36. See

Fig.2



Fig. 2. Doraemon Episode 1 (00:02:30-35)

Dorayaki is the most shown food in the Doraemon series. Dorayaki or famously known to the mob as Yummy Buns, are categorized as a type of Japanese pastry. Dorayaki closely resembles a pair of pancakes, but smaller and with a red bean paste filled core. Dorayaki is extremely popular in Japan and now its popularity has spread to other non-Asian countries around the globe. Dorayaki belongs to the category of the normal Japanese cake (*Wagashi*) that appears as a chubby round, consisting of two pieces of cake made up of *castella* glued together with red bean paste filling. Additionally, there are variations from the original taste of Dorayaki like Dorayaki red beans and Dorayaki chocolate.

Dorayakis earned their name from the Japanese term *dora*. In Japanese, *dora* means "gong". Legend has it, the first Dorayaki ever to be made was by a samurai named Benkei. Samurai Benkei forgot his gong (*dora*) upon leaving a farmer's home, when he was taking his refuge. The farmer who did not know what the item serves for unknowingly used the gong to fry pancakes and thus gave birth to the famous Dorayaki. See fig.3

The Japanese manga and anime character Doraemon is known for his love for dorayaki. In the manga, Dorayakis has been a plot device several times throughout the series. As much as Doraemon enjoys his Dorayakis, it has also functioned to be a trap as Suneo Honekawa, a character in *Doraemon* demonstrated in the Friendship Capsule with reference to an episode of the *Doraemon* series. Since 2000, the corporate company Bunmeido has been selling a limited version of dorayaki called the Doraemon Dorayaki annually around March and September.

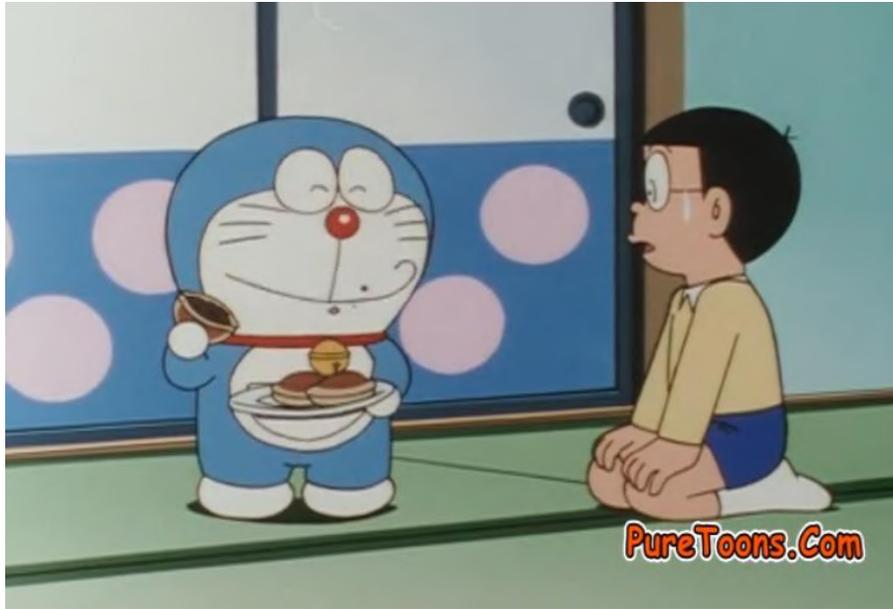


Fig. 3. Doraemon Episode 1 (00:05:11-17)

Next cultural factor taken is Japanese dolls. Dolls have been celebrated across Japan since ancient times. The Japanese dolls hold a notable significance culturally and are represented as an item of veneration, a child's toy, an object of joy, or a collector's treasure. The outer appearance of dolls has constantly changed, but the Japanese love of dolls has remained steadfast. Dolls have traditionally been related to luck. within the 9th century, Japanese dolls made from paper and grass were set adrift in rivers to hold away bad luck. Clay figures were buried with the dead, especially in the burial mounds of emperors and noblemen.

Even to the present day in Japan, dolls are not only considered objects of decoration or entertainment but living creatures also. An expression of such special behaviour is found within the ceremonies of Doll Burial. When the doll's owner reluctantly throws it away, he takes it to a temple where old and new dolls, both costly and ordinary ones, are piled together. After the owners bid their last farewell, the dolls are burnt to ashes.

Daruma dolls are red, round-faced dolls named after Daruma (Bodhidharma), the founding father of Zen Buddhism. Daruma dolls are commonly sold around New Year with both eyes painted over. One eye is unpainted when making a wish and the second eye is unpainted when the wish comes true. Daruma dolls have wide-open eyes and fierce scowls that are intended to stay evil spirits and demons away and convey good luck. Daruma dolls have no legs as Daruma was intensely focussed in his meditation that eventually led his legs to fall off. Daruma is featured in both 15th-century paintings and recent 21st-century television cartoons.

A Daruma doll made its appearance on Doraemon in Season 1 – Episode 92. See fig.4.1 and fig4.2



Fig. 4.1. Doraemon. S14 Episode 1 (00:12:00-04)



Fig. 4.2. Doraemon. S14 Episode 1 (00:16:14-17)

Next cultural factor taken is school discipline shown in the series. The Japanese education system is one among the foremost influential agents moulding the Japanese youth. Given the massive amount of time that Japanese students spend in schools, it is little wonder that the education system plays a phenomenal role in determining the material and base of Japanese society.

Japanese high school students do not take cars to school as they commute, as many either walk or ride bicycles if the space is not great. In other cases, students must take public buses and trains, often changing lines several times so as to succeed in their destinations. It is common for college kids to spend two or more hours every day on public transportation.

A day of a high school student does not end after they finish their lessons and extracurriculars at college. Approximately 60 per cent of high school students also attend cram schools after class so as to take supplementary lessons. In these cram schools, students get prepared to tackle the university entrance examinations by getting trained for differing types of exam questions and mock exams. For students who want to experience intellectual challenges that are

beyond the extent of the quality curriculum taught in regular high schools, they take up the extra homework that is given to them. Many high school students experience the pressure of performing well within the university entrance exam, since it determines their way forward for career prospects after graduation. Hence, cram schools are flourishing in Japan, as parents are willing to pay expensive tuition fees for this level of training so as to maximize their children's chances of stepping into a top-tier university.

The story of *Doraemon* creates a stable, relieving ambience, well balanced between the truth of children's lifestyle and several fantasy factors, shown by Doraemon's reassuring presence and his pocket full of gadgets.

One example of how reality is sustained is that of the constant presence of Nobita's school and his teacher. Nobita is time and time again scolded by his teacher for forgetting his homework, coming late to school or for his mischievous pursuits. Nobita's class teacher also appears outside of the varsity environment, for instance, in an episode of *Doraemon*, the teacher is seen visiting Nobita's house to speak with his mother about Nobita's performance in school. The teacher is a middle-aged, gentle man, with a round body and rather square face and his demeanor is dignified and nonthreatening. Similarly, the school environment does not create any real threats or place any pressure on Nobita, although he fails to do his schoolwork and other class-room activities consistently. Nobita is occasionally bullied by Jaian and Suneo, which eventually leads him to Doraemon for his help, often to enact revenge. In short, school and teachers aren't central to Nobita's life, just a traditional yet unavoidable background for Nobita and his friends.

The main hang out spot for the children in *Doraemon* may be a small vacant patch of land with a couple of concrete pipes stacked up in a corner. The spot is often reminiscent of a nostalgic

past representing a 'timeless utopia' (Natsume 12-13). it's going to however represent a mixture of the children's imagination and their reality, or represent a liminal or transitional space that mixes elements of the urban past with people who are contemporary. Although Dekisugi-kun sometimes joins them, the core group habituating this location/play space are consistently four children, Nobita, Shizuka, Jaian and Suneo, all of whom Doraemon generally conducts his adventures with.

The playgroup is made by only classmates and this is often unlike the normal formation of neighbourhood playgroups, which once consisted of youngsters of different ages. *Fukaya & Fukaya (1976) - reference* indicated from their survey, that by 1975, children's definition of 'friends' excluded children of various ages and are comparatively more inclusive towards kids belonging to the same age category. *Fukaya and Fukaya* also mention that children's play areas have shrunk to within a radius of 5 minutes of their home and most playing takes place indoors. The survey results highlight the many changes in children's lives and activities, because of their loss of time and space for enjoying outside during the rise in study time, the disappearance of vacant land and so on. The said development also affects their view of life and their relationships with others, both friends and family.

With the collapse of playgroups composed of children of different ages, the older children's experiences are no longer handed right down to the younger generation which leads to each generation facing their own difficult life experiences without previous knowledge or appropriate advice. Similarly, with the neighborhood network disappearing slowly, parents even have to confront their children without adequate knowledge and mental preparation.

Next cultural factor taken is clothing. Japanese fashion represents an established history of traditional culture, encompassing colour palettes developed throughout various periods and rules in the country's history.

The traditional dress or the national costume of Japan is known to be the *kimono*. *Kimonos*, which are generally made from silk, have large sleeves that run from the shoulders all the way down to the heels. They are tied with a belt called an *obi*. A range of *kimonos* exists in the present day, with women having more options than men. Compared to Western dress, the *kimono* tends to limit one's movement, and it takes longer to place it on and store properly. Hence, most Japanese today wear *kimonos* only on days of special occasions, formal gatherings or other traditional events. See Fig.5

In the summer, however, a more easily worn, lightweight informal *kimono* referred to as a *yukata* is worn by children and young adults at festivals and other special occasions. In lifestyle, the people tend to prefer clothing that is easier to move around in, like T-shirts, jeans, polo shirts, and sweat suits.

The traditional Japanese sandals worn with *kimonos* are called *geta*. Classic *geta* appear as two flip flops supported by two audio-cassette-size platforms. They were originally designed so the foot would stay elevated in muddy streets and would stop the feet from getting dirty.



Fig. 1. Doraemon S14 Episode 1 (00:20:31-36)

Next cultural factor taken is architecture. Japanese architecture is appreciated by many as the works encompasses an idea of tranquility, zen and simplicity. In traditional Japanese architecture, there are various styles, features and techniques unique to Japan in each period and use.

Wood has traditionally been the first choice when it comes to building material in Japanese architecture. Wood was prioritized as the primary material given the scarcity of stone available at the time due to volcanic activity and also for its proven resistance to earthquakes. In many of the older Japanese houses as well as a number of few new houses, the wood was left unpainted and made use of in its natural form as an appreciation of the grain.

Connection to nature has always been a crucial and important feature of Japanese architecture. Japan's connection to nature is attributed to its Shinto and Buddhist beliefs, which have had a big influence on its architecture. The influence is clearly seen with the employment of natural light and the use of wood as an artefact, both on the outside and within the interior.

A big difference from Western homes is that shoes aren't worn inside the house and slippers are made use of for indoor use. Shoes are removed when entering a house to keep the floors clean. The *genkan*, a small sunken area between the entrance and the rest of the house, is an area for removing, storing, and putting on shoes. Sliding doors (*fusuma*) and movable screens (*shoji*) were utilized in old Japanese houses. The screens were typically made up of paper, to permit light and shadows to permeate into the house. See Fig.6



Fig. 6. Doraemon S14 Episode 1 (00:16:52-58)

Different cultural factors and it is represented in the Doraemon series have been discussed in this chapter. Japan's soft power Doraemon has created a positive image for the country. Doraemon has been created as a platform where people can understand more about Japanese culture and the young generation is influenced by it.

Conclusion

Diplomacy as a study of International Relations has many models. Among them is cultural diplomacy as part of public diplomacy. Like public diplomacy, cultural diplomacy is an international relations technique that relies on soft power. One of the essences of diplomacy is the process of getting to know each other and understanding the character, characteristics and customs of each country. In the old era, the way to know a country can be through historical literature, the knowledge gained from lessons about the countries in school and stories from the parents. In modern times with the development of advanced means of communication that can facilitate the process of getting to know each other, the young people of the world know other countries through the internet, television, video streaming platforms and other means of communication. Young people are deeply involved with the development of communication technology. Media such as movies, social media, Facebook, Instagram, Twitter, Youtube and others can be a medium of introduction or getting to know each other. Now, the youth of the world can know Japan further through the means they like and know pop culture such as anime, manga like Doraemon. So through anime and manga, Japan can introduce itself to the international world. Created in the post-war state of Japan, Doraemon has essentially become a household name among the children of not only its own country but of the world. In this project, chapter one discussed the theory of cultural diplomacy. Second chapter analysed Doraemon series with different cultural factors like food, clothing, art and craft, architecture, school discipline etc. It is understood that Japanese culture is often projected as representing Asian culture as a whole in the eyes of the world. Cultural allure is generated by mangas like Doraemon that embrace and circulate pop culture in addition to traditional Japanese culture and art.

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**DETERMINATION OF CAUCHY'S CONSTANTS FOR DIFFERENT
LIQUIDS USING HOLLOW PRISM**

PROJECT REPORT

Submitted by

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Submitted to the

Mahatma Gandhi University, Kottayam

In partial fulfilment of the requirement for the award of

BACHELOR'S DEGREE OF SCIENCE IN PHYSICS

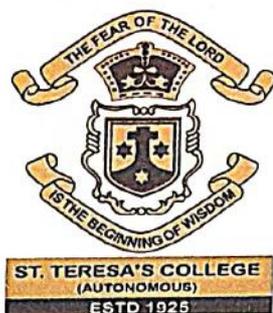


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ERNAKULAM



CERTIFICATE

This is to certify that the project report entitled “**DETERMINATION OF CAUCHY'S CONSTANTS FOR DIFFERENT LIQUIDS USING HOLLOW PRISM**” is an authentic work submitted by **VARSHA VIJAY** under my supervision at Department of Physics, St. Teresa's College for the partial fulfilment of the award of Degree of Bachelor of Science in Physics during the academic year 2021-2022. The work presented in this dissertation has not been submitted for any other degree in this or any other university.

Supervising Guide

Susan

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Place : Ernakulam

Date : 10/05/2022

ST. TERESA'S COLLEGE (AUTONOMOUS)

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B.Sc PHYSICS

PROJECT REPORT

Name : VARSHA VIJAY
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EXAMINERS:

Priya Mathew
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DECLARATION

I, **VARSHA VIJAY**, Register No: **AB19PHY024** hereby declare that this project work entitled '**DETERMINATION OF CAUCHY'S CONSTANT FOR DIFFERENT LIQUID USING HOLLOW PRISM**' has been prepared by me during the academic year 2021-22 under the guidance of **Smt. Susan Mathew**, Department of Physics and Centre for Research, St. Teresa's College, Ernakulam is in the partial fulfilment for the award of degree of bachelor of Physics under Mahatma Gandhi University. I further declare that the work reported in the project has not been submitted and will not be submitted, either in part or in full, for the award of any other degree or diploma in the institute or any other institute or university.

Place: Ernakulam

Date:

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I am grateful to Almighty God for the good health and wellbeing that were necessary to complete this project.

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Varsha Vijay

ABSTRACT

The separation of visible light into its different colours is known as dispersion. This experiment is based on the phenomenon of normal dispersion. The angle of the prism A and the angle of minimum deviation D for different wavelength are determined. From this the refractive index n for these colours are calculated. Taking the value of wavelength λ , the Cauchy's constants A and B are calculated for different pairs of spectral colours using the equation. In this project we have determined the refractive indices of different transparent liquids using spectrometer-hollow prism method. Thus Cauchy's constant is determined.

CONTENTS

1.	Introduction	1
2.	Principle.....	2
3.	Experimental setup.....	5
4.	Procedure.....	7
5.	Observations and Calculations.....	10
6.	Result and Conclusion.....	21
7.	Application.....	21
8.	References.....	22

1. INTRODUCTION

Cauchy's dispersion equation shows an empirical relationship between the refractive index and wavelength of light for a particular transparent material. The equation is named after the mathematician Augustus-Louis Cauchy. He defined the equation in 1836. This equation was actually defined in his work on spectral theory that is 'Cauchy Memoire'.

The validity of the equation is only for the normal dispersion in the visible wavelength region. This equation is useful in some applications due to its mathematical simplicity. The Sellmeier Equation is a later development of Cauchy's work. The curve of the Cauchy's equation represents the visible region with considerable accuracy. A and B are the parameters of Cauchy's constant and depends on refractive index. Here A is a dimensionless parameter, when wavelength, $\lambda \rightarrow \infty$ then refractive index, $n \rightarrow A$. For the medium wavelength in the visible region, the curvature and amplitude of the refractive index is affected by B. So, the refractive index n is inversely proportional to the square of the light's wavelength.

When compared to the red light, the parallel light beams that incident on a lens bend towards the axis more as the wavelength of red is greater than that of violet hence, refractive index of a material for red light would be less than that of the violet light. The dispersion of the red light when compared to the violet light is also less. This is because the inverse proportionality of both wavelength and refractive index which is shown by Cauchy's equation.

2. PRINCIPLE

When an electromagnetic wave is incident on an atom or a molecule, the periodic electric force of the wave sets the bound charges into a vibratory motion. The frequency with which these charges are forced to vibrate is equal to the frequency of the wave. The phase of this motion as compared to the impressed electric force will depend on the impressed frequency. It will vary with the difference between the impressed frequency and the natural frequency of the charges.

Dispersion can be explained with the concept of secondary waves that are produced by the induced oscillations of the bound charges. When a beam of light propagates through a transparent medium (solid or liquid), the amount of lateral scattering is extremely small. The scattered waves travelling in a lateral direction produce destructive interference. However, the secondary waves travelling in the same direction as the incident beam superimpose on one another. The resultant vibration will depend on the phase difference between the primary and the secondary waves. This superimposition, changes the phase of the primary waves and this is equivalent to a change in the wave velocity.

Wave velocity is defined as the speed at which a condition of equal phases is propagated. Hence the variation in phase due to interference, changes the velocity of the wave through the medium. The phase of the oscillations and hence that of the secondary waves depends upon the impressed frequency. It is clear, therefore, that the velocity of light in the medium varies with the frequency of light. Also refractive index depends upon the velocity of light in the medium. Therefore, the refractive index of the medium varies with the frequency (wavelength) of light.

The relation permittivity of the medium in the case of dynamic polarizability is given by

$$\epsilon_r = 1 + X_e = 1 + \frac{Ne^2}{\epsilon_0 m} \sum_i \frac{f_i}{\omega_i^2 - \omega^2} \dots\dots\dots(1)$$

Here, N is the number of electrons per unit volume, e the charge and m is the mass of the electron, ϵ_0 permittivity of free space, f_i oscillator strengths of the substance, ω_i is the angular frequency of the electromagnetic spectrum of the substance, ω is the impressed angular frequency.

Also $\sum f_i = 1$ and relative permeability in majority of substances that transmit electromagnetic waves is equal to 1.

Therefore, $n_2 = \epsilon_r$

Assuming that there is only one atomic frequency ω_0 where $\omega \ll \omega_0$

$$n_2 = 1 + \frac{Ne^2}{\epsilon_0 m(\omega_1^2 - \omega^2)} \dots\dots\dots(2)$$

Using binomial expansion

$$\begin{aligned} n &= \left[1 + \frac{Ne^2}{\epsilon_0 m(\omega_1^2 - \omega^2)} \right]^{\frac{1}{2}} \\ &= 1 + \frac{Ne^2}{2\epsilon_0 m(\omega_1^2 - \omega^2)} \\ &= 1 + \left(\frac{Ne^2}{2\epsilon_0 m\omega_0^2} \right) \left(1 - \frac{\omega^2}{\omega_0^2} \right)^{-1} \\ &= 1 + \left(\frac{Ne^2}{2\epsilon_0 m\omega_0^2} \right) \left(1 + \frac{\omega^2}{\omega_0^2} \right) \end{aligned}$$

As

$$\omega = \frac{2\pi c}{\lambda} \quad \text{and} \quad \omega_0 = \frac{2\pi c}{\lambda_0}$$

$$n = 1 + \frac{Ne^2\lambda_0^2}{8\pi^2\epsilon_0 mc^2} + \frac{Ne^2\lambda_0^4}{8\pi^2\epsilon_0 mc^2\lambda^2} \dots\dots\dots(3)$$

$$\text{Taking } 1 + \frac{Ne^2\lambda_0^2}{8\pi^2\epsilon_0 mc^2} = A \quad \dots\dots\dots(4)$$

$$\text{and } \frac{Ne^2\lambda_0^4}{8\pi^2\epsilon_0 mc^2} = B \quad \dots\dots\dots(5)$$

$$n = A + \frac{B}{\lambda^2} \quad \dots\dots\dots(6)$$

Equation (6) represents Cauchy's dispersion formula. It is evident that the refractive index of the medium decreases with increase in wavelength of light.

If a graph is plotted between μ and $1/\lambda^2$ it will be a straight line. The intercept on the Y-axis gives value A. the slope of the line PC gives value of B.

A and B are called Cauchy's constants. The values of A and B depend on the medium. A is a dimensionless parameter, when $\lambda \rightarrow \infty$ then $n \rightarrow A$.

B has a unit of nm^2 . It affects the curvature of the amplitude of the refractive index for medium of wavelength in the visible region. The wavelength is of the order of a few hundred nanometers so, we can omit the higher powers of the wavelength since the coefficients associated with them are very small.

If the refractive indices n_1 and n_2 for any two known wavelength λ_1 and λ_2 are determined by a spectrometer, the Cauchy's constants A and B can be calculated from the above equation as,

$$n_1 = A + \frac{B}{\lambda_1^2} \dots\dots\dots(1)$$

$$n_2 = A + \frac{B}{\lambda_2^2} \dots\dots\dots(2)$$

On solving, (1) and (2) and rearranging

$$A = n_1 - \frac{B}{\lambda_1^2}$$

And
$$B = \frac{\lambda_1^2 \lambda_2^2 (n_2 - n_1)}{\lambda_1^2 - \lambda_2^2} \quad \text{where } n_2 > n_1$$

Refractive indices n_1 and n_2 are calculated using spectrometer.

3. EXPERIMENTAL SETUP

Apparatus and Instrument Used:

Spectrometer

Telescope and collimator are the parts of spectrometer. The three levelling screws on the prism table are engraved with concentric rings and lines. In order to lock the telescope and collimator, clamping devices are provided after the adjustments. For the measurement in spectrometer, a Vernier scale is used.

Adjustments of Spectrometer (Preliminary)

1. Telescope

Telescope is focused on a distant object. In order to get the clear image of the distant object by coinciding with the crosswire without parallax, the length of the telescope is varied by rack and pinion arrangement. So now the collimator is ready to produce parallel rays.

2. Collimator

Bring the collimator in line with the telescope and get the image in the telescope only after the slit is illuminated with the light. It must be noted that the slit is to be sufficiently wide so that the crosswire coincide with image without parallax and the collimator is also ready to produce parallel rays.

3. Prism Table

Here, the hollow prism ABC is placed on the table. It is important that the base must be turned towards the clamp. One reflecting face AC must be arranged in such a way that it is perpendicular to the line joining two screws S_1 and S_2 . Now the table is rotated in a way that the edge A is pointing towards the collimator. From the first face AB, we can see the reflected image of the slit in order to coincide the image with the crosswire; S_1 and S_2 are worked as needed. Now by working the screw S_3 the image from the other face AC is observed through the telescope that is made symmetrical. Now the prism table is levelled.

Hollow Prism

For finding the Cauchy's constant, we use a hollow prism. We use it by filling a particular transparent liquid in it.

Transparent Liquids

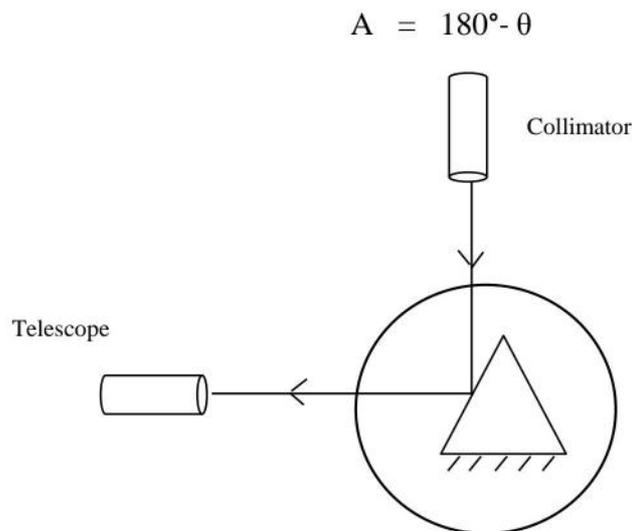
The transparent liquids that we use here for the experiment are

- Water
- Rubbing alcohol
- Vinegar
- Sanitizer
- Glycerine

4. PROCEDURE

Angle of Prism:

After the preliminary adjustments, telescope is brought in perpendicular direction to the collimator and clamped. Now the reflected image of the slit is obtained on the face AB of the prism just by rotating the Vernier table. This is recorded through a telescope and the readings of both verniers are noted. Similarly, the Vernier table is unclamped and the reflected image from the other face AC is obtained through a telescope and its Vernier readings are noted. θ is obtained by taking the mean of the difference between the corresponding vernier readings. θ is the angle of which the table has been rotated. Now the angle of prism A is found out by supplementary method,



Angle of Minimum Deviation (D):

In this case a liquid prism is required to find the angle of minimum deviation. Let say water. Now the Vernier table has to be unclamped and rotated so that the light from the collimator falls obliquely on one face of the prism. The refracted image is seen through it by rotating the telescope. Image should be obtained towards the direct ray position so the Vernier table is slowly rotated in required direction. The telescope is also rotated in the same direction so that the image is always in the field of view. The Vernier table is rotated up to the moment where the refracted image of a colour, let say green is found to be static for a moment then retrace and this is the minimum deviation position for that colour.

Repeat the experiment with different liquid for finding out the angle of minimum deviation in each case. The refractive index of each colour is determined by calculating

$$n = \frac{\sin\left(\frac{A+D}{2}\right)}{\sin\frac{A}{2}}$$

where, D is the minimum angle of deviation, A is the angle of prism and n is the refractive index.

Now for finding the Cauchy's constant, we use the equation:

$$n = A + \frac{B}{\lambda^2}$$

where A and B are the Cauchy's constants, λ is the wavelength of the particular colour and n is the refractive index. Consider any two colours of wavelength λ_1 and λ_2 with calculated refractive index n_1 and n_2 (where $n_2 > n_1$) respectively for a particular liquid and apply the rearranged form of the above equation given by,

$$B = \frac{\lambda_1^2 \lambda_2^2 (n_2 - n_1)}{\lambda_1^2 - \lambda_2^2}$$

And

$$A = n_1 - \frac{B}{\lambda_1^2}$$

A graph can be plotted by taking refractive index along Y-axis and $1/\lambda^2$ along X axis, straight line is obtained. The slope of straight lines directly gives the Cauchy's coefficient B while the Y intercept gives the other coefficient A.

5. OBSERVATIONS AND CALCULATIONS

Angle of prism

Value of one main scale division = 30'

No. of divisions on vernier scale = 30

$$\text{Least count (LC)} = \frac{\text{Value of one main scale division}}{\text{No. of divisions on vernier scale}} = \frac{30'}{30} = 1'$$

READINGS OF	VERNIER 1			VERNIER 2		
	MSR (deg)	VSR (div)	TOTAL READING= MSR +VSR(LC) (deg)	MSR (deg)	VSR (div)	TOTAL READING= MSR +VSR(LC) (deg)
REFLECTED RAYS FROM 1st FACE (a)	291°	5	291°5'	110°30'	28	110°58'
REFLECTED RAYS FROM 2nd FACE (b)	171°30'	15	171°45'	351°	14	351°14'
DIFFERENCE BETWEEN (a) AND (b)	119°20'			119°44'		

$$\begin{aligned} \text{Total reading} &= \text{MSR} + (\text{VSR} \times \text{LC}) \\ &= 291^\circ + (5 \times 1') \\ &= 291^\circ 5' \end{aligned}$$

$$\text{Mean } \theta = 119^\circ 32'$$

$$\begin{aligned} \text{Angle of prism A} &= 180^\circ - \theta \\ &= 180^\circ - 119^\circ 32' \\ &= 60^\circ 28' \end{aligned}$$

ANGLE OF MINIMUM DEVIATION FOR DIFFERENT COLORS OF WATER

COLOUR	VER-NIER	REFRACTED RAY READING			DIRECT RAY READING			DIFFERENCE D = X-Y (deg)	MEAN D (deg)	$n = \frac{\sin(\frac{A+D}{2})}{\sin \frac{A}{2}}$
		MSR (deg)	VSR (div)	TOTAL READING = MSR +VSR(LC) (deg)	MSR (deg)	VSR (div)	TOTAL READING = MSR +(VSR x LC) (deg)			
VIOLET	1	348°30'	22	348°52'	13°	24	13°24'	24°32'	24°34'	1.3421
	2	169°	11	169°11'	193°30'	17	193°47'	24°36'		
BLUE	1	349°	7	349°7'	13°	24	13°24'	24°17'	24°19'30"	1.339
	2	169°	25	169°25'	193°30'	17	193°47'	24°22'		
GREEN	1	349°30'	1	349°31'	13°	24	13°24'	23°53'	23°55'	1.3338
	2	169°30'	20	169°50'	193°30'	17	193°47'	23°57'		
YELLOW	1	349°30'	6	349°36'	13°	24	13°24'	23°48'	23°50'	1.3327
	2	169°30'	25	169°55'	193°30'	17	193°47'	23°52'		

For violet:

$$\begin{aligned}
 \text{Total reading} &= \text{MSR} + (\text{VSR} \times \text{LC}) \\
 &= 348^\circ 30' + (22 \times 1') \\
 &= 348^\circ 52'
 \end{aligned}$$

$$n = \frac{\sin \frac{(A+D)}{2}}{\sin \frac{A}{2}} = \frac{\sin \frac{(60^\circ 28' + 24^\circ 34')}{2}}{\sin \frac{60^\circ 28'}{2}} = 1.3421$$

CALCULATION OF CAUCHY'S CONSTANT FOR WATER

(i) FROM TABLE:

For green (λ_2) and yellow (λ_1)

$$\lambda_1 = 576.96 \text{ nm}$$

$$\lambda_2 = 546.07 \text{ nm}$$

From the table:

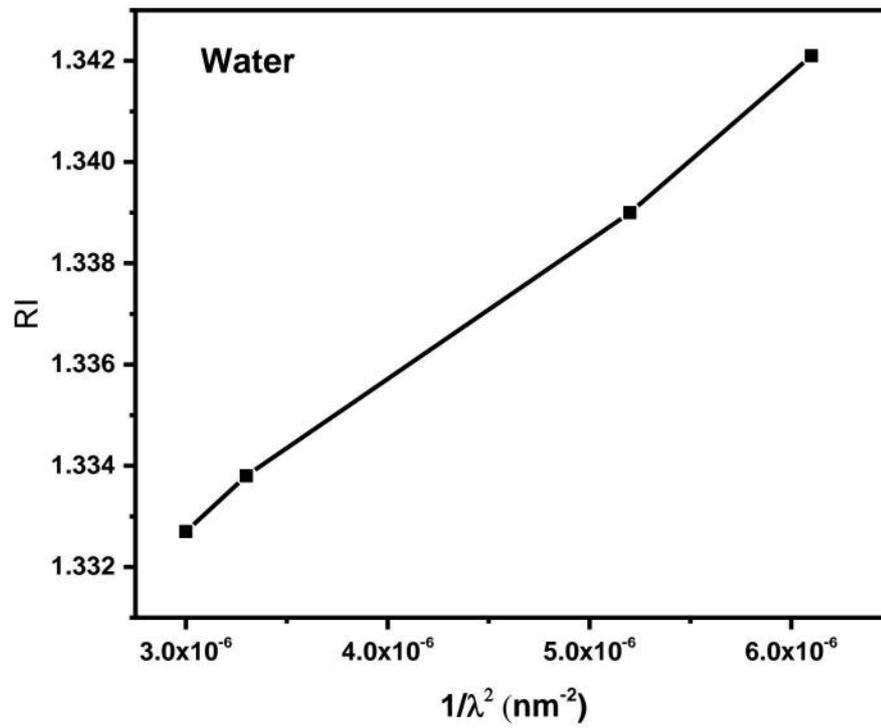
$$n_1 = 1.3327$$

$$n_2 = 1.3338$$

$$\begin{aligned} B &= \frac{\lambda_1^2 \lambda_2^2 (n_2 - n_1)}{\lambda_1^2 - \lambda_2^2} \\ &= \frac{(576.96^2)(546.07^2)(1.3338 - 1.3327)}{576.96^2 - 546.07^2} \\ &= \mathbf{3147.541 \text{ nm}^2} \end{aligned}$$

$$\begin{aligned} A &= n_1 - \frac{B}{\lambda_1^2} \\ &= 1.3327 - \frac{0.00314}{576.96^2} \\ &= \mathbf{1.3332} \end{aligned}$$

(ii) FROM GRAPH:



A = 1.32389

B = 2956.716 nm^2

ANGLE OF MINIMUM DEVIATION FOR DIFFERENT COLORS OF ALCOHOL

COLOUR	VER-NIER	REFRACTED RAY READING			DIRECT RAY READING			DIFFERENCE D = X-Y (deg)	MEAN D (deg)	$n = \frac{\sin(\frac{A+D}{2})}{\sin\frac{A}{2}}$
		MSR (deg)	VSR (div)	TOTAL READING = MSR +VSR(LC) (deg)	MSR (deg)	VSR (div)	TOTAL READING = MSR +(VSR x LC) (deg)			
VIOLET	1	340°30'	20	340°50'	7°30'	19	7°49'	26°59'	26°57'	1.3723
	2	161°	16	161°16'	188°	11	188°11'	26°55'		
BLUE	1	341°	4	341°4'	7°30'	19	7°49'	26°45'	26°45'30"	1.3699
	2	161°	25	161°25'	188°	11	188°11'	26°46'		
GREEN	1	341°30'	4	341°34'	7°30'	19	7°49'	26°15'	26°15'30"	1.3636
	2	161°30'	25	161°55'	188°	11	188°11'	26°16'		
YELLOW	1	341°30'	9	341°39'	7°30'	19	7°49'	26°10'	26°10'	1.3624
	2	162°	1	162°1'	188°	11	188°11'	26°10'		

For violet:

$$\begin{aligned}
 \text{Total reading} &= \text{MSR} + (\text{VSR} \times \text{LC}) \\
 &= 340^\circ 30' + (20 \times 1') \\
 &= 340^\circ 50'
 \end{aligned}$$

$$n = \frac{\sin \frac{(A+D)}{2}}{\sin \frac{A}{2}} = \frac{\sin \frac{(60^\circ 28' + 26^\circ 57')}{2}}{\sin \frac{60^\circ 28'}{2}} = 1.3723$$

CALCULATION OF CAUCHY'S CONSTANT FOR ALCOHOL

(i) FROM TABLE:

For violet (λ_2) and yellow (λ_1)

$$\lambda_1 = 576.96 \text{ nm}$$

$$\lambda_2 = 404.65 \text{ nm}$$

From the table:

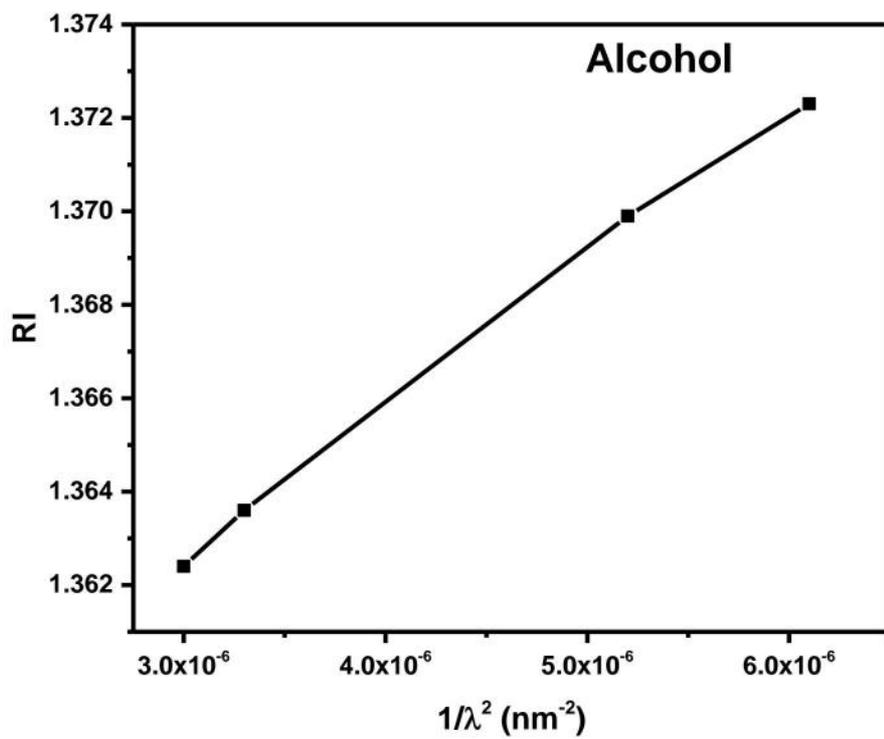
$$n_1 = 1.3624$$

$$n_2 = 1.3723$$

$$\begin{aligned} \mathbf{B} &= \frac{\lambda_1^2 \lambda_2^2 (n_2 - n_1)}{\lambda_1^2 - \lambda_2^2} \\ &= \frac{(576.96^2)(404.65^2)(1.3723 - 1.3624)}{576.96^2 - 404.65^2} \\ &= \mathbf{3190.334 \text{ nm}^2} \end{aligned}$$

$$\begin{aligned} \mathbf{A} &= n_1 - \frac{\mathbf{B}}{\lambda_1^2} \\ &= 1.3624 - \frac{0.00319}{576.96^2} \\ &= \mathbf{1.3623} \end{aligned}$$

(ii) FROM GRAPH:



$$A = 1.35292$$

$$B = 3210.448 \text{ nm}^2$$

ANGLE OF MINIMUM DEVIATION FOR DIFFERENT COLORS OF VINEGAR

COLOUR	VER-NIER	REFRACTED RAY READING			DIRECT RAY READING			DIFFERENCE D = X-Y (deg)	MEAN D (deg)	$n = \frac{\sin(\frac{A+D}{2})}{\sin \frac{A}{2}}$
		MSR (deg)	VSR (div)	TOTAL READING = MSR +VSR(LC) (deg)	MSR (deg)	VSR (div)	TOTAL READING = MSR +(VSR x LC) (deg)			
VIOLET	1	342°30'	13	342°43'	7°30'	1	7°31'	24°48'	24°48'30"	1.3452
	2	163°	4	163°4'	187°30'	23	187°53'	24°49'		
BLUE	1	342°30'	24	342°54'	7°30'	1	7°31'	24°37'	24°37'30"	1.3429
	2	163°	15	163°15'	187°30'	23	187°53'	24°38'		
GREEN	1	343°	23	343°23'	7°30'	1	7°31'	24°8'	24°10'	1.337
	2	163°30'	11	163°41'	187°30'	23	187°53'	24°12'		
YELLOW	1	343°	28	343°28'	7°30'	1	7°31'	24°3'	24°5'	1.3359
	2	163°30'	16	163°46'	187°30'	23	187°53'	24°7'		

For violet:

$$\begin{aligned}
 \text{Total reading} &= \text{MSR} + (\text{VSR} \times \text{LC}) \\
 &= 342^\circ 30' + (13 \times 1') \\
 &= 342^\circ 43'
 \end{aligned}$$

$$n = \frac{\sin \frac{(A+D)}{2}}{\sin \frac{A}{2}} = \frac{\sin \frac{(60^\circ 28' + 24^\circ 48' 30'')}{2}}{\sin \frac{60^\circ 28'}{2}} = 1.3452$$

CALCULATION OF CAUCHY'S CONSTANT FOR VINEGAR

(i) FROM TABLE:

For blue (λ_2) and green (λ_1)

$$\lambda_1 = 546.07 \text{ nm}$$

$$\lambda_2 = 435.83 \text{ nm}$$

From the table:

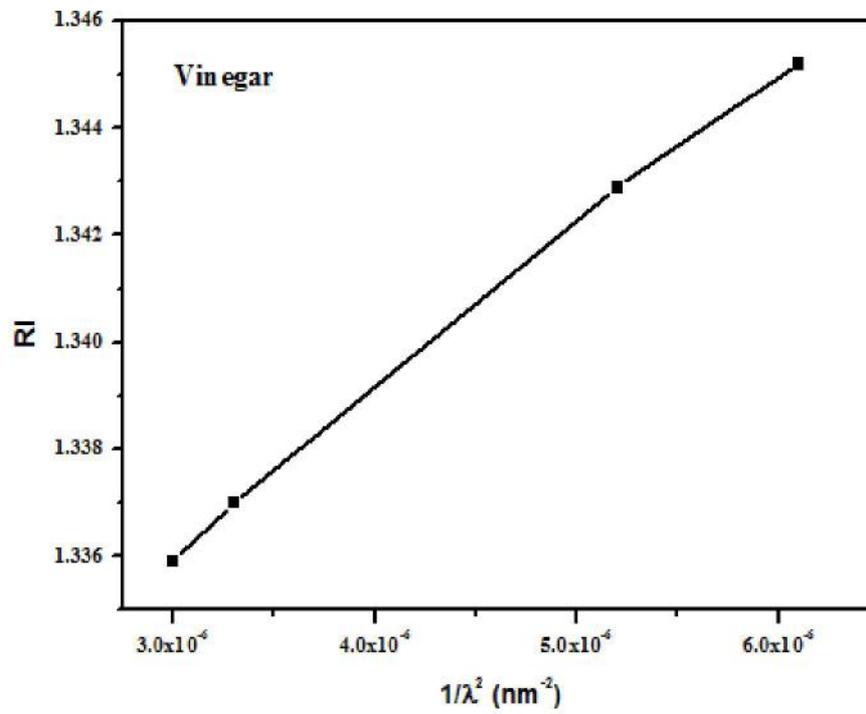
$$n_1 = 1.337$$

$$n_2 = 1.3429$$

$$\begin{aligned} B &= \frac{\lambda_1^2 \lambda_2^2 (n_2 - n_1)}{\lambda_1^2 - \lambda_2^2} \\ &= \frac{(546.07^2)(435.83^2)(1.3429 - 1.337)}{546.07^2 - 435.83^2} \\ &= \mathbf{3087.283 \text{ nm}^2} \end{aligned}$$

$$\begin{aligned} A &= n_1 - \frac{B}{\lambda_1^2} \\ &= 1.337 - \frac{0.00308}{546.07^2} \\ &= \mathbf{1.3369} \end{aligned}$$

(ii) FROM GRAPH:



A = 1.32698

B = 3014.925 nm^2

**ANGLE OF MINIMUM DEVIATION FOR DIFFERENT COLORS OF
SANITIZER**

COLOUR	VER-NIER	REFRACTED RAY READING			DIRECT RAY READING			DIFFERENCE D = X-Y (deg)	MEAN D (deg)	$n = \frac{\sin(\frac{A+D}{2})}{\sin \frac{A}{2}}$
		MSR (deg)	VSR (div)	TOTAL READING = MSR +VSR(LC) (deg)	MSR (deg)	VSR (div)	TOTAL READING = MSR +(VSR x LC) (deg)			
VIOLET	1	343°	1	343°1'	8°30'	9	8°39'	25°38'	25°40'30"	1.3562
	2	163°	19	163°19'	189°	2	189°2'	25°43'		
BLUE	1	343°	5	343°5'	8°30'	9	8°39'	25°34'	25°32'30"	1.3545
	2	163°30'	1	163°31'	189°	2	189°2'	25°31'		
GREEN	1	343°30'	8	343°38'	8°30'	9	8°39'	25°1'	25°1'	1.3478
	2	164°	1	164°1'	189°	2	189°2'	25°1'		
YELLOW	1	343°30'	15	343°45'	8°30'	9	8°39'	24°54'	24°55'30"	1.3467
	2	164°	5	164°5'	189°	2	189°2'	24°57'		

For violet:

$$\begin{aligned}
 \text{Total reading} &= \text{MSR} + (\text{VSR} \times \text{LC}) \\
 &= 343^\circ + (1 \times 1') \\
 &= 343^\circ 1'
 \end{aligned}$$

$$n = \frac{\sin \frac{(A+D)}{2}}{\sin \frac{A}{2}} = \frac{\sin \frac{(60^\circ 28' + 25^\circ 40' 30'')}{2}}{\sin \frac{60^\circ 28'}{2}} = 1.3562$$

CALCULATION OF CAUCHY'S CONSTANT FOR SANITIZER

(i) FROM TABLE

For blue (λ_2) and yellow (λ_1)

$$\lambda_1 = 576.96 \text{ nm}$$

$$\lambda_2 = 435.83 \text{ nm}$$

From the table:

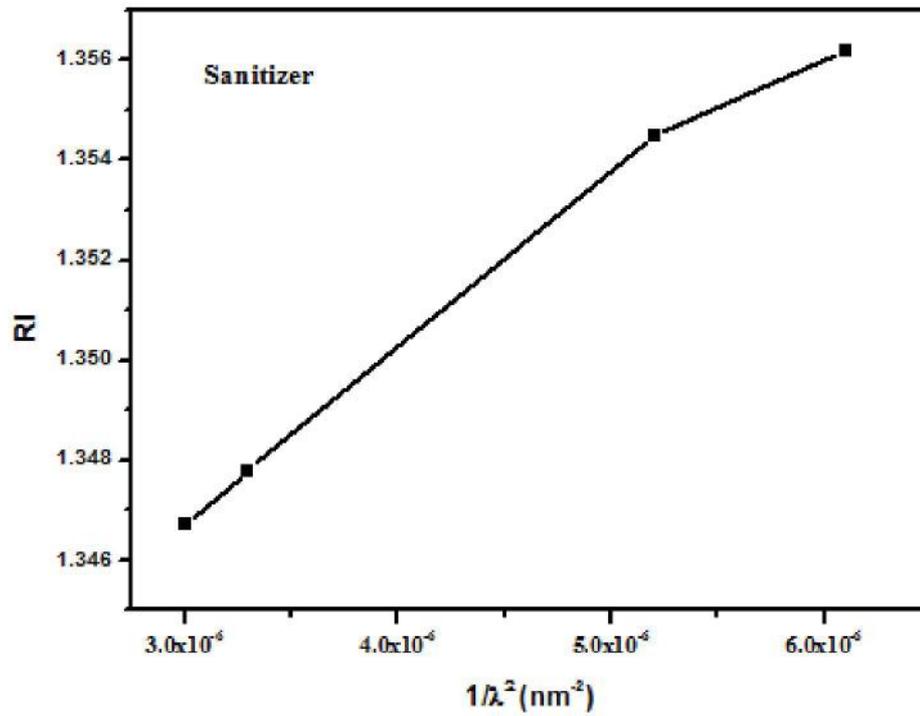
$$n_1 = 1.3467$$

$$n_2 = 1.3545$$

$$\begin{aligned} \mathbf{B} &= \frac{\lambda_1^2 \lambda_2^2 (n_2 - n_1)}{\lambda_1^2 - \lambda_2^2} \\ &= \frac{(576.96^2)(435.83^2)(1.3545 - 1.3467)}{576.96^2 - 435.83^2} \\ &= \mathbf{3450.415 \text{ nm}^2} \end{aligned}$$

$$\begin{aligned} \mathbf{A} &= n_1 - \frac{\mathbf{B}}{\lambda_1^2} \\ &= 1.3467 - \frac{0.00345}{576.96^2} \\ &= \mathbf{1.3466} \end{aligned}$$

(ii) FROM GRAPH:



A = 1.33739

B = 3161.194 nm²

**ANGLE OF MINIMUM DEVIATION FOR DIFFERENT COLORS OF
GLYCERINE**

COLOUR	VER-NIER	REFRACTED RAY READING			DIRECT RAY READING			DIFFERENCE D = X-Y (deg)	MEAN D (deg)	$n = \frac{\sin(\frac{A+D}{2})}{\sin \frac{A}{2}}$
		MSR (deg)	VSR (div)	TOTAL READING = MSR +VSR(LC) (deg)	MSR (deg)	VSR (div)	TOTAL READING = MSR +(VSR x LC) (deg)			
BLUE	1	334°	28	334°28'	8°30'	6	8°36'	34°8'	34°12'	1.4603
	2	154°30'	15	169°11'	189°	1	189°1'	34°16'		
GREEN	1	335°	2	335°2'	8°30'	6	8°36'	33°34'	33°38'	1.4536
	2	155°	19	155°19'	189°	1	189°1'	33°43'		
YELLOW	1	335°	10	335°10'	8°30'	6	8°36'	33°26'	33°28'	1.4517
	2	155°30'	1	155°31'	189°	1	189°1'	33°30'		
RED	1	335°	19	335°19'	8°30'	6	8°36'	33°17'	33°20'30"	1.4502
	2	155°30'	7	155°37'	189°	1	189°1'	33°24'		

For blue:

$$\begin{aligned}
 \text{Total reading} &= \text{MSR} + (\text{VSR} \times \text{LC}) \\
 &= 334^\circ + (28 \times 1') \\
 &= 334^\circ 28'
 \end{aligned}$$

$$n = \frac{\sin \frac{(A+D)}{2}}{\sin \frac{A}{2}} = \frac{\sin \frac{(60^\circ 28' + 34^\circ 12')}{2}}{\sin \frac{60^\circ 28'}{2}} = 1.4603$$

CALCULATION OF CAUCHY'S CONSTANT FOR GLYCERINE

(ii) FROM GRAPH

For blue (λ_2) and green (λ_1)

$$\lambda_1 = 546.07 \text{ nm}$$

$$\lambda_2 = 435.83 \text{ nm}$$

From the table:

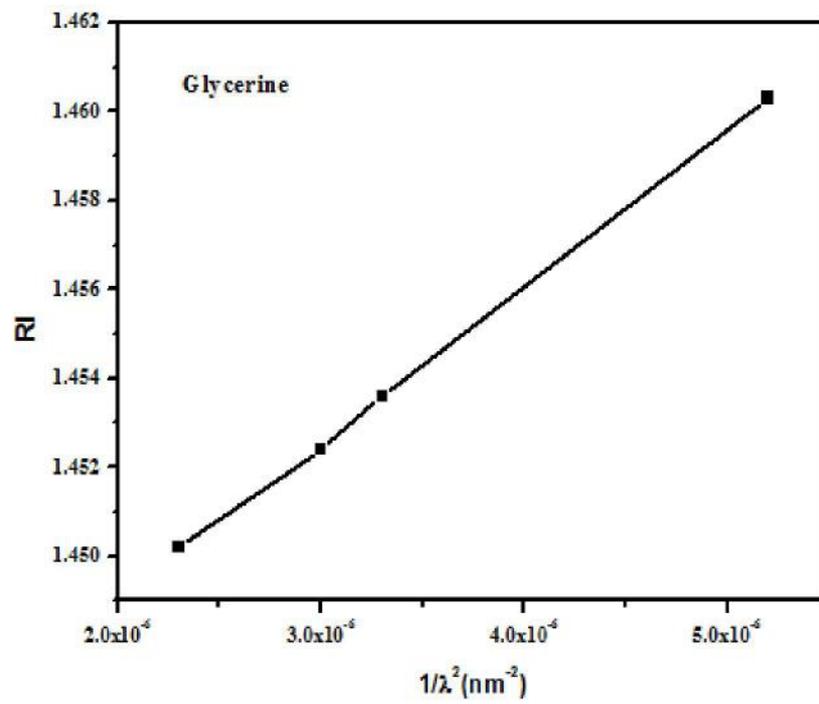
$$n_1 = 1.4536$$

$$n_2 = 1.4603$$

$$\begin{aligned} B &= \frac{\lambda_1^2 \lambda_2^2 (n_2 - n_1)}{\lambda_1^2 - \lambda_2^2} \\ &= \frac{(546.07^2)(435.83^2)(1.4603 - 1.4536)}{546.07^2 - 435.83^2} \\ &= \mathbf{3500.897 \text{ nm}^2} \end{aligned}$$

$$\begin{aligned} A &= n_1 - \frac{B}{\lambda_1^2} \\ &= 1.4536 - \frac{0.0035}{546.07^2} \\ &= \mathbf{1.4535} \end{aligned}$$

(ii) FROM GRAPH:



$$A = 1.44202$$

$$B = 3508.676 \text{ nm}^2$$

6. RESULT AND CONCLUSION

The Cauchy's constant for the given liquids are found to be as follows:

Liquid	From Calculation		From Graph	
	A	B (nm ²)	A	B (nm ²)
Water	1.3332	3147.541	1.3238	2956.716
Alcohol	1.3623	3190.334	1.3529	3210.448
Vinegar	1.3369	3087.283	1.3269	3014.925
Sanitizer	1.3544	3450.415	1.3373	3161.194
Glycerine	1.4535	3500.897	1.4420	3508.676

From Cauchy's equation it is evident that the refractive index of the medium decreases with increase in wavelength.

7. APPLICATIONS

1. Cauchy's equation represents the curve in the visible region with considerable accuracy.
2. Precise determination of refractive index of most popular environmental pollutant gases.

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COMPUTATIONAL REPURPOSED LIGANDS OF LAMIACEAE FAMILY: POTENTIAL CURE FOR MALARIA

A dissertation submitted in partial fulfilment of the requirement

for the degree of '**Master of Science**' in **BOTANY**

By

VARSHA JAYASANKAR

REG NO: AM20BOT016



DEPARTMENT OF BOTANY & CENTRE FOR RESEARCH

ST.TERESA'S COLLEGE (AUTONOMOUS)

ERNAKULAM

2022

CERTIFICATE

This is to certify that the dissertation titled, **COMPUTATIONAL REPURPOSED LIGANDS OF LAMIACEAE FAMILY : POTENTIAL CURE FOR MALARIA**” is an authentic record of work carried out by **VARSHA JAYASANKAR** under the supervision and guidance of **Dr. ASHA D.**, Assistant Professor, Department of Botany & Centre for Research, St. Teresa’s College (Autonomous), Ernakulam in partial fulfilment of the requirement for the Master’s Degree of Science in Botany.



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Examiners



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14/06/2022

PLACE: ERNAKULAM

DATE: 24-5-2022

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Place: Ernakulam

Date: 24-5-2022



VARSHA JAYASANKAR

CONTENTS

CHAPTER	TITLE	PAGE NO
1.	INTRODUCTION	1
2.	AIM AND OBJECTIVES	8
3.	REVIEW OF LITERATURE	9
4.	MATERIALS AND METHODS	14
5.	RESULTS	18

6.	DISCUSSION	32
7.	SUMMARY & CONCLUSION	34
8.	REFERENCES	35

1. INTRODUCTION

Although sciences and technology have progressed rapidly, de novo drug development has been a costly and time-consuming process over the past decades. In view of these circumstances, 'drug repurposing' (or 'drug repositioning') has appeared as an alternative tool to accelerate drug development process by seeking new indications for already approved drugs rather than discovering de novo drug compounds. In the meantime, the explosive and large-scale growth of molecular, genomic and phenotypic data of pharmacological compounds is enabling the development of new area of drug repurposing called computational drug repurposing.

Pathway-based drug-repurposing utilizes metabolic pathways, signaling pathways, and protein-interaction networks information to predict the similarity or connection between disease and drug. For example, using omics data processed from human patients or animals, disease-specific pathways are reconstructed to serve as new targets for repositioned drugs (Park, *et. al.*,2019).

Biomedical discovery has been reshaped upon the exploding digitization of data which can be retrieved from a number of sources, ranging from clinical pharmacology to cheminformatics-driven databases. Now, supercomputing platforms and publicly available resources such as biological, physicochemical, and clinical data, can all be integrated to construct a detailed map of signaling pathways and drug mechanisms of action in relation to drug candidates. Recent advancements in computer-aided data mining have facilitated analyses of 'big data' approaches and the discovery of new indications for pre-existing drugs has been accelerated (Karaman, & Sippl *et.al.*, 2019).

Malaria, sometimes called the "King of Diseases", is caused by protozoan parasites of the genus *Plasmodium*. The most serious and sometimes fatal type of malaria is caused by *Plasmodium falciparum*. The other human malaria species, *P. vivax*, *P. ovale*, *P. malariae*, and sometimes *P. knowlesi* can cause acute, severe illness but mortality rates are low. Malaria is the most important infectious disease in tropical and subtropical regions, and continues to be a major global health problem, with over 40% of the world's population exposed to varying degrees of malaria risk in some 100 countries. It is estimated that over 500 million people suffer from malaria infections annually, resulting in about 1-2 million deaths, of

whom 90% are children in sub-Saharan Africa. The number of malaria cases worldwide seems to be increasing, due to increasing transmission risk in areas where malaria control has declined, the increasing prevalence of drug resistant strains of parasites, and in a relatively few cases, massive increases in international travel and migration. The need for effective and practical diagnostics for global malaria control is increasing, since effective diagnosis reduces both complications and mortality from malaria. Differentiation of clinical diagnoses from other tropical infections, based on patients' signs and symptoms or physicians' findings, may be difficult. Therefore, confirmatory diagnoses using laboratory technologies are urgently needed (Tangpukdee *et.al.*,2009).

India contributes about 70% of malaria in the South East Asian Region of WHO. Although annually India reports about two million cases and 1000 deaths attributable to malaria, there is an increasing trend in the proportion of *Plasmodium falciparum* as the agent. There exists heterogeneity and variability in the risk of malaria transmission between and within the states of the country as many ecotypes/paradigms of malaria have been recognized. The pattern of clinical presentation of severe malaria has also changed and while multi-organ failure is more frequently observed in falciparum malaria, there are reports of vivax malaria presenting with severe manifestations (Tuteja, *et.al.*, 2007).

Mosquitoes of the genus *Anopheles* transmit malaria parasites. *Anopheles* mosquito species vary in their vector potential because of environmental conditions and factors affecting their abundance, blood-feeding behaviour, survival, and ability to support malaria parasite development. In the complex life cycle of the parasite in female mosquitoes, a process termed sporogony, mosquitoes acquire gametocyte-stage parasites from blood-feeding on an infected host. The parasites carry out fertilization in the midgut, transform to ookinetes, then oocysts, which produce sporozoites. Sporozoites invade the salivary glands and are transmitted when the mosquito feeds on another host. Most individual mosquitoes that ingest gametocytes do not support development to the sporozoite stage. Bottlenecks occur at every stage of the cycle in the mosquito. Powerful new techniques and approaches exist for evaluating malaria parasite development and for identifying mechanisms regulating malaria parasite–vector interactions (Beier, *et. al.*,1998).

Plasmodium falciparum is the etiological agent of malaria, the leading cause of death due to a vector-borne infectious disease, claiming 0.5 million lives every year. The single-cell eukaryote undergoes a complex life cycle and is an obligate intracellular parasite of

hepatocytes (clinically silent) and erythrocytes (disease causing). An infection can progress to a wide range of pathologies, including severe anaemia and cerebral malaria, which can lead to death. *P. falciparum* repeatedly replicates over the course of 48 h inside erythrocytes, resulting in exponential growth and rapid disease progression. As the single most important infectious disease afflicting children, no other pathogen has exerted a higher selection pressure on the human genome. Over 20 polymorphisms, including the sickle-cell trait, have been selected in human populations, despite severe fitness costs, since they offer protection against fatal *P. falciparum* infections. No effective vaccine exists, but several curative treatments are available (Joy, *et.al.*, 2003).

6YCZ, 6MPV, 3SRI are identified receptor proteins of *P. falciparum*, of which the protein structures are available in PDB (Protein Data Bank). The receptor proteins play a crucial role in the reproduction and life cycle of the plasmodium species. The denaturation of these proteins by any interaction, leads to the death and inability of the organism to multiply.

The medicinal use of plants as analgesic drugs in folk medicine is an ancient tradition, far older than the current sciences of medicine in developing countries. According to estimations, up to 70,000 plant species are used ethnomedicinally worldwide. Effects of herbal extracts have been studied by different pain tests including writhing test, light tail flick test, tail immersion test, hot-plate test, and formalin test.

The Lamiaceae family, one of the most important herbal families, incorporates a wide variety of plants with biological and medical applications. The most known members of this family are a variety of aromatic spices like thyme, mint, oregano, basil, sage, savory, rosemary, self-heal, hyssop, lemon balm, and some others with more limited use. Phytochemicals can be defined, in the strictest sense, as chemicals produced by plants. However, the term is generally used to describe chemicals from plants.

Plants in this family, are herbs or shrubs often with an aromatic smell. They are common in the Maltese Islands and other Mediterranean countries for the fact that some of them produce a high amount of essential oil that enables them to survive the hot summer season. Some examples from this family include mints, thyme, tulsi, spearmint and coleus. It is widely cultivated for medicinal, perfumery, culinary and ornamental purposes. Medicinal constituents include the strong aromatic essential oil, tannins, saponins and organic acids.

The plant has sedative, diuretic, tonic, antispasmodic and antiseptic properties (Raja, *et.al.*, 2012).

Lamiaceae is a family comprising 236 genera, and more than 7000 species. It is one of the most widely used and phytochemically studied families, because of their various compounds. Lamiaceae can be divided into two major categories, the first one includes all those species that mainly produce volatile terpenoids, found in the volatile compounds, such as *Salvia* sp., *Mentha* sp., *Thymus* sp. and *Rosmarinus* sp. While the second one comprises species that mainly biosynthesize constituents of the polar fraction, as *Ajuga* sp., *Origanum* sp., *Teucrium* sp., *Melittis* sp., and *Stachys* sp. Numerous researches on phytochemicals have led to the identification of many compounds, such as α - and β -pinene, menthol, thymol, eucalyptol, and limonene among the volatile constituents, and mono- and sesquiterpenes. From the other hand, Terpenes phenolic acids (rosmarinic, caffeic acids) and Alkaloids (apigenin, hesperidin), were detected (Skendi *et. al.*, 2019).

Various phytochemicals from different representatives of the family is as follows:

- Alpha-cadinol is a cadinane sesquiterpenoid that is cadin-4-ene carrying a hydroxy substituent at position 10. It has a role as a plant metabolite, a fungicide and a volatile oil component. It is a cadinane sesquiterpenoid, a carbobicyclic compound, a tertiary alcohol and a member of octahydronaphthalenes.
- Ursolic Acid is a pentacyclic triterpenoid found in various fruits, vegetables and medicinal herbs, with a variety of potential pharmacologic activities including anti-inflammatory, antioxidative, antiviral, serum lipid-lowering, and antineoplastic activities. Upon administration, ursolic acid may promote apoptosis and inhibit cancer cell proliferation through multiple mechanisms. This may include the regulation of mitochondrial function through various pathways including the ROCK/PTEN and p53 pathways, the suppression of the nuclear factor-kappa B (NF-kB) pathways, and the increase in caspase-3, caspase-8 and caspase-9 activities.
- Rosmarinic acid is a natural polyphenol antioxidant found in many Lamiaceae herbs used commonly as culinary herbs such as lemon balm, rosemary, oregano, sage, thyme, and peppermint. Chemically, rosmarinic acid is an ester of caffeic acid with 3,4-dihydroxyphenyl lactic acid. Rosmarinic acid has powerful anti-inflammatory

properties, and research suggests that it may help treat inflammatory conditions like arthritis, asthma, and atopic dermatitis.

- Eugenol, also called clove oil, is an aromatic oil extracted from cloves that is used widely as a flavouring for foods and teas and as an herbal oil used topically to treat toothache and more rarely to be taken orally to treat gastrointestinal and respiratory complaints. Eugenol in therapeutic doses has not been implicated in causing serum enzyme elevations or clinically apparent liver injury, but ingestions of high doses, as with an overdose, can cause severe liver injury. Eugenol is a phenylpropanoid formally derived from guaiacol with an allyl chain substituted para to the hydroxy group. It is a major component of clove essential oil, and exhibits antibacterial, analgesic and antioxidant properties. It has been widely used in dentistry to treat toothache and pulpitis.
- Carvacrol is a phenol that is a natural monoterpene derivative of cymene. An inhibitor of bacterial growth, it is used as a food additive. Potent activator of the human ion channels transient receptor potential V3 (TRPV3) and A1 (TRPA1). It has a role as a volatile oil component, a flavouring agent, an antimicrobial agent, an agrochemical and a TRPA1 channel agonist. It is a member of phenols, a p-menthane monoterpenoid and a botanical anti-fungal agent. It derives from a hydride of a p-cymene. carvacrol is a phenolic monoterpene found in thyme, oregano, and several other species of the Lamiaceae. Long valued for their smell and taste, these substances also have antibacterial and anti-spasmodic properties.
- Linalool is a monoterpenoid that is octa-1,6-diene substituted by methyl groups at positions 3 and 7 and a hydroxy group at position 3. It has been isolated from plants like *Ocimum canum*. It has a role as a plant metabolite, a volatile oil component, an antimicrobial agent and a fragrance. It is a tertiary alcohol and a monoterpenoid. Linalool naturally occurs in plants and spices as for example lavender, basil, or thyme. In contact with air linalool autoxidizes forming hydroperoxides.
- beta-caryophyllene is a beta-caryophyllene in which the stereocentre adjacent to the exocyclic double bond has S configuration while the remaining stereocentre has R

configuration. It is the most commonly occurring form of beta-caryophyllene, occurring in many essential oils, particularly oil of basil. It has a role as a non-steroidal anti-inflammatory drug, a fragrance, a metabolite and an insect attractant.

- Thymol is a phenol that is a natural monoterpene derivative of cymene. It has a role as a volatile oil component. It is a member of phenols and a monoterpenoid. It derives from a hydride of a p-cymene. It is a phenol obtained from thyme oil or other volatile oils. It is used as a stabilizer in pharmaceutical preparations. It has been used for its antiseptic, antibacterial, and antifungal actions, and was formerly used as a vermifuge.
- Nepetalactone is a name for multiple iridoid analog stereoisomers. Nepetalactones are produced by *Nepeta cataria* (catnip) and many other plants belonging to the genus *Nepeta*, in which they protect these plants from herbivorous insects by functioning as insect repellents.
- Camphene appears as a colourless to white crystalline solid with an insipid camphor-like odour. Dust and crystals are irritants to the eyes, nose and throat. Emits flammable vapors when heated. Emits acrid smoke and irritating fumes at high temperature. Used for the manufacture of synthetic camphor.

Cell membranes contain a host of proteins with diverse functions that support the life of a cell. Receptors are a special class of proteins that function by binding a specific ligand molecule. When a ligand binds to its receptor, the receptor can change conformation, transmitting a signal into the cell. In some cases, the receptors will remain on the surface of the cell and the ligand will eventually diffuse away. In other cases, ligand binding to a receptor triggers a series of events leading to internalization of the receptor: ligand complex in a process known as receptor-mediated endocytosis. Molecules have an innate affinity for one another due to electrostatic forces, such as Coulombic attractions, hydrogen bonds, and dispersion forces. The noncovalent interactions that result from this affinity are of particular importance in biological processes, including the catalysis of chemical reactions (by enzymes), neutralization of foreign toxins (by antibodies), and stimulation of cellular activities (by hormones). To initiate these processes, receptors and ligands exchange interactions with solvent and solute molecules for interactions with each other (Attie & Raines *et.al.*, 1995).

Chimera docking is a novel method has been developed for the analysis of ligand–receptor interactions. The method utilizes binding data generated from the analysis of chimeric proteins with chimeric peptides. To each chimeric part of the peptide and receptor are assigned descriptors, thus creating a matrix of X descriptors. These descriptors are then correlated with the experimentally determined interaction binding affinities for each chimeric receptor/peptide pair by use of partial least-squares projection to latent structures (PLS) (Prusis *et.al.*, 2001).

Chimera is used in docking the ligand and the receptor to produce a score which is analysed, to determine the level of denaturation of the protein. If the ligand interaction is suitable enough to denature the protein leading to an alteration in its function, the ligand (phytochemical) can be used to produce a potential drug against the disease.

2. AIMS AND OBJECTIVES

- To identify the ligand and receptor proteins
- Docking of the ligand with the receptor
- Computational analysis of the ligand receptor interaction
- Scoring and charting the interaction
- Producing the final list of ligands (phytochemicals) which can be used as an element in the potential drug production.

3. REVIEW OF LITERATURE

Cocan *et. al.* (2018) investigated the activity of ethanolic extracts from the following medicinal plant species cultivated in western Romania: *Melissa officinalis* L., *Rosmarinus officinalis* L. (RO) and *Salvia officinalis* L. (SO). Antioxidant activity, total phenolics content and a profile of the main hydroxycinnamic acids (HCAs), including caffeic, ferulic, coumaric and rosmarinic acids, was determined for each plant extract. The *in vitro* antimicrobial activity against four bacterial strains (*Escherichia coli*, *Listeria*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*), and the effect on cell viability in two melanoma cell lines (B164A5 murine melanoma and A375 human melanoma) was also assessed. The results indicated that total phenolics content was 73.76–274.73 mg GAE·g⁻¹ and the antioxidant activity was 2.32–2.87 mM Fe²⁺·100 g⁻¹. There was found a strong positive correlation (R=0.9691) between total phenolics content and the antioxidant activity in the investigated samples. Regarding the HCA profile obtained by high performance liquid chromatography, the results demonstrated that rosmarinic acid represents the main identified compound. The ethanolic extracts of RO and SO exhibited antibacterial activity against Gram positive and Gram-negative bacteria. RO was the most effective in terms of decreasing the cell viability of murine and human melanoma cell lines, while the HCAs did not exhibit any effect on cell viability. These findings suggested that plant extracts from the *Lamiaceae* family may be used in the clinic as natural antibacterial agents.

In the study conducted by Dorman *et.al.*, (2003), De-odourised aqueous extracts of four commonly consumed herbs belonging to the Lamiaceae family, i.e., oregano (*Origanum vulgare* L.), rosemary (*Rosmarinus officinalis* L.), sage (*Salvia officinalis* L.) and thyme (*Thymus vulgaris* L.), were investigated for their antioxidant properties. Various experimental models were used for the characterisation of the activity, including iron reduction capacity, DPPH radical dot, ABTS radical dot+ and radical dot OH radical-scavenging activities and the capacity of the extracts to inhibit copper-induced oxidation of human low-density lipoproteins (LDL) *ex vivo*. The extracts showed varying degrees of reductive and radical scavenging capacity, and were capable of a marked prolongation of the lag-time in the LDL oxidation assay. The hierarchy of the observed antioxidant activity of the extracts was dependent on the type of assay used. The observed antioxidant characteristics were not fully related to the total phenolic contents of the extracts in any of

the assays, but were presumably strongly dependent on rosmarinic acid, the major phenolic component present in this type of Lamiaceae extract.

Recent studies in West Africa and in Papua New Guinea by Greenwood (1989) have shown that the prevalence of malaria can vary widely between neighbouring villages and within different parts of the same village. Both genetic and environmental factors are likely to contribute to these variations. Clustering in households of genetically determined red cell abnormalities, and possibly of immune response genes, may contribute to differences in the prevalence of malaria within a village. Environmental factors probably play the major part in explaining differences between villages. The position of a village in relation to mosquito breeding sites, the design of houses and the level at which anti-mosquito measures are used will all influence the degree to which its inhabitants are exposed to infection. Attitudes to the treatment of a case of malaria may also contribute to local variations in the prevalence of malaria. Malaria parasitaemia and splenomegaly will be less frequent in a community where effective treatment is given immediately at home, or sought promptly from a primary health care worker, than in a neighbouring community where there is a much greater reliance on traditional medicines. Recognition of local variations in the prevalence of malaria is important because identification of the factors responsible for a low prevalence in one village but a high one in a neighbouring community may indicate a possible control measure. Local variations in the epidemiology of malaria were also taken into account when any kind of malaria intervention trial is planned.

According to the WHO, in 2008, there were 247 million reported cases of malaria and nearly one million deaths from the disease. Parasite resistance against first-line drugs, including artemisinin and mefloquine, is increasing. In this study the plant-derived compounds aglafolin, rocaglamid, kokusaginine, arborine, arborinine and tuberostemonine were investigated for their anti-plasmodial activity *in vitro* by Astelbauer *et.al.*, (2012). Fresh *Plasmodium falciparum* isolates were taken from patients in the area of Mae Sot, north-western Thailand in 2008 and the inhibition of schizont maturation was determined for the respective compounds. With inhibitory concentrations effecting 50%, 90% and 99% inhibition (IC_{50} , IC_{90} and IC_{99}) of 60.95 nM, 854.41 nM and 7351.49 nM, respectively, rocaglamid was the most active of the substances, closely followed by aglafoline with 53.49 nM, 864.55 nM and 8354.20 nM. The activity was

significantly below that of artemisinin, but moderately higher than that of quinine. Arborine, arborinine, tuberostemonine and kokusaginine showed only marginal activity against *P. falciparum* characterized by IC₅₀ and IC₉₉ values higher than 350 nM and 180 μM, respectively, and regressions with relatively shallow slopes $S > 14.38$.

Lambros & Vanderberg *et.al.*, (1979) studied the synchronous development of the erythrocytic stages of a human malaria parasite, *Plasmodium falciparum*, in culture was accomplished by suspending cultured parasites in 5% D-sorbitol and subsequent reintroduction into culture. Immediately after sorbitol treatment, cultures consisted mainly of single and multiple ring-form infections. At the same time, varying degrees of lysis of erythrocytes infected with the more mature stages of the parasite was evident. Approximately 95% of the parasites were in the ring stage of development at 48 and 96 hr after sorbitol treatment; likewise, a high percentage of trophozoite and schizont stages was observed at 24, 72, and 120 hr. D-Mannitol produced similar, selective, lytic effects.

The constant emergence of resistant strains of *Plasmodium falciparum* has necessitated the continuous screening of traditional plants such that novel and effective antimalarial drugs will be developed. Enenebeaku *et.al.*, (2021) investigated the antiplasmodial activity of the methanol root extract of *Dictyandra arborescens* against *Plasmodium* and was determined in vivo and the active compounds responsible for the observed activity identified in silico. Column chromatography was used to determine the solvent fraction containing the active compounds. All fractions reduced percentage parasitaemia in the treated mice, and hexane fraction showed significant antimalarial activity. The hexane fraction gave two eluates coded EA and EB whose bioactive components were determined using Gas Chromatography-Mass Spectrometry (GC-MS). Eluate EA gave 11 compounds (propane 1,2-dichloro propane, hexadecanoic acid, methyl ester, n-hexadecanoic acid, 9,17 octadecadienal, (Z)-, cis-13-octadecenoic acid, methyl ester, 6-octadecenoic acid, methyl ester, (Z)-, heptadecanoic acid, 16-methyl, methyl ester and bis (2-ethylhexyl) phtalate). In comparison, eluate EB gave 16 compounds (carbonic acid, prop-1-en-2-yl tetradecyl ester, 5-octadecene, (E)-, isobutyl tetradecyl carbonate, hexadecanoic acid, methyl ester, n-hexadecanoic acid butyl octadecyl ether, 10-octadecenoic acid, methyl ester, cyclopropaneoctanoic acid, 2-hexyl-2,3-divinyloxirane and carbonic acid, dodecyl 2,2,2-trichloroethyl ester). These compounds were subjected to molecular docking against Lactate dehydrogenase and Plasmepsin II enzymes from *P.*

berghei. Bis(2-ethylhexyl) phthalate and bis(3-methylbutan-2-yl) phthalate gave binding affinity values close to artesunate for the two protein targets. The antimalarial potential of *D. arborescens* root as a novel source of an antimalarial drug is thus validated.

Every year, malaria caused by *Plasmodium falciparum* leads to 1 million deaths. Disease condition is alarming due to acquired resistance in parasite against antimalarial drugs in circulation. It brings the necessity to design novel inhibitors against newly identified drug targets. RIO-2 kinase regulates ribosome biogenesis and represents a promising drug target. North eastern region of India is a biodiversity hub with a rich source of medicinal plants. Medicinal plants represent a source of phytochemical library to be screened to develop an inhibitor against the PfRIO-2 kinase. In current report, we selected plants with known antimalarial activity and performed in silico screening with phytochemicals against PfRIO-2 as a target. The majority of antimalarial phytochemicals docked very well into the ATP binding pocket of the PfRIO-2 kinase. A competition assay with substrate ATP indicates that a total of 5 phytochemicals, rutin, bebeerines, isochondrodendrine, nimbin and punicalagin, share similar interactions with protein residues within the ATP binding pocket and have potential to inhibit ATP binding. A significant relationship was found between docking energy and experimentally determined antimalarial values of rutin, bebeerines, isochondrodendrine, nimbin and punicalagin ($R^2 = 0.91, p < 0.001$). Docking and virtual screening has identified lead phytochemicals, namely rutin, bebeerines, isochondrodendrine, nimbin and punicalagin, as a potent PfRIO-2 inhibitor, but cannot replace experimental verification (Prasad & Trivedi *et.al.*, 2012).

Vladimir *et.al.*, (2014) conducted a study to evaluate acetylcholinesterase (AChE) inhibitory and antioxidant activities of Lamiaceae medicinal plants growing wild in Croatia. Using Ellman's colorimetric assay all tested ethanolic extracts and their hydroxycinnamic acid constituents demonstrated *in vitro* AChE inhibitory properties in a dose dependent manner. The extracts of *Mentha x piperita*, *M. longifolia*, *Salvia officinalis*, *Satureja montana*, *Teucrium arduini*, *T. chamaedrys*, *T. montanum*, *T. polium* and *Thymus vulgaris* at 1 mg/mL showed strong inhibitory activity against AChE. The antioxidant potential of the investigated Lamiaceae species was assessed by DPPH' scavenging activity and total antioxidant capacity assays, in comparison with hydroxycinnamic acids and trolox. The extracts differed greatly in their total

hydroxycinnamic derivatives content, determined spectrophotometrically. Rosmarinic acid was found to be the predominant constituent in most of the investigated medicinal plants (by RP-HPLC) and had a substantial influence on their AChE inhibitory and antioxidant properties, with the exception of *Teucrium* species. These findings indicate that Lamiaceae species are a rich source of various natural AChE inhibitors and antioxidants that could be useful in the prevention and treatment of Alzheimer's and other related diseases.

In a study conducted by Rai *et.al.*, (2013), the members of Lamiaceae family including aromatic plants that are being used in traditional medicine for various disorders were investigated. The therapeutic application of these plants is attributed to the presence of secondary metabolites or phytochemicals such as alkaloids, saponins, flavonoids, glycosides and phenols. The study was a preliminary screening of phytochemicals of *Leucas linifolia*, *Coleus aromaticus*, *Pogestemon patchouli*, which belong to Lamiaceae family. Methanol, ethanol and chloroform extracts of each plant were subjected to both qualitative and quantitative phytochemical screening. The alkaloids, saponins, total phenols, tannins, flavonoids, steroids and proteins were quantified in the extracts by standard spectrophotometric methods. The results of the qualitative analysis of the study plants, revealed the presence of steroids and absence of terpenoids, amino acids in all the leaf extracts. In addition, methanol extracts were positive for alkaloids, saponins, tannins and phenols, flavonoids, carbohydrates and glycosides. Whereas, the ethanol extracts showed fewer constituents in different combination in all the three study plants. However, chloroform is a good solvent for extraction of steroids from these plants since only steroids were present in chloroform extract. The concentration of total phenols and tannins was higher in methanol extract. *Pogestemon patchouli* had the highest concentration of flavonoids more so in ethanol than either methanol or chloroform extracts. Although, protein concentrations were higher in the ethanol extracts of *Leucas linifolia* and *Coleus aromaticus*, methanol extract of *Pogestemon patchouli* had more protein than ethanol extract. However, chloroform which extracted steroids, is not a good choice for extraction of proteins from these plants. In conclusion, for further studies on the phytochemical and biological structure-function relationship, the use of appropriate solvent for extraction and purification of the specific phytochemical from plants is one of the crucial steps.

4. MATERIALS AND METHODS

4.1. Ligand Screening

For the initial Ligand screening purposes, a web-based tool named SwissADME (<https://www.swissadme.ch/>) was used to eliminate a few compounds according to Lipinski's rule of five parameters. For a compound to qualify as ligand it should have <500 Da molecular weight, a high lipophilicity i.e., value of Log P being less than 5, hydrogen bond acceptors being less than 10 and H-bond donors less than 5. Any compound with more than 2 violations was ruled out for further study (Lipinski, 2004).

4.2. Protein Preparation and Active site Determination

Required protein in PDB format was downloaded from the website rcsb.org, commonly known as the Protein Data Bank. 3D conformers of the ligand were downloaded from PubChem.

Using PyMOL (Version 2.4.1) software water molecules as well as native ligands from the protein were removed, defined as cleaning/purification of the protein for further application. Using a web server called Deep Site Active Pockets of the proteins were calculated. The results calculated by the web server were in the form of different ids, centers and scores.

Scoring in deep site was using neural networking based on following instructions using DCNN architecture. Center values for the grid were selected keeping score greater than 0.98.

UCSF Chimera (Version 1.14) was used to prepare the receptor using the DockPrep function. Dock Prep prepared structures for Docking using these functions:

- deleting water molecules
- repairing truncated sidechains
- adding hydrogens
- assigning partial charges
- writing files in Mol2 format

4.2.1. In silico Docking Using Auto dock Vina

Auto dock Vina (Version 1.1.2) along with UCSF Chimera (Version 1.14) was used for molecular Docking Studies. Centre values and size of the grid of different scores were used from DEEPSITE calculations done above.

Following Parameters were set in auto dock vina.

4.2.2. Receptor options –

- Add hydrogens in Chimera (true/false) – whether to add hydrogens in Chimera before calling the script. The receptor prep script will check for hydrogens and add them if they are missing. AutoDock Vina needs the polar (potentially H-bonding) hydrogens to identify atom types for scoring purposes.
- Merge charges and remove non-polar hydrogens (true/false) – note AutoDock Vina does not use charges or nonpolar hydrogens, so this setting is not expected to affect results except for the presence or absence of nonpolar hydrogens in the processed receptor
- Merge charges and remove lone pairs (true/false) – note AutoDock Vina does not use charges or lone pairs, so this setting is not expected to affect results except for the presence or absence of lone pairs in the processed receptor (and there may not have been any lone pairs to start with)
- Ignore waters (true/false)
- Ignore chains of non-standard residues (true/false) – ignore chains composed entirely of residues other than the 20 standard amino acids.
- Ignore all non-standard residues (true/false) – ignore all residues other than the 20 standard amino acids.

4.2.3. For Ligands

- Merge charges and remove non-polar hydrogens (true/false) – note Auto Dock Vina does not use charges or nonpolar hydrogens, so this setting is not expected to affect

results except for the presence or absence of nonpolar hydrogens in the ligand output files

- Merge charges and remove lone pairs (true/false) – note AutoDock Vina does not use charges or lone pairs, so this setting is not expected to affect results except for the presence or absence of lone pairs in the ligand output files (and there may not have been any lone pairs to start with)

4.3. Docking parameters

- Number of binding modes (1-10, 10) – maximum number of binding modes to generate
- Exhaustiveness of search (1-8, 8) – thoroughness of search, roughly proportional to time
- Maximum energy difference (kcal/mol) (1-3,3) – maximum score range; binding modes with scores not within this range of the best score will be discarded.

The docking results were calculated by Auto dock vina using its Scoring function and results were displayed in the form of Scores and RMSD values. Docking results with the highest value score accompanied by negative sign and least RMSD values were chosen for further studies.

4.4. Residue Analysis

PyMOL was used for visualization of interactions of the docked structure at the ligand sites. Discovery Studio 2020 was used to study the ligand interactions and total number of residues. It was also used to plot the 2D structure of the interactions and residues.

4.5. Statistical Analysis

Descriptive, estimation and Hypothesis testing with confidence interval of 95% was applied to data using formula 1 given below.

$$CI = \bar{x} \pm z \frac{s}{\sqrt{n}}$$

CI = confidence interval

\bar{x} = sample mean

z = confidence level value

s = sample standard deviation

n = sample size

Formula 1: used for calculation of confidence interval

5. RESULTS

5.1 Ligand Screening

The following ligands were selected:

- Alpha Cardinol
- Beta Caryophyllene
- Camphene
- Carvacrol
- Eugenol
- Linalool
- Nepetalactone
- Rosmarinic Acid
- Thymol
- Ursolic Acid

The ligands were screened using SwissADME. The various chemical properties of the ligands are displayed in Table 5.1.

5.2. Protein Preparation and Active site Determination

The structure of the receptor protein -6YCZ was obtained from PDB (Protein Data Bank). The structure of the protein is shown in Fig. 5.1. The structure of the ligands is shown in Table 5.2.

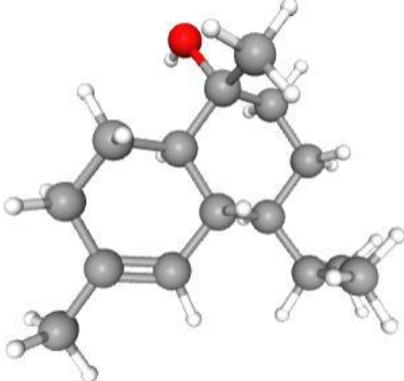
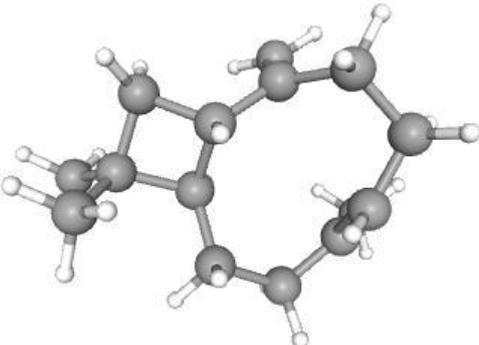
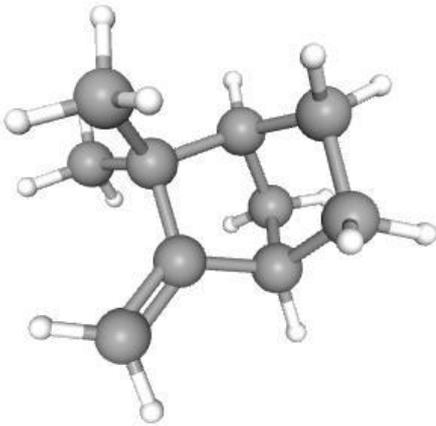


Fig. 5.1: Structure of 6YCZ receptor protein.

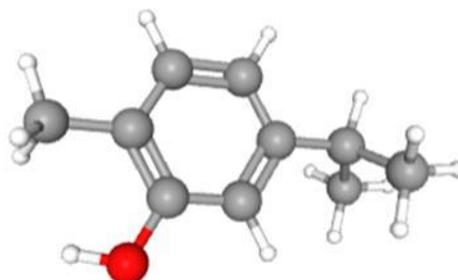
CARVACROL	C10H14O	150.22 g/mol	20.23 Å ²	2.82	Log S (ESOL)	-3.31	High	-4.74 cm/s	Yes: 0 violation	0.55	No: 2 violation	1
					Solubility	7.40e-02 mg/ml; 4.92e-04 mol/l		n		s: MW<20, Heteroatoms<2		
					Class	Soluble						
EUGENOL	C10H12O2	164.20 g/mol	29.46 Å ²	2.25	Log S (ESOL)	-2.46	High	-5.69 cm/s	Yes: 0 violation	0.55	No: 1 violation	1.58
					Solubility	5.69e-01 mg/ml; 3.47e-03 mol/l		n		s: MW<250		
					Class	Soluble						
LINALOOL	C10H18O	154.25 g/mol	20.23 Å ²	2.66	Log S (ESOL)	-2.4	High	-5.13 cm/s	Yes: 0 violation	0.55	Yes: 0 violation	2.74
					Solubility	6.09e-01 mg/ml; 3.95e-03 mol/l		n				
					Class	Soluble						
NEPETALETONE	C10H14O2	166.22 g/mol	26.30 Å ²	2.06	Log S (ESOL)	-2.07	High	-5.96 cm/s	Yes: 0 violation	0.55	No: 1 violation	3.98
					Solubility	1.40e+00 mg/ml; 8.44e-03 mol/l		n		s: MW<250		
					Class	Soluble						
ROSMARINIC ACID	C18H16O8	360.31 g/mol		1.58	Log S (ESOL)	-3.44	Low	-6.82 cm/s		0.56	No: 1 violation	3.38

THYMOLOL	C ₁₀ H ₁₄ O	150.22 g/mol	20.23 Å ²	2.8	Solubilit	1.31e-01 mg/ml; 3.63e-04 mol/l	High	-4.87 cm/s	Yes; 0 violatio	0.55	No; 1 violation : MW<250	1
					Class	Soluble						
URSOLIC ACID	C ₃₀ H ₄₈ O ₃	456.7 g/mol	144.52 Å ²	1.05	Log S (ESOL)	-2.46	High	-4.74 cm/s	Yes; 0 violatio	0.56	No; 1 violation : MW>350	3.59
					Solubilit	5.69e-01 mg/ml; 3.47e-03 mol/l						
					Class	Soluble						

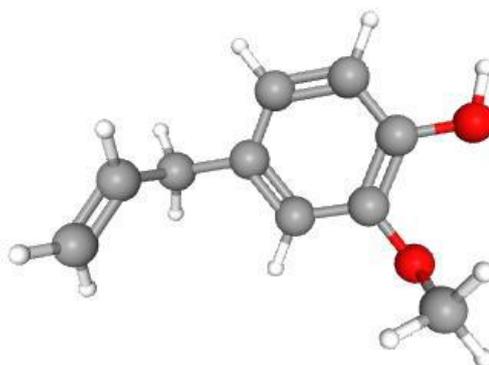
Table 5.1: Chemical Properties of Ligands.

LIGAND	STRUCTURE
Alpha Cardinol	 <p>A ball-and-stick model of the ligand Alpha Cardinol. The structure features a bicyclic core with a fused six-membered ring and a five-membered ring. A hydroxyl group (-OH) is attached to the five-membered ring, with the oxygen atom shown in red and the hydrogen atom in white. The rest of the molecule consists of carbon (grey) and hydrogen (white) atoms.</p>
Beta Caryophyllene	 <p>A ball-and-stick model of the ligand Beta Caryophyllene. It is a bicyclic molecule with a fused six-membered ring and a five-membered ring. The structure is highly branched and contains several double bonds, characteristic of a sesquiterpene. It is composed of carbon (grey) and hydrogen (white) atoms.</p>
Camphene	 <p>A ball-and-stick model of the ligand Camphene. It is a bicyclic molecule with a fused six-membered ring and a five-membered ring. The structure is highly branched and contains several double bonds, characteristic of a sesquiterpene. It is composed of carbon (grey) and hydrogen (white) atoms.</p>

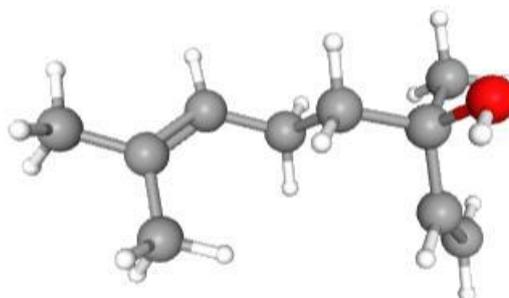
Carvacrol



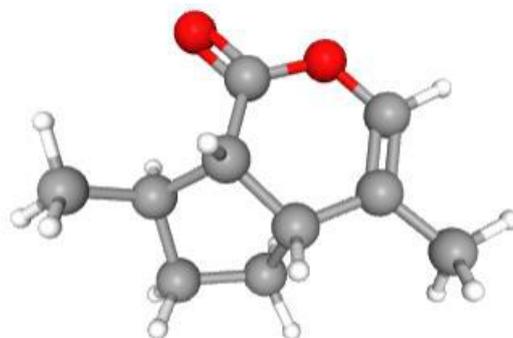
Eugenol



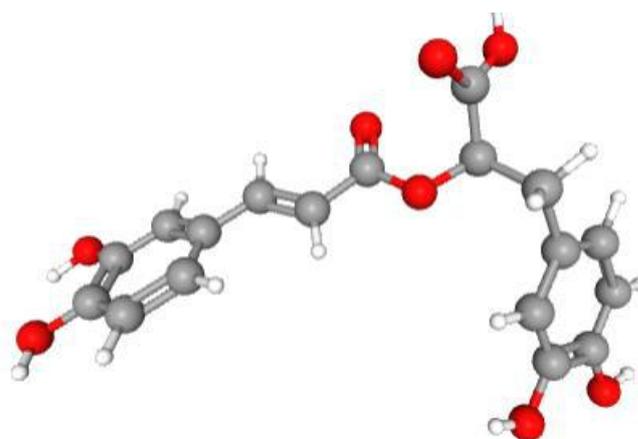
Linalool



Nepetalactone



Rosmarinic Acid



Thymol



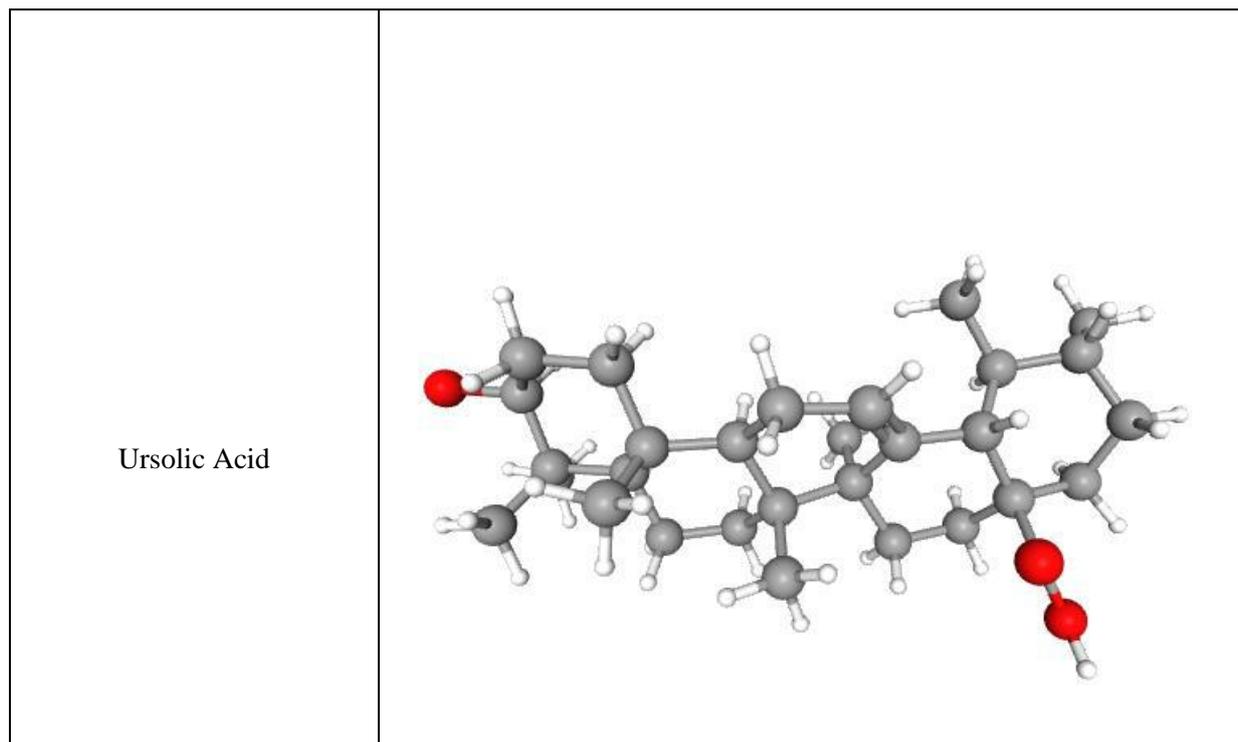


Table 5.2: Structure of Ligands obtained from PubChem

5.2 Docking Scores

For 6YCZ, two active sites were selected out of which the 2th active site was selected with a Deep site score of 0.991. The selection was made on the basis of the highest binding energy of the ligand-receptor.

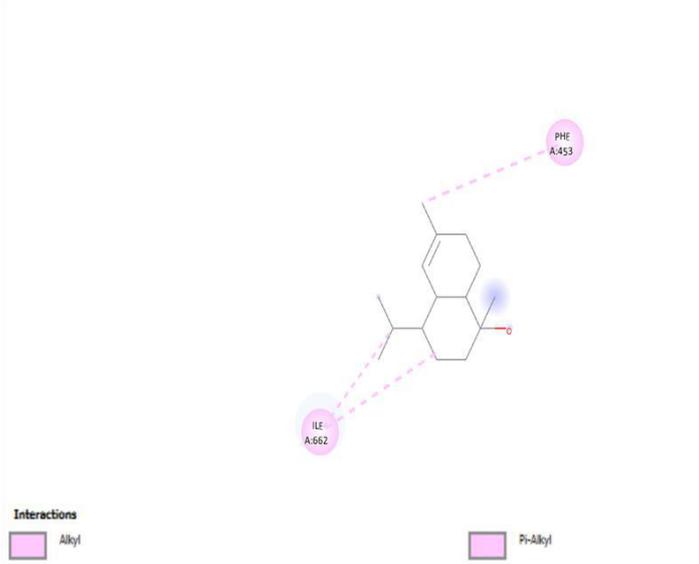
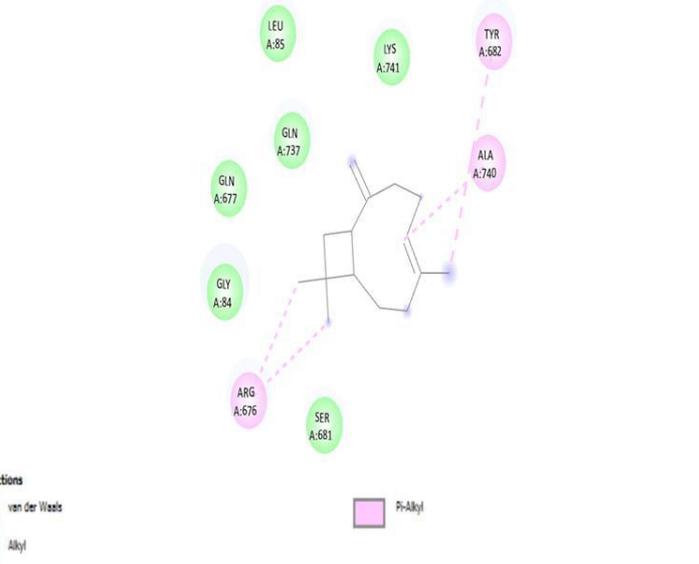
Docking scores for the above 10 ligands with the receptor protein 6YCZ was obtained by using the software AutoDock vina. The docking scores obtained are shown in Table 5.3 with respect to the ligands.

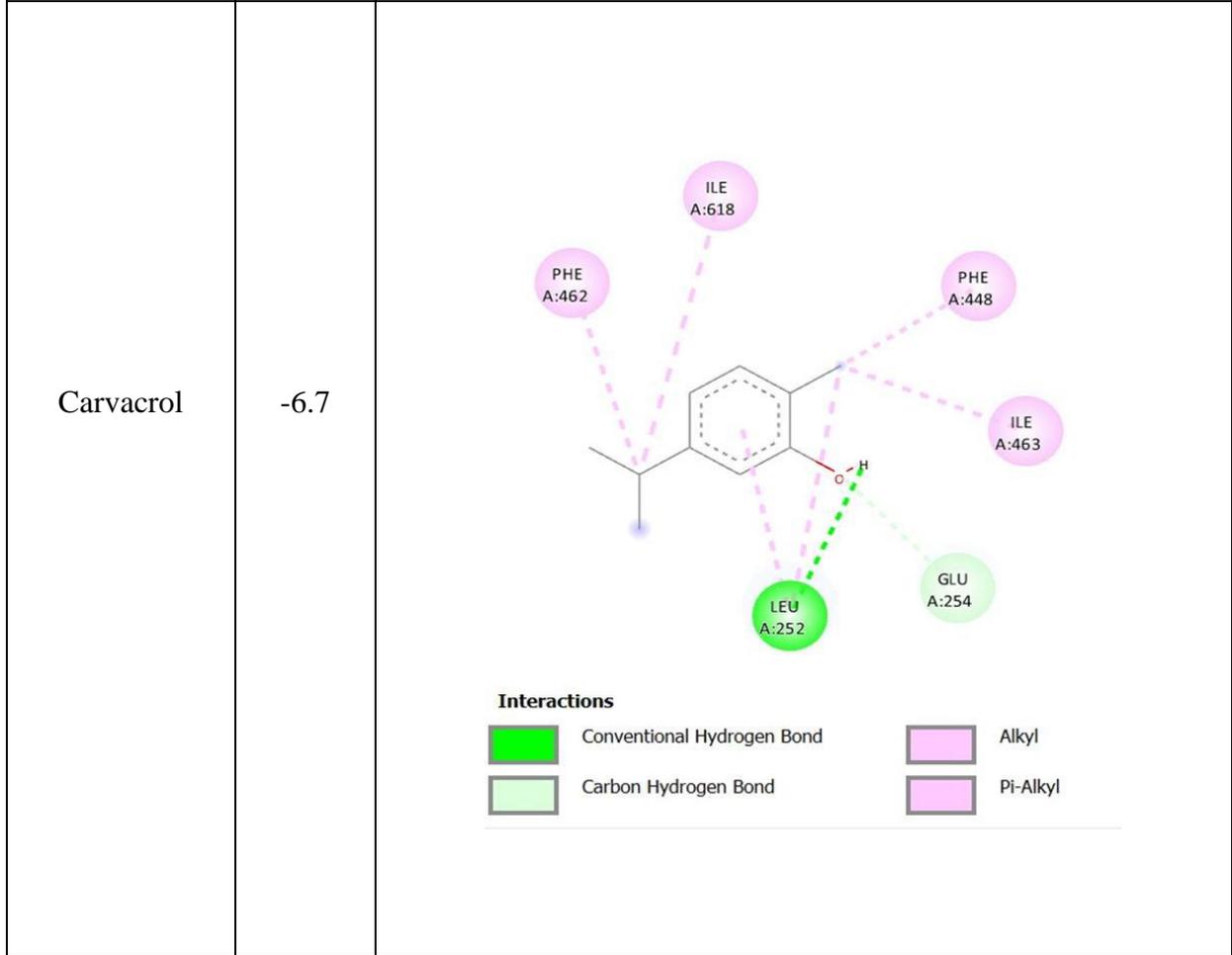
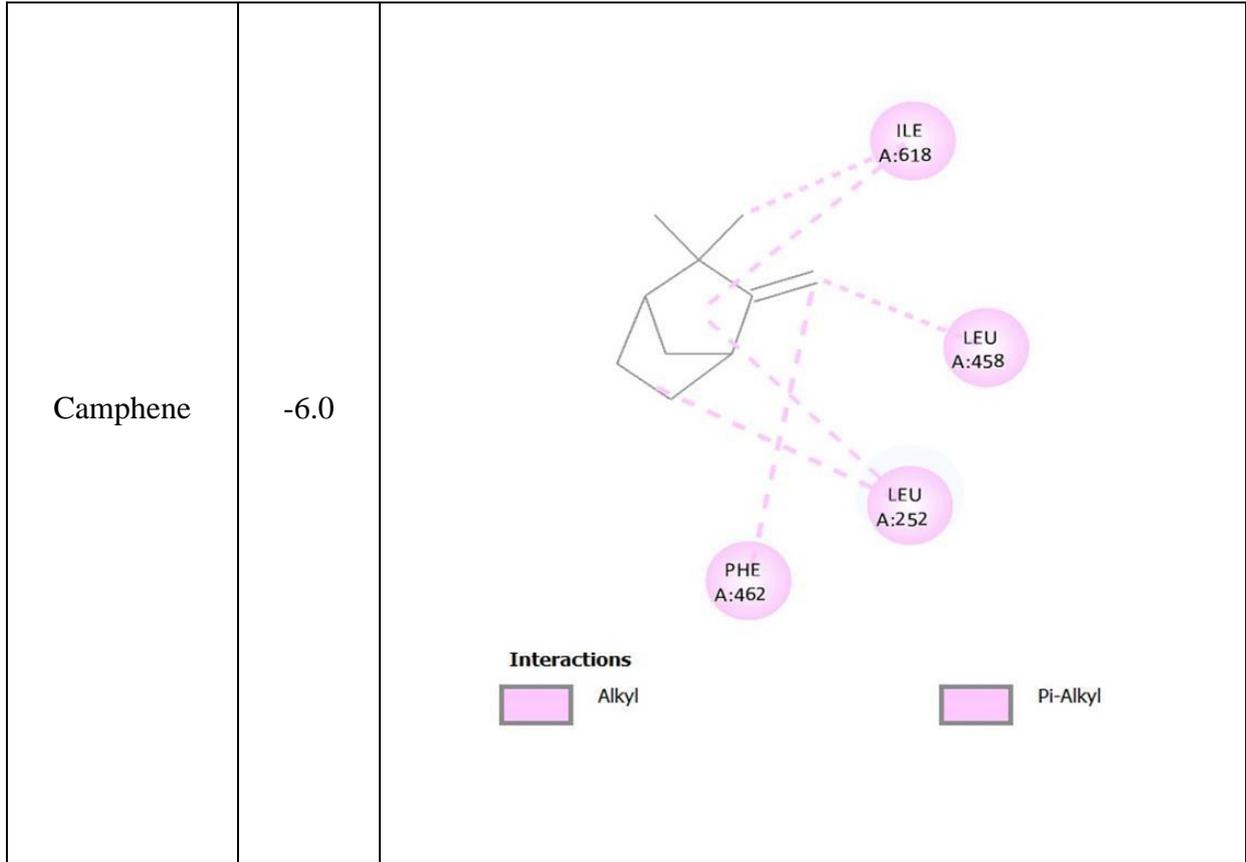
LIGANDS	DOCK SCORE
alpha cardinol	-6.7
Beta caryophyllene	-6.8
Camphene	-6
Carvacrol	-6.7
Euegenol	-6.4
Linalool	-5.6
Nepetalactone	-6.7
Rosmarinic acid	-8.1
Thymol	-5.6
Ursolic acid	-9.7

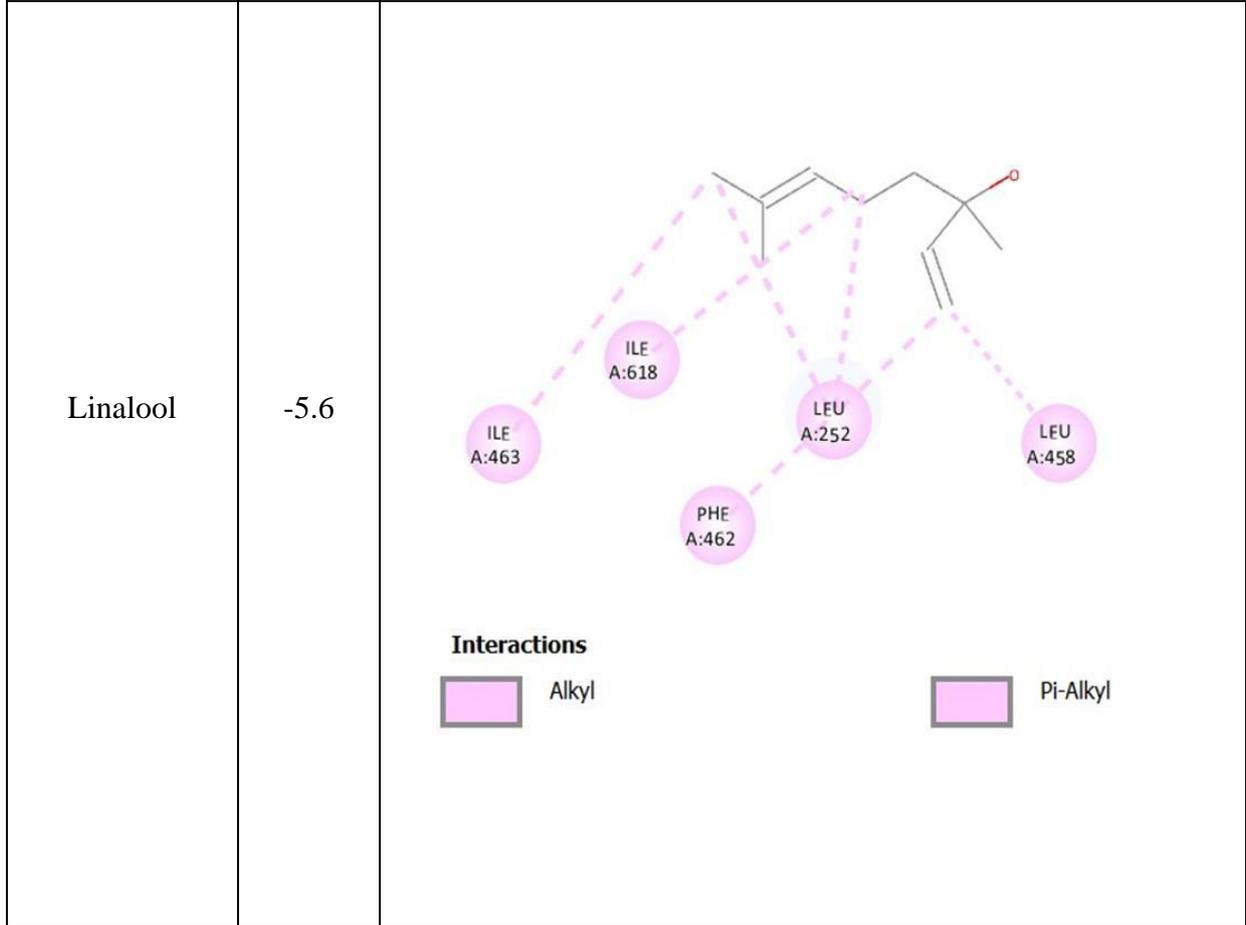
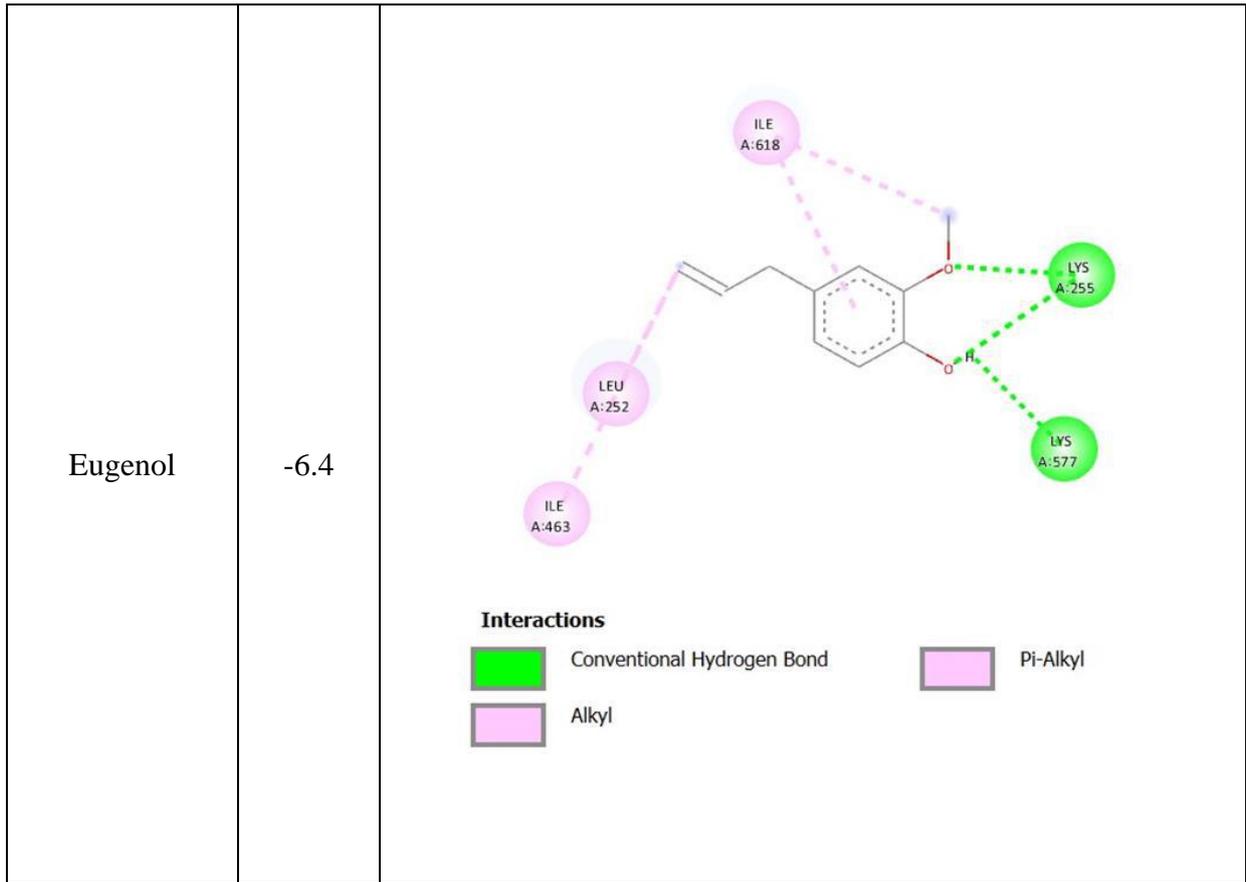
Table 5.3: Docking Scores of Ligands.

5.3 Residue and Statistical Analysis

The residue and statistical analysis were performed using Discovery Studio 2020. The results produced are shown in Table 5.4.

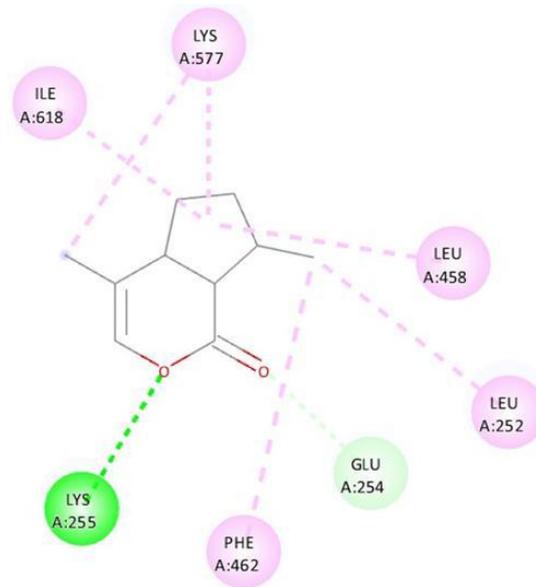
LIGAND	DOCK SCORE	INTERACTION
Alpha Cardinol	-6.7	 <p>Interactions</p> <ul style="list-style-type: none"> Alkyl Pi-Alkyl
Beta Caryophyllene	-6.8	 <p>Interactions</p> <ul style="list-style-type: none"> van der Waals Alkyl Pi-Alkyl



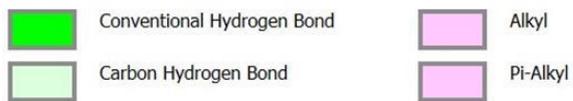


Nepetalactone

-6.7

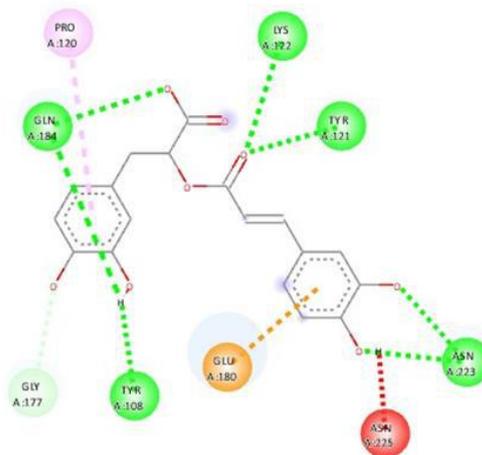


Interactions



Rosmarinic Acid

-8.1



Interactions



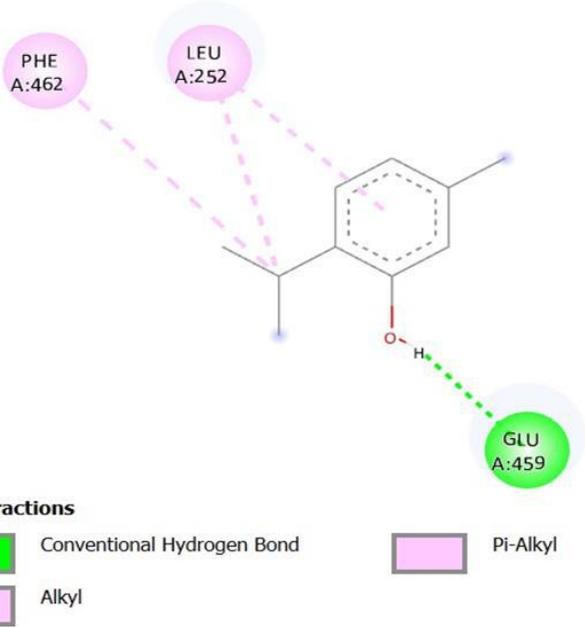
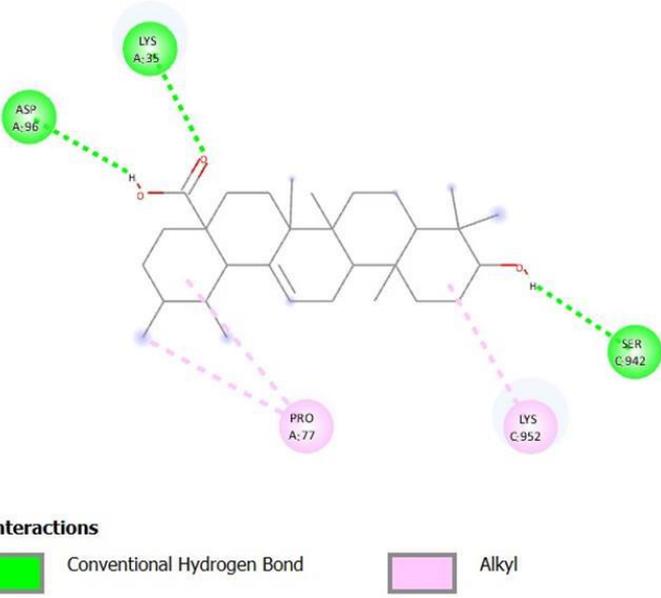
Thymol	-5.6	 <p>Interactions</p> <ul style="list-style-type: none"> ■ Conventional Hydrogen Bond ■ Pi-Alkyl ■ Alkyl
Ursolic Acid	-9.7	 <p>Interactions</p> <ul style="list-style-type: none"> ■ Conventional Hydrogen Bond ■ Alkyl

Table 5.4: Results of Residue and Statistical Analysis

6. DISCUSSION

Malaria is a life-threatening disease caused by parasites that are transmitted to people through the bites of infected female Anopheles mosquitoes. Malaria is caused by a parasite known as Plasmodium, which is normally spread through infected mosquitoes. *Plasmodium falciparum* is the main causative organism of Malaria in humans. In the study conducted, the receptor protein of *P. falciparum* was identified and the receptor degradation was studied, using phytochemicals of Lamiaceae family as ligands.

The major phytochemicals in the representatives of Lamiaceae family were selected and plants common in India such as *Ocimum basilicum*, *Leucas aspera* etc were taken into consideration. The Lamiaceae (Labiatae) is one of the most diverse and widespread plant families in terms of ethnomedicine and its medicinal value is based on the volatile oil concentration (Venkateshappa *et.al.*, (2013).

The interaction of the ligand with the protein is studied through the software AutoDock vina, which produces a docking score with respect to the ligand and the receptor protein. The scores are statistically analysed in Discovery Studio 2020. The residue analysis is also performed. In computational repurposing of ligands, the ligand structures are obtained from PubChem. The receptor protein structure is obtained from PDB.

Drug repurposing is performed either experimentally or computationally. The latter approach is also called 'in silico drug repurposing', which belongs to the area of computational pharmacology. In silico drug repurposing is classified into discovering new indications for an existing drug (drug-centric) and identifying effective drugs for a disease (disease-centric) and has the common strategy of similarity assessment between drugs and or diseases (Park *et.al.*, (2019).

The results of the present study showed that from the ten phytochemicals selected Ursolic acid and rosmarinic acid showed the best results. Ursolic (UA), oleanolic (OA) and rosmarinic (RA) acids are bioactive metabolites found in *Lepechinia caulescens* that have generated interest for their health benefits, which include antimicrobial, antioxidant, antimutagenic, gastroprotective, antidiabetic, antihypertensive and anti-inflammatory properties, among others (Vergara *et.al.*, (2021).

The ligands which produced the highest docking scores can be selected to produce a potential drug to cure Malaria. The ligands which showed the highest scores include - Ursolic Acid, Rosmarinic Acid, Alpha Cardinol, Beta Caryophyllene and Carvacrol which showed best docking results with the protein 6YCZ.

The main strategies to control malaria globally are vector control with long-lasting insecticide-treated bed nets, early diagnosis and treatment with artemisinin-based combination therapies (ACTs), and chemoprevention in pregnant women and young children. After decades of research, a malaria vaccine (RTS, S/AS01) received a positive opinion from the European Medicines Agency under Article 58 in 2015; however, it is only moderately efficacious and has an uncertain future. Its introduction is unlikely to lessen the demand for antimalarial drugs (Ashley & Phyto *et.al.*, (2018).

7. SUMMARY & CONCLUSION

Malaria is one of the most common diseases found in developing countries. Malaria is caused by the infection of *Plasmodium falciparum*. The infection spreads at rapid rates during monsoon season as the Mosquitoes of the genus Anopheles transmit malaria parasites.

The study aimed to identify ligands of Lamiaceae family which could be used as a potential cure for malaria. The receptor protein of *Plasmodium falciparum* was identified as 6YCZ and its structure was obtained from PDB. The ligands selected from the Lamiaceae family are - Alpha Cardinol, Beta Caryophyllene, Camphene, Carvacrol, Eugenol, Linalool, Nepetalactone, Rosmarinic Acid, Thymol and Ursolic Acid.

All ten ligands were studied using bioavailability radar. The results of the present study proposed that Ursolic acid, Rosmarinic acid, Alpha Cardinol, Beta Caryophyllene and Carvacrol showed best docking results with 6YCZ. Moreover, Ursolic acid and Rosmarinic acid showed the best docking results with the protein 6YCZ. To find the effectiveness and to propose the exact mechanism, *in-vitro* studies can be encouraged on these ligands by targeting proteins of organisms responsible for malaria that are discussed above to understand the mechanism and a potential cure for Malaria.

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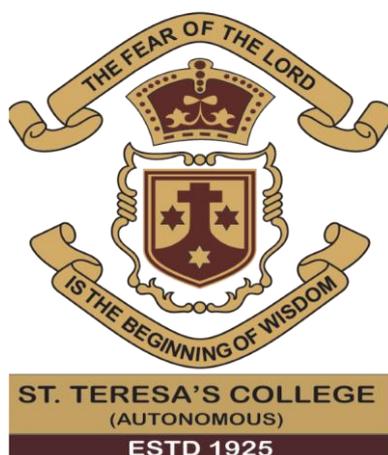
Phytochemical screening, Functional groups and Elemental analysis of *Ipomoea cairica* (L.) subjected to abiotic stress in the industrial area of Eloor, Ernakulam district of Kerala

DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENT
FOR THE AWARD OF DEGREE OF
“BACHELOR OF SCIENCE” IN

BOTANY

By

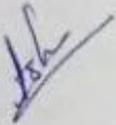
**VIDHYA JITHESH
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CERTIFICATE

This is to certify that the dissertation entitled “ **Phytochemical screening, Functional groups and Elemental analysis of *Ipomoea cairica* (L.) subjected to abiotic stress in the industrial area of Eloor, Ernakulam district of Kerala** ” submitted by as a part of the B.Sc degree course for the year 2021-2022 has been carried out under the supervision and guidance of Dr. Asha D , Department of Botany, St. Teresa’s college Ernakulam.



Dr.Asha D.
Supervising Teacher
St. Teresa’s college , Ernakulam



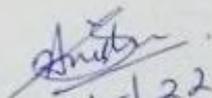
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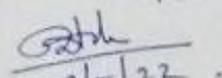


Place: Ernakulam

Date:

Examiner:

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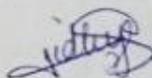
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Vidhya Jitesh

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CONTENTS

CHAPTER	TITLE	PAGE NUMBER
1	INTRODUCTION	1 - 6
2	REVIEW OF LITERATURE	7 - 8
3	MATERIALS & METHODS	9 - 14
4	RESULTS	15 - 20
5	DISCUSSION	21 - 22
6	SUMMARY & CONCLUSION	23
7	REFERENCES	24 - 25

INTRODUCTION

Knowledge of herbs has been handed down from generation to generation for thousands of years. The revival of interest in natural drugs started in last decade mainly because of the widespread belief that green medicine is healthier than synthetic products. In the recent past, there has been a tremendous increase in the use of plant-based health products in developing as well as developed countries resulting in an exponential growth of herbal products globally.

According to the WHO, about 80% of the population in the world rely on the traditional medicine for the treatment of various diseases (Padmaa, et al., 2010). However, due to over population, urbanization, and continuous exploitation of these herbal reserves, the natural resources along with their related traditional knowledge are depleting day by day (Pande et al., 2007).

Most of the medicinal plant parts are used as raw drugs and they possess varied medicinal properties (Mahesh and Satish 2008). Medicinal plants are easily available, less expensive and also have no side effects (Cathrine et al., 2011). Medicinal plants represent a rich source of the antimicrobial agent (Mahesh et al., 2008).

In the present era of drug development and discovery of newer drug molecules, many plant products are evaluated on the basis of their traditional uses. In this regard, one of the many plants which are being evaluated for their therapeutic efficacies is *Ipomoea cairica* (Convolvulaceae) which is a perennial herb of unknown origin, possibly tropical Africa and Asia (Austin and Huaman, 1996); widely cultivated, now distributed nearly pantropically. Grows in disturbed sites, such as roadsides and waste-ground in urban areas, and is invasive of natural habitats, especially along river banks and coastal dunes.

Environment can be defined as a sum total of all the living and non-living elements and their effects that influence human life. While all living or biotic elements are animals, plants, forests, fisheries, and birds, non-living or abiotic elements include water, land, sunlight, rocks, and air. Environmental science is an interdisciplinary academic field that integrates physical, biological, and geography (including ecology, biology, physics, chemistry, plant science,

zoology, mineralogy, oceanography, limnology, soil science, geology and physical geography, and atmospheric science) to the study of the environment, and the solution of environmental problems. Environmental science emerged from the fields of natural history and medicine during the Enlightenment. Today it provides an integrated, quantitative, and interdisciplinary approach to the study of environmental systems.

Nature is a synthesis of the five elements air, water, soil, fire and earth and man has been living in balanced harmony with nature since time immemorial. But the changes which man has brought about in his environment were largely determined by his necessities, his knowledge and his value. (Ajantha et al., 1989). These are undoubtedly being polluted by the dust, smoke, sewage, sullage, industrial discharge and city refuse. (Arun, 1999).

As a result of rain, dew or fog, leaves and other aerial organs of plants often become wet. In most species, the turgidity of leaves is restored from the wilted condition after immersion of water for 24 hour or less. Water largely entered through the epidermal cells, through hairs and specialized epidermal cells can provide for such entry in some cases. On prolonged immersion the leaves of many species show opening of stomata and some time also the injection the intercellular spaces with liquid water under certain condition, leaves and other aerial parts are capable of absorbing water from the air, it has been reported that pine seedlings of *Pinus ponderosa* in dry soil can absorb water vapour from the near saturated or unsaturated atmosphere (Subhash, 1980).

Human population size has grown enormously over the last hundred years. This means an increase in demand for food, water, home, electricity, roads, automobiles and numerous other commodities. These demands are exerting tremendous pressure on our natural resources and are also contributing to pollution of air, water and soil. The need of the hour is to check the degradation and depletion of our precious natural resources and pollution without halting the process of development.

Macronutrients and Micronutrients in Plants

The essential elements can be divided into macronutrients and micronutrients. Nutrients that plants require in larger amounts are called macronutrients. About half of the essential elements are considered macronutrients: carbon, hydrogen, oxygen, nitrogen, phosphorus, potassium, calcium, magnesium, and sulphur. The next-most-abundant element in plant cells is nitrogen (N); it is part of proteins and nucleic acids. Nitrogen is also used in the synthesis of some vitamins. Hydrogen and oxygen are macronutrients that are part of many organic compounds and also form water. Oxygen is necessary for cellular respiration; plants use oxygen to store energy in the form of ATP. Phosphorus (P), another macromolecule, is necessary to synthesise nucleic acids and phospholipids. As part of ATP, phosphorus enables food energy to be converted into chemical energy through oxidative phosphorylation. Light energy is converted into chemical energy during photophosphorylation in photosynthesis; and into chemical energy to be extracted during respiration. Sulphur is part of certain amino acids, such as cysteine and methionine, and is present in several coenzymes. Sulphur also plays a role in photosynthesis as part of the electron transport chain where hydrogen gradients are key in the conversion of light energy into ATP. Potassium (K) is important because of its role in regulating stomatal opening and closing. As the openings for gas exchange, stomata help maintain a healthy water balance; a potassium ion pump supports this process.

Magnesium (Mg) and calcium (Ca) are also important macronutrients. The role of calcium is twofold: to regulate nutrient transport and to support many enzyme functions. Magnesium is important to the photosynthetic process. These minerals, along with the micronutrients, also contribute to the plant's ionic balance.

In addition to macronutrients, organisms require various elements in small amounts. These micronutrients, or trace elements, are present in very small quantities. The seven main micronutrients include boron, chlorine, manganese, iron, zinc, copper, and molybdenum. Boron (B) is believed to be involved in carbohydrate transport in plants; it also assists in metabolic regulation. Boron deficiency will often result in bud dieback. Chlorine (Cl) is necessary for osmosis and ionic balance; it also plays a role in photosynthesis. Copper (Cu) is a component of some enzymes. Symptoms of copper deficiency include browning of leaf tips and chlorosis (yellowing of the leaves). Iron (Fe) is essential for chlorophyll synthesis, which

is why an iron deficiency results in chlorosis. Manganese (Mn) activates some important enzymes involved in chlorophyll formation. Manganese-deficient plants will develop chlorosis between the veins of its leaves. The availability of manganese is partially dependent on soil pH. Molybdenum (Mo) is essential to plant health as it is used by plants to reduce nitrates into usable forms. Some plants use it for nitrogen fixation; thus, it may need to be added to some soils before seeding legumes. Zinc (Zn) participates in chlorophyll formation and also activates many enzymes. Symptoms of zinc deficiency include chlorosis and stunted growth.

Deficiencies in any of these nutrients, particularly the macronutrients, can adversely affect plant growth. Depending on the specific nutrient, a lack can cause stunted growth, slow growth, or chlorosis. Extreme deficiencies may result in leaves showing signs of cell death. (Boundless, 2021).

Medicinal plant selected for the study

Ipomoea is the largest genus in the flowering plant family Convolvulaceae, This family comprises of plants with high industrial, pharmaceutical, scientific, and cultural significance. It is distributed across continents and has its presence in Senegal, Nigeria, tropical Africa and into Asia, Mascarene Island, Malaysia and Australasia. Typically, *Ipomoea* is used in folk medication for the treatment of hemorrhoids, diabetes, bronchitis and arthritis (Shubhangi and Patil, 2004). The most widespread common name is morning glories. The genus includes food crops; the tubers of sweet potatoes (*Ipomoea batatas*) and the leaves of water spinach (*I. aquatica*) are commercially important food items and have been for millennia. The water spinach (*I. aquatica*) commonly found in ponds, cultivated for stem and leaves used as vegetables.

Habit and habitat

Perennial twiner with tuberous root stock; Terrestrial, common among bushes, hedges of gardens, waste places and outskirts of forests. Also cultivated occasionally in the gardens, parks and railway platforms.

Morphological characters

Ipomoea cairica comes under the family Convolvulaceae. Perennial twiner with tuberous root-stock; The slender stems are hairless; Leaves palmately 5 to 7-partite; segments elliptic obovate or lanceolate, narrowed at both ends, retuse, mucronate at apex, glabrous; Flowers in 1 to 3-flowered cymes; Calyx-segments unequal, ovate, mucronulate, tuberculate on the back of outer ones; Corolla 6 -7 cm long, white or purple; Capsules 2 -celled, 4 -valved; Seeds pubescent.

This plant reproduces vegetatively by rooting along its stems and also produces seeds. Stem fragments and seeds are often dispersed in dumped garden waste and can also be spread by water (Barker, 2005).

Some are simply weeds, whereas others are economically important, viz., sweet potatoes and still others are ornamental plants, such as the morning glories *I. purpurea* and *I. cairica*, respectively. The genus *Ipomoea* including *Ipomoea cairica* and *Ipomoea palmate* has been reported to have many biological activities (Teow et al., 2007). Several species of *Ipomoea* have been used as medicines. Studies have shown the potential of the genus as a source of therapeutic agents. The glycoresins within them constitute one important chemotaxonomic marker of this family (Wagner, 1993).

Locality of Sample Collection

Eloor is a suburb of Kochi and a municipality in Paravur Taluk, Ernakulam District in the Indian state of Kerala, India. It is an industrial area situated around 13 kilometres (8.1 miles) north of the city centre. It is an island of 14.21 km² formed between two distributaries of river Periyar and is the largest industrial belt in Kerala. The neighbouring places of Eloor are Kalamassery industrial hub, Aluva, Cheranalloor and Paravur. There are various companies of different kinds along the industrial belt including Fertilisers and Chemicals Travancore (FACT), Indian Rare Earths Limited, Hindustan Insecticides Limited and many others manufacturing a range of products like chemical-petrochemical products, rare-earth elements, rubber-processing chemicals, fertilizers, zinc/chromium compounds and leather products. The industrial belt of Eloor in Kerala is one of the world's 'top toxic hot spots', according to international environment group Greenpeace.

The aim of the study was to conduct phytochemical study, functional group and elemental analysis of *Ipomoea cairica* growing in an industrial area.

OBJECTIVES

To detect the phytochemical constituents present in the ethanol extract of *Ipomoea cairica* by qualitative phytochemical analysis.

To evaluate the functional groups present in the species using FTIR technique.

To analyse the elemental composition of *Ipomoea cairica* growing in a locality experiencing industrial pollution using SEM-EDX.

REVIEW OF LITERATURE

- Calixto (2005) collected the information from WHO and reported that 65% - 80% of the world's population in developing countries depend on the medicinal plants for their primary health care due to the poverty and lack of access to modern medicine.
- *Ipomoea cairica* is a perennial fast-growing vine. This species is adapted to grow in area with extreme seasonal fluctuations and because of its tuberous roots, it has been observed that the top part of the plant may die and later resprouts when environmental conditions are favourable (Weber, 2003; Maimela and Gumede, 2019). ○ Eames and Mac (1947) did a study on the number of stomata per unit area of epidermis variously greatly.
- Jyoti et al., (2008) analysed the amount of Pb, Cd, Cr, and Ni in soil and plant samples of *Abutilon indicum*, *Calotropis procera*, *Euphorbia hirta*, *Peristrophe bycaliculata*, and *Tinospora cordifolia* collected from 3 environmentally different sites.
- Sutapa et al., (2015) investigated the methanol extracts of leaves and flowers of *Ipomea cairica* for antimicrobial and antioxidant effects. Results showed very good activity against all bacterial and fungal strains tested. The extract also showed remarkable antioxidant activity, with DPPH scavenging activities correlating with its reductive potential.
- A Study of *Ipomoea cairica* extract by Shefali et al. (2013) showed dose dependent reduction of response in the formalin test inflammatory phase in mice. A possible explanation for the antinociceptive activity is the release of pro-nociceptive mediators unrelated to carrageenan-induced edema. The isolated caffeoylquinic acids could explain, in part, the antinociceptive effect.
- Flavio et al (2006) evaluated the in-vitro antioxidant activities of methanolic extracts of leaves and flowers by DPPH radical inhibition. The methanolic extract of *I. cairica* leaves showed maximum antioxidant activity (83.52%) while the methanolic extract of flowers showed maximum antioxidant activity at 81.85% at 500 µg/ml concentrations.

- The methanol extract of (MEIP) flowering tops showed antioxidant activity by inhibiting DPPH and hydroxyl radical, nitric oxide and super oxide anion scavenging, hydrogen peroxide scavenging, and reducing power activities (Dudharejia and Shah, 2009).
- Aqueous methanol extract of *Ipomoea cairica* leaves possess a strong anti-inflammatory activity (Mohamed and Karawya, 2010).
- The major constituents of the extract were the coumarins, scopoletin and umbelliferone and the lignans, arctigenin, matairesinol and trachelogenin (Olga *et al.*, 1997; Sharda and Kokate, 1979). Indole alkaloids were isolated from the leaves of this species (Mohamed and Karawya, 2010).
- From the aerial parts of *Ipomoea cairica* the coumarins umbelliferone and scopoletin, and the dibenzyl-g-butyrolactone lignans arctigenin, matairesinol and trachelogenin, were isolated along with β -sitosterol and fatty acids (Singh *et al.*, 2013).
- (+)-(8*R*,8'*S*)-thujaplicatin methyl ether, arctigenin, matairesinol, *trans*-2,3-dibenzyl butyrolactone, vanillic acid, hydroxybenzoic acid, methoxybenzoic acid, methylparaben, stearic acid, palmitic acid, oleic acid, friedelinol and a mixture of β -sitosterol and stigmasterol were obtained from the methanolic extract of the *Ipomoea cairica* (Ralte, 2014).
- The crystallite domain size was calculated from the width of the XRD peaks, assuming that they are free from non-uniform strains, using the Debye-Scherrer formula (Cullity, 1978). Functional groups present in the bioengineered nanoparticles and interactions with protein were analysed by transform infrared (FTIR) analysis (Najitha and Balasubramanian 2014b).
- The hydroxyl and carboxyl groups present in the plants were able to bind with the metals and the flavonoids and phenols have exclusive power to warp nanoparticles to avoid the agglomeration (Ahmad *et al.*, 2010).

MATERIALS AND METHODS

Plant selected for the study

Ipomoea cairica is a vining, herbaceous, perennial plant with palmate leaves and large, showy white to lavender flowers. A species of morning glory, it has many common names, including mile-a-minute vine, Messina creeper, Cairo morning glory, coast morning glory and railroad creeper.

Scientific Name

Ipomoea cairica (L.) Sweet

Synonyms

Convolvulus cairicus L.

Convolvulus pendulus (R. Br.) Spreng.

Ipomoea palmata Forssk.

Ipomoea pendula R. Br.

Ipomoea tuberculata (Desr.) Roem. & Schult.

Systematic Position

- Kingdom: Plantae
- Division : Phanerogamae
- Class: Dicotyledons
- Subclass : Gamopetalae
- Series : Bicarpellatae
- Order: Solanales
- Family: Convolvulaceae
- Genus: Ipomoea

➤ Species : *Ipomoea cairica*

Common names : 'Mile-a-minute vine', 'Messina creeper', 'Cairo Morning glory', 'Coast Morning glory', 'Railroad creeper'.

Malayalam Name: Kolambi Poo

Botanical Characteristics:

One of the commonest yet most useful of the evergreen creepers, refreshing the eye in the hottest weather with its clear, green leaves and delicate, mauve blooms, the Railway Creeper is found in gardens, villages, and on practically every railway station, thus earning for itself its nickname. This morning glory vine is beautiful, climbing on to whatever it finds the purple flower studded vine wrapped around bending bamboo stems, is a pleasing sight. Its stem is hairless, readily set roots when in touch with the earth. Flowers purple, pink or rarely pinkish white, to 8cm across, solitary or in groups of 2-3. Fruit a 4-valved capsule, about 1cm across, each valve with 1 seed. Seed with wispy hairs attached. Spread by wind, water and humans.

Plant collection

The whole plant of *Ipomoea cairica* (L.) used for the investigation was obtained from Eloor industrial area, Ernakulam, Kerala. The plant specimen was authenticated using the Flora of presidency of Madras. Fresh plant material was washed under running tap water, then air dried and powdered.

Extraction

The plant powder was extracted with ethanol using cold extraction. Totally 30 g of dried plant powder was extracted in 250 ml of ethanol for 24 hours in occasional shaking at room temperature. The supernatant was collected and evaporated to make the final volume one-fifth of the original volume. It was stored at 4°C in airtight bottles for further studies.

Phytochemical analysis

The ethanolic extract of *Ipomoea cairica* was subjected to preliminary phytochemical screening for their presence or absence of active constituents utilising a standard method of analysis.

1. Test for Alkaloids

Mayer's Test: 2 ml test sample was treated with few drops of Mayer's reagent along sides of the test tube and the formation of white or creamy precipitate indicated the presence of alkaloids.

(Mayer's Reagent- 1.358g of HgCl_2 was dissolved in 60ml of water and poured into a solution of 5g of potassium iodide in 10ml of distilled water and made upto 100 ml of reagent).

Dragendorff's Test: Test sample was treated with 1-2 ml of Dragendorff's reagent and the formation of prominent reddish brown precipitate indicated the presence of alkaloids.

(Dragendorff's Stock reagent- Solution (A): 0.85g basic bismuth nitrate dissolved in 10ml glacial acetic acid and 40 ml water under heating. Solution (B): 8g potassium iodide dissolved in 30 ml water. Stock solution: A and B mixed in 1:1 ratio).

Wagner's Test: Test sample was treated with few drops of Wagner's reagent along sides and the formation of reddish brown precipitate indicated the presence of alkaloids.

(Wagner's reagent - 2 g Iodine and 6 g potassium Iodide dissolved in 5 ml distilled water and made upto 100 ml.)

2. Test for Flavonoids

Sulphuric acid test: A fraction of the extract was treated with concentrated H_2SO_4 and observed for the formation of orange colour.

NaOH test: A small amount of extract was treated with aqueous NaOH and HCl, observed for the formation of yellow orange colour.

3. Test for Amino acids

Ninhydrin Test: Extract solution was treated with Ninhydrin (Triketohydrindene hydrate) at the pH range of 4 - 8. Development of purple colour indicated the positive response for amino acids.

4. Test for Reducing sugars

Fehling's test for free reducing sugar: About 0.5 g of extract was dissolved in distilled water and filtered. The filtrate was heated with 5 ml of equal volumes of Fehling's solution A and B. Formation of a red precipitate of cuprous oxide was an indication of the presence of reducing sugars.

Benedict's Test: To 5 ml of the extract solution, 5 ml of Benedict's solution was added in a test tube and boiled for a few minutes. Development of brick red precipitate confirmed the presence of reducing sugars.

5. Test for Anthraquinones

Modified Borntrager's Test: 5 ml of extract solution was hydrolyzed with dilute sulphuric acid and extracted with benzene. 1 ml of dilute ammonia was added to it. Rose pink coloration suggested the positive response for anthraquinones.

6. Test for Saponins

Foam Test: A small amount of extract was shaken with water and looked for the formation of persistent foam.

7. Test for Sterols

Liebermann-Burchard test: One ml extract was treated with chloroform, acetic anhydride and added drops of H₂SO₄ and observed for the formation of dark pink or red colour.

Sulphuric acid test: The fraction of extract was treated with ethanol and H₂SO₄ and observed for the formation of violet blue or green colour.

8. Test for Tannins

FeCl₃ Test: 5 ml of extract solution was allowed to react with 1 ml of 5% ferric chloride solution. Greenish black colouration indicated the presence of tannins.

Potassium Dichromate Test: 5 ml of the extract was treated with 1 ml of 10% aqueous potassium dichromate solution. Formation of yellowish brown precipitate suggested the presence of tannins.

Lead acetate Test: 5 ml of the extract was treated with 1 ml of 10% lead acetate solution in water. Yellow colour precipitation gave the test for tannins.

9. Test for Phenols

Ferric chloride test: A fraction of extract was treated with 5% ferric chloride, formation of deep blue colour confirms the presence of phenol

Liebermann's test: The extract was heated with sodium nitrite, add H₂SO₄ solution diluted with water and add excess of dilute NaOH and observed for the formation of deep red or green or blue colour.

10. Test for Glycosides

Legal's test: Dissolved the extract (0.1 g) in pyridine, added sodium nitroprusside reagent and made alkaline with NaOH solution. Pink to red colour solution indicates the presence of glycosides.

Borntreger's test: The extract is hydrolyzed with concentrated HCl for 2 hours on a water bath and filtered and few ml of above filtrate was shaken with chloroform, chloroform layer was separated and added 10 % ammonia, formation of pink colour indicates the presence of glycosides

11. Test for Gums

Molisch's Test: 2 ml of concentrated sulphuric acid was added to 2 ml of extract solution. Then it was treated with 15% α -naphthol in ethanol (Molisch's reagent). Formation of a red violet ring at the junction of two layers indicated the positive test for gums.

12. Test for Terpenoids

Chloroform test: The plant extract was taken in a test tube with few ml of chloroform and add concentrated sulphuric acid carefully to form a layer and observed for presence of reddish brown colour.

Liebermann-Burchard test: 1 ml extracts was treated with chloroform, acetic anhydride and added drops of H₂SO₄ and observed for the formation of dark green colour.

FTIR spectrum analysis

The ethanol extract of *Ipomoea cairica* (L.) was mixed with KBr salt, using a mortar and pestle, and compressed into a thin pellet. Infrared spectra were recorded on a Shimadzu FTIR Spectrometer 8000 series, between 4,000-400 cm⁻¹.

Scanning Electron Microscopy (SEM) with Energy Dispersive X-Ray Analysis (EDX)

The ethanol extract derived from plant sample of *Ipomoea cairica* (L.) was subjected to the elemental analysis using Scanning Electron Microscope (SEM) with an energy dispersive x-ray spectrometer (EDX). For doing the elemental analysis, Scanning Electron Microscope (with EDX) was used with a model number Jeol 6390LV having accelerating voltage: 0.5 kV to 30 kV and resolution at 4 nm (30 kV) which provides images at magnification: 300,000. SEM provides detailed high resolution images of the sample by rastering a focussed electron beam across the surface and detecting secondary or backscattered electron signal. An Energy Dispersive X-Ray Analyzer (EDX or EDA) is also used to provide elemental identification and quantitative compositional information. SEM provides images with magnifications up to ~X50,000 allowing sub micron-scale features to be seen i.e. well beyond the range of optical microscopes. It is very rapid, high resolution imaging with identification of elements present in the plant samples.

RESULTS

Phytochemical screening of plant materials

The phytochemical screening of *Ipomoea cairica*(L.) is displayed in Table 1. Preliminary phytochemical screening of twelve different secondary metabolites were done in in the ethanol extract of *Ipomoea cairica*. The ethanol extract showed the presence of the maximum number of secondary metabolites in the plant.

Fourier transform infrared (FTIR) fingerprinting analysis

Figure 2 shows the results of FTIR spectroscopic studies which revealed the presence of various functional groups in ethanol leaf extract of *Ipomoea cairica* (L.). The peak at 3989 and 3385.07 cm^{-1} is corresponding to hydrogen - bonded O-H stretching frequency respectively. The peak at 3385.07 cm^{-1} that peak covers the entire region with a very broad peak. The peak at 2929.87 cm^{-1} to assign H-C-H stretch. The peak at 2223.92 cm^{-1} to assign C \equiv N stretch. The absorptions can be seen as several distinct peak in this region. The more intense bands occurring at 2200.78, 2181.49, 2152.56, 2133.27 corresponding to C \equiv C stretching indicate the presence of alkynes.

The peak at 1710.86 cm^{-1} to assign C=O stretching indicate the carboxylic acid. The peak at 1627.97 cm^{-1} to assign C-C=C stretching indicate the alkenes. The peak at 1263.37, 1055.06 cm^{-1} assigned to the C-O stretching vibration and indicate the esters.

Energy dispersive X-ray spectroscopy

Table 2 shows the results of the elemental composition of *Ipomoea cairica*(L.) using SEM and EDX technique. The SEM - EDX spectra of the ethanol extract of the *Ipomoea cairica*(L.) is shown in figure 3.

The topography of elements was confirmed through SEM images which is displayed in figure 4. Oxygen, Silicon, Chloride, Potassium and Calcium were present in the sample. Many standards were used like CaCO₃, SiO₂, KCL, MAD, Ca wollastonites. In all these elements,

Carbon and Oxygen were present as high concentrations while Potassium was seen as moderate amount. But P, Si, Cl and S were present only in trace quantities. Trace elements are estimated by determining the percentage abundance (%) of elements in the sample.



Fig. 1: Medicinal plant *Ipomoea cairica* (L.) collected from Industrial area, Eloor

Plant Constituents	Test/ Reagent	<i>Ipomoea cairica</i> (L.)
Alkaloids	Mayer's Test	+
	Dragendorff's Test	+
	Wagner's Test	
Phenols	Ferric chloride test	+
	Liebermann's test	+
Tannins	FeCl₃ Test	+
	Potassium Dichromate Test	+
	Lead acetate Test	+
Flavonoids	Sulphuric acid test	+
	NaOH test	+
Anthraquinones	Modified Borntrager's Test	+
Saponins	Foam Test	+
Steroids	Liebermann-Burchard test	+
	Sulphuric acid test	+

Terpenoids	Chloroform test	+
	Liebermann-Burchard test	+
Glycosides	Legal's test	-
	Borntrager's test	-
Reducing sugars	Benedict's Test	-
	Fehling's test for free reducing sugar	-
Amino acids	Ninhydrin Test	-
Gums	Molisch's Test	-

Presence: +, Absence: -

Table 1: Phytochemical screening of leaf extract of *Ipomoea cairica* (L.)

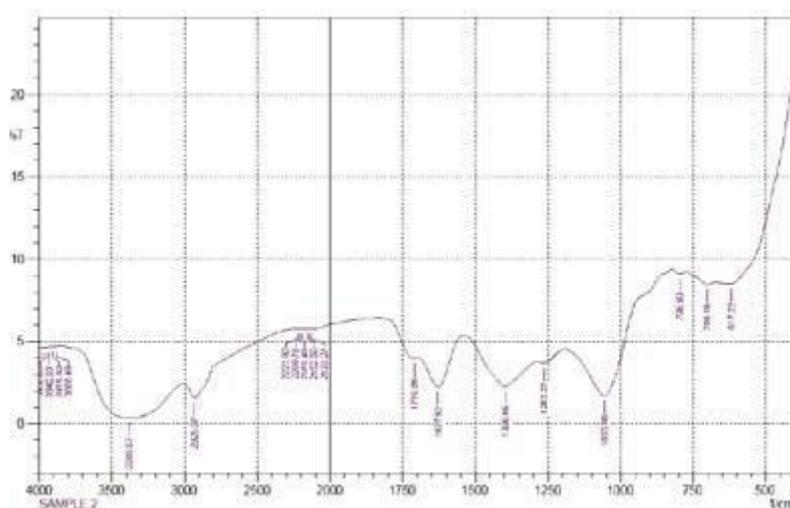


Fig. 2: FTIR Spectrum analysis of Ethanol leaf extract of *Ipomoea cairica* (L.)

Element	Line Type	Weight %	Atomic %
C	K series	57.57	65.39
O	K series	39.18	33.41
Si	K series	0.17	0.08

P	K series	0.34	0.15
S	K series	0.15	0.06
Cl	K series	0.23	0.09
K	K series	1.81	0.63
Ca	K series	0.55	0.19
TOTAL		100	100

Table 2: The percentage of trace elements present in ethanol leaf extract of *Ipomoea cairica* (L)

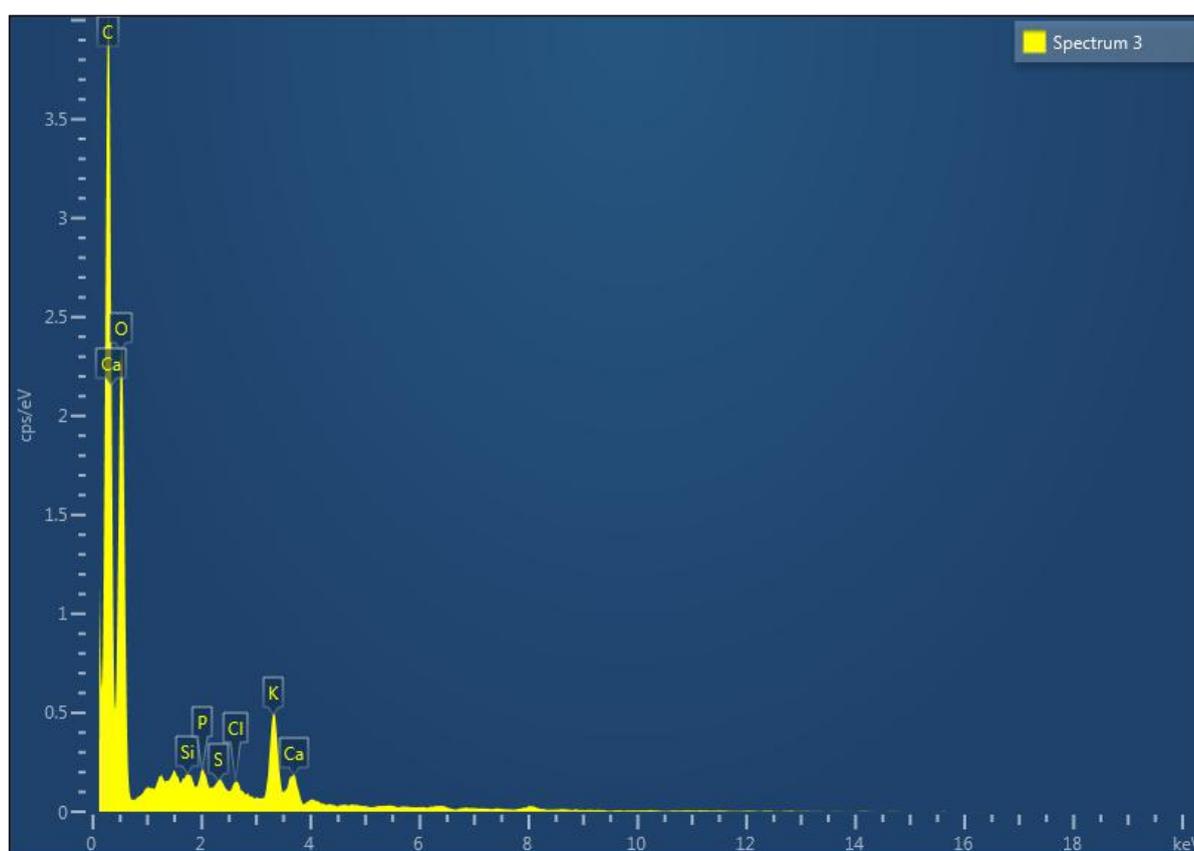


Fig. 3: The SEM EDX spectra of ethanol leaf extract of *Ipomoea cairica* (L.)

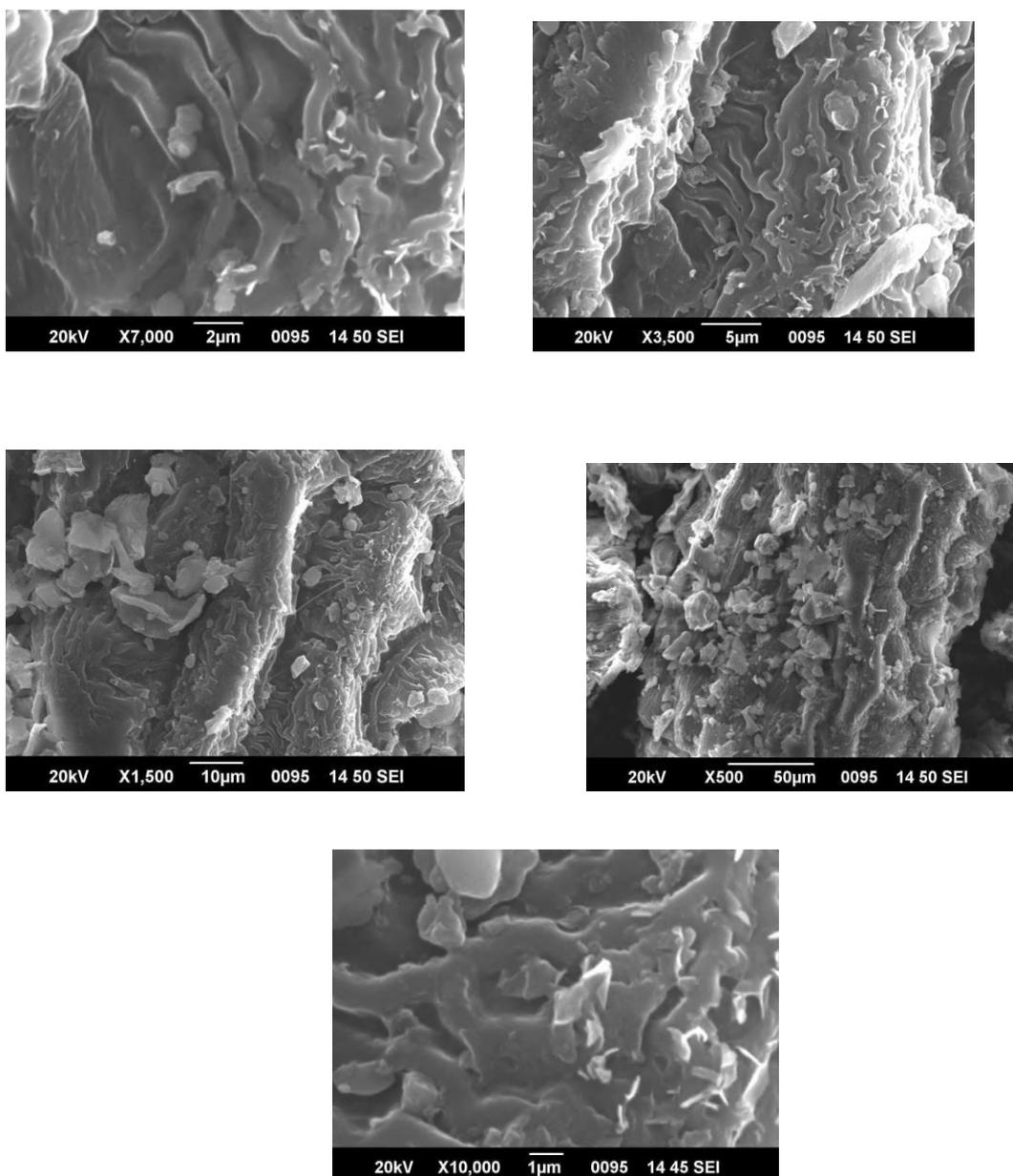


Fig. 4: The SEM EDX images of ethanol leaf extract of *Ipomoea cairica* (L.)

DISCUSSION

Ipomea cairica is commonly known as ‘Railway creeper’ or Morning glory. The plants are medicinally used as an antioxidant, anti-inflammatory, antiviral, and highly potent against malaria (Arora *et al.*, 2013). Morning Glory is a tropical plant and is commonly found in

tropical regions of Africa and Asia, including India. Most parts of the *Ipomoea cairica* have been recorded to be edible; the leaves are eaten when still young and roots are cooked before consuming. In some areas this plant is considered to have antibiotic properties. *Ipomoea cairica* is often used as a screening plant in the garden by allowing the vine to twist and climb along a trellis or fence, giving a beautiful display.

Ipomoea cairica (Coastal morning glory) is considered as a significant environmental weed commonly seen in India. This species is capable of very rapid growth and can completely smother trees and under-storey plants, but it will creep along the ground in the absence of supporting vegetation. Significant infestations may lead to a reduction in biodiversity through the replacement of native vegetation and the displacement of certain native animals (Whistler, 1988)..

It also commonly invades rainforest margins, where it grows over larger trees and smothers tree saplings and under-storey shrubs, and is a major problem in littoral rainforest remnants. However, it is also a weed of sandy beach fronts and other coastal environments, drier forests, wetlands, and limestone cliffs.

Phytochemical analysis

Phytochemical screening is of paramount importance in identifying new source of therapeutically and industrially valuable compound having medicinal significance, to make the best and judicious use of available natural wealth (Ambasta et al., 1986; Kokate et al., 1998). Phytochemical investigation of the ethanolic extracts of *Ipomoea cairica* (L.) revealed the presence of various phytochemicals such as alkaloids, phenols, tannins, flavonoids, anthraquinones, saponins, steroids & terpenoids. The presence of alkaloids in *Ipomoea cairica*(L.) may be associated with their use by traditional medicines for the treatment of different diseases. Phenolic compounds present in it have attracted a great attention in relation to their potential for beneficial effects on health (Narayana et al., 2001).

phytochemical analysis of plants for the presence of saponins are widely well known to have expectorant and anti tissue activity (Rao et. al., 1984; Sharama et al., 1984). FTIR spectroscopy data analysis helps in understanding the chemical functionality of the compound in the plant sample and when run under IR region in the range of 400-4000 cm^{-1} there was a variation in the peak in both the plant samples (Thenmozhi et al., 2011; Kalaiselvi et al., 2012).

The bands between 3000 and 2800 cm^{-1} represent C-H stretching vibrations that are mainly generated by lipids (Wolkers & Hoekstra, 1995; Wei et al., 2009). The weak absorption band of 796.60, 700.16, 617.22 cm^{-1} indicate the presence of chloride in the plant extract (Muruganatham, 2009). The O-H stretching indicate the phenolic compound, that have excellent antioxidant properties (Shirwaikar, 2003).

FTIR allows detecting whole range of infrared spectrum simultaneously providing speed and accuracy in measurements of biological specimens (Griffiths & Haseth, 1986). The presence of characteristic functional groups phenols, carboxylic acid, alkanes, alkenes, esters, alkynes, fatty acid and lipids are responsible for various medicinal properties of *Ipomoea cairica* (L.) Based on the functional group analysis, *Ipomoea cairica* (L.) doesn't contain any toxic compounds.

In the present study, results of EDX showed the presence of trace elements such as Si, Cl, S, K and Ca in *Ipomoea cairica* (L.). Deficiency of these trace elements in human subjects can occur under the most practical dietary conditions and in much diseased status (Udayakumar & Begum, 2004). Trace elements play both curative and preventive role in combating diseases. Calcium is needed in the development of bone and teeth and it regulate heart rhythm, help in normal blood clotting, maintain proper nerve and muscle functions and lower blood pressure (Bibi et al., 2006). Potassium is essential for the transport of nutrients inside the cell. Without potassium, nutrients could not able enter into the cell that lead cell death. Silicon is also another important element to prevent the hardening of veins and arteries. Chloride works with sodium and potassium carry an electrical charge when dissolved body fluids and to regulate the pH in the body. Chloride is also important for digest the food properly and absorb many elements. The presence of these trace elements in *Ipomoea cairica* (L.) marks its use in therapeutic purpose.

SUMMARY & CONCLUSION

Plant based drug has been used worldwide in traditional medicines for treatment of various disease. Phytochemical studies have attracted the attention of plant scientists due to the development of new and sophisticated techniques. These techniques played a significant role in the search for additional resources of raw material for pharmaceutical industry. *Ipomoea cairica* (L.) commonly known as 'Railway creeper' or Morning glory' belongs to the family

Convolvulaceae. It has also ornamental value as climber with attractive flowers. This plant also included as plants affecting central nervous system, and also actively used as an antioxidant. The main objective of the study was to screen the ethanol leaf extract of *Ipomoea cairica*(L.) for its phytochemical constituents, and to evaluate the functional groups using FITR and elemental analysis through EDX analysis growing in an industrial area.

The plant showed the presence of many phytochemicals which are responsible for the various pharmacological medicinal properties. The results obtained from the present study revealed that, the ethanol extracts of *Ipomoea cairica* (L.) showed the presence of most of the secondary metabolites like alkaloids, phenols, tannins, flavonoids, anthraquinones, saponins, steroids & terpenoids in the leaves. The FTIR study revealed the presence of functional groups of trace elements. The SEM-EDX study of the ethanol extract showed the presence of trace elements. However, the species was devoid of any heavy metals even though they were collected from an industrial area. The intensive study on the out coming active constituents of *Ipomoea cairica* (L.) can lead to the discovery of new botanical - drug.

The present study revealed that locally available non-economical weed plant *Ipomea cairica* commonly found in waste lands has a great pharmaceutical potential. The present study will add some specific criteria for the authentication and identification of *Ipomoea cairica*. Thus, it may conclude that that *Ipomoea cairica* has a leading capacity for the development of new good efficacy drugs in future and can be effective source to treat and control many diseases due to the presence of phytochemicals.

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Project Report

On

AN INTRODUCTION TO FRACTALS

Submitted

in partial fulfilment of the requirements for the degree of

BACHELOR OF SCIENCE

in

MATHEMATICS

by

VIDHYA CS

(Register No.AB19AMAT032)

Under the Supervision of

SUSAN MATHEW



DEPARTMENT OF MATHEMATICS

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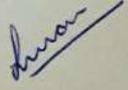
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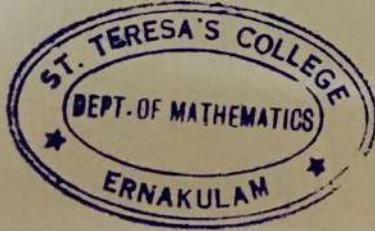


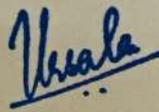
CERTIFICATE

This is to certify that the dissertation entitled, **AN INTRODUCTION TO FRACTALS** is a bonafide record of the work done by Ms. **VIDHYA CS** under my guidance as partial fulfilment of the award of the degree of **Bachelor of Science in Mathematics** at St. Teresa's College (Autonomous), Ernakulam affiliated to Mahatma Gandhi University, Kottayam. No part of this work has been submitted for any other degree elsewhere.

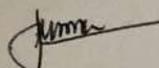
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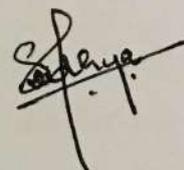
External Examiners

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DECLARATION

I hereby declare that the work presented in this project is based on the original work done by me under the guidance of Susan Mathew, Assistant Professor, Department of Mathematics, St. Teresa's College(Autonomous), Ernakulam and has not been included in any other project submitted previously for the award of any degree.



Ernakulam.

VIDHYA CS

Date:06/04/2022

AB19AMAT032

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Date:06/04/2022

VIDHYA CS

AB19AMAT032

Contents

<i>CERTIFICATE</i>	ii
<i>DECLARATION</i>	iii
<i>ACKNOWLEDGEMENT</i>	iv
<i>CONTENT</i>	v
1 INTRODUCTION	1
1.1 PRELIMINARY ANALYSIS	2
2 A CHAOTIC OUTLINE	3
2.1 CHAOS THEORY	3
2.2 FAMOUS SETS IN CHAOS THEORY	4
3 FRACTALS	7
3.1 CHARACTERISTICS OF FRACTALS	7
3.2 SPECIFIC FUNCTION FRACTALS	9
3.2.1 SIERPINSKI TRIANGLE	9
3.2.2 VON KOCH CURVE	10
3.2.3 CANTOR SET	11
4 FRACTAL DIMENSION	13
4.1 SELF-SIMILARITY DIMENSION	13
4.2 BOX DIMENSION	14
5 APPLICATION OF FRACTALS	17
5.1 FRACTALS IN BIOLOGICAL SCIENCE	17
5.2 FRACTALS IN HUMAN BODY	17
5.2.1 THE LUNGS	17
5.2.2 THE BRAIN	18

5.2.3	MEMBRANES	19
5.3	FRACTAL ART	19
5.4	FRACTALS IN ECONOMY	19
5.5	FRACTALS IN NATURE	20
5.6	FLUID MECHANICS	21
6	CONCLUSION	22
	<i>REFERENCES</i>	24

Chapter 1

INTRODUCTION

Many people are fascinated by the beautiful images termed Fractals. Extending beyond the typical perception of mathematics as a body of complicated, boring formulas, fractal geometry mixes art with mathematics to demonstrate that equations are more than just a collection of numbers. What makes fractals even more interesting is that they are best existing mathematical description of many natural forms, such as coast lines, mountains or parts of living organisms. . . . In mathematics, any of a class of complex geometric shapes commonly have fractional dimension, a concept of first introduced by the mathematician Felix Hausdorff in 1918. Although fractals are closely connected with computer techniques, some people had worked on fractals long before the invention of computer. Those people were British cartographers. Who encountered the problem in measuring the length of the Britain Coast? The coastline measured on a large-scale map was approximately half the length of the coastline measured on a detailed map. The closer they looked, the more detailed and longer the coastline became. They did not realize that they had discovered one of the main properties of fractals.

1.1 PRELIMINARY ANALYSIS

COMPLEX NUMBERS

Complex numbers are the numbers that are expressed in the form of $a+ib$ where a,b are real numbers and "i" is an imaginary number.

CANTOR SET

cantor set is a closed set consisting entirely of boundary points. It is the set of all numbers 0 and 1 expressible without 1's in its base expansion.

Chapter 2

A CHAOTIC OUTLINE

To understand the significant of fractals and their role in modern mathematics, it is to know something about the area of scientific and mathematics inquiry known as chaos theory. The importance of this new area, together with the excitement and frustrations experienced by scientists and the mathematicians as they made their initial discoveries, often without knowledge of other related work is wonderfully portrayed in James Gleick's *Chaos: Making a new science*. Gleick suggests that chaos is "a new science of the global nature of systems" Chaotic behavior exists in many natural systems such as weather and climate.

2.1 CHAOS THEORY

BUTTERFLY EFFECT:

1. This is the defining property of chaotic system.
2. In chaos theory, the butterfly effect is the sensitive dependence on initial condition in which a small change in one state of a deterministic nonlinear system can result in large differences in a later state.
3. The term is closely associated with the work of mathematician and meteorologist Edward Lorenz. He noted that butterfly effect is derived from the metaphorical example of the details of a tornado (the exact time of formation, the exact path taken) being influenced by minor perturbations such as a distant butterfly flapping its wings several weeks earlier.

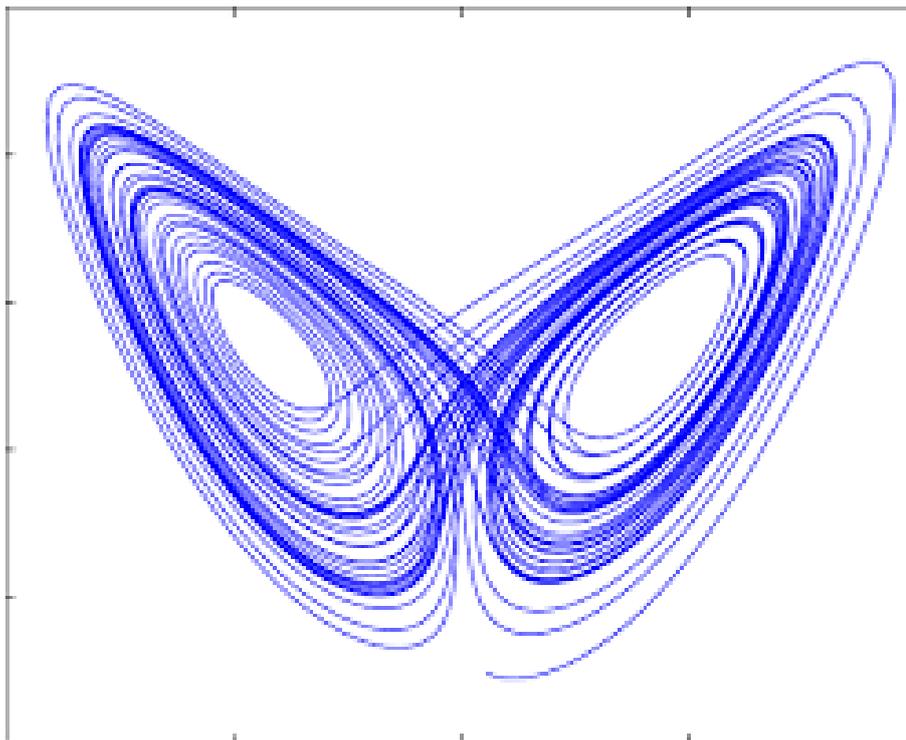


Figure 2.1: butterfly effect

2.2 FAMOUS SETS IN CHAOS THEORY

Chaos theory is a part of mathematics. It looks as certain systems that are very sensitive. A very small change may make the system behave completely differently. The collection of sets that play significant role in chaos theory, namely Julia sets and the even more well-known Mandelbrot set. Julia sets are named after the French mathematician Gaston Julia, invented and studied these sets in the early 20th century. The Mandelbrot set is named after the contemporary French mathematician Benoit Mandelbrot whose work from the 1950s through the 1970s at IBM in New York is generally recognized as the foundation of fractal geometry. With this connection, it is most appropriate that the Mandelbrot set has become a “logo” for fractal geometry and chaos theory.

MANDELBROT SET

1. Mandelbrot set is the set of complex numbers C for which the function $f(z)=z^2 + C$ does not diverge to infinity at $z=0$, that is, sequence

remain unchanged at absolute value. The points of the Mandelbrot set have been colored black. It is also possible to assign color to the point outside the Mandelbrot set. Theirs color depend on how many iterations have been required to determine that they are outside the Mandelbrot set.

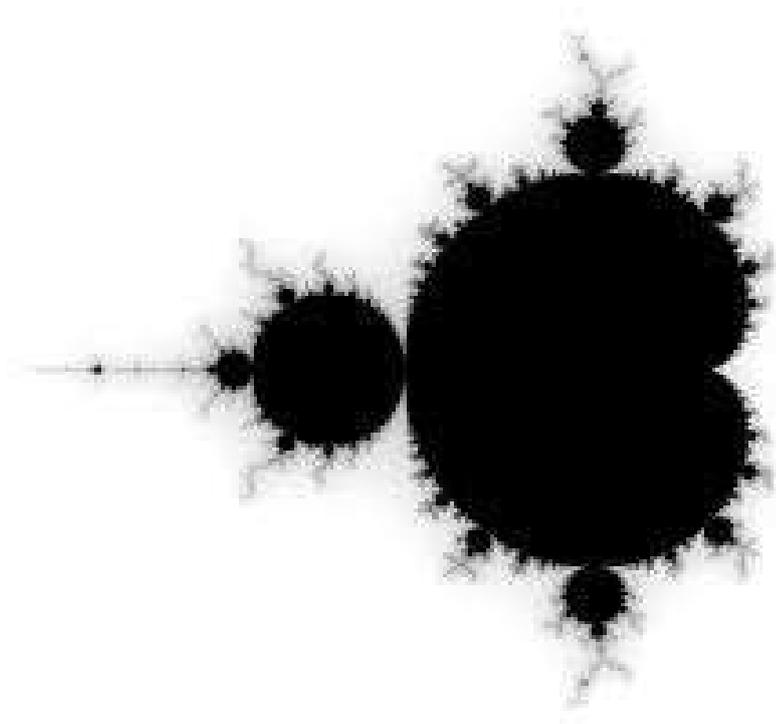


Figure 2.2: mandelbrot set

JULIA SET

1. Julia set consists of values such that an arbitrarily small perturbation can cause drastic changes in the sequence of iterated function values. Thus the behaviour of Julia set is chaotic. The boundary between points in the Co number plane that diverge to infinity and those that finite under repeated iteration of same mapping.

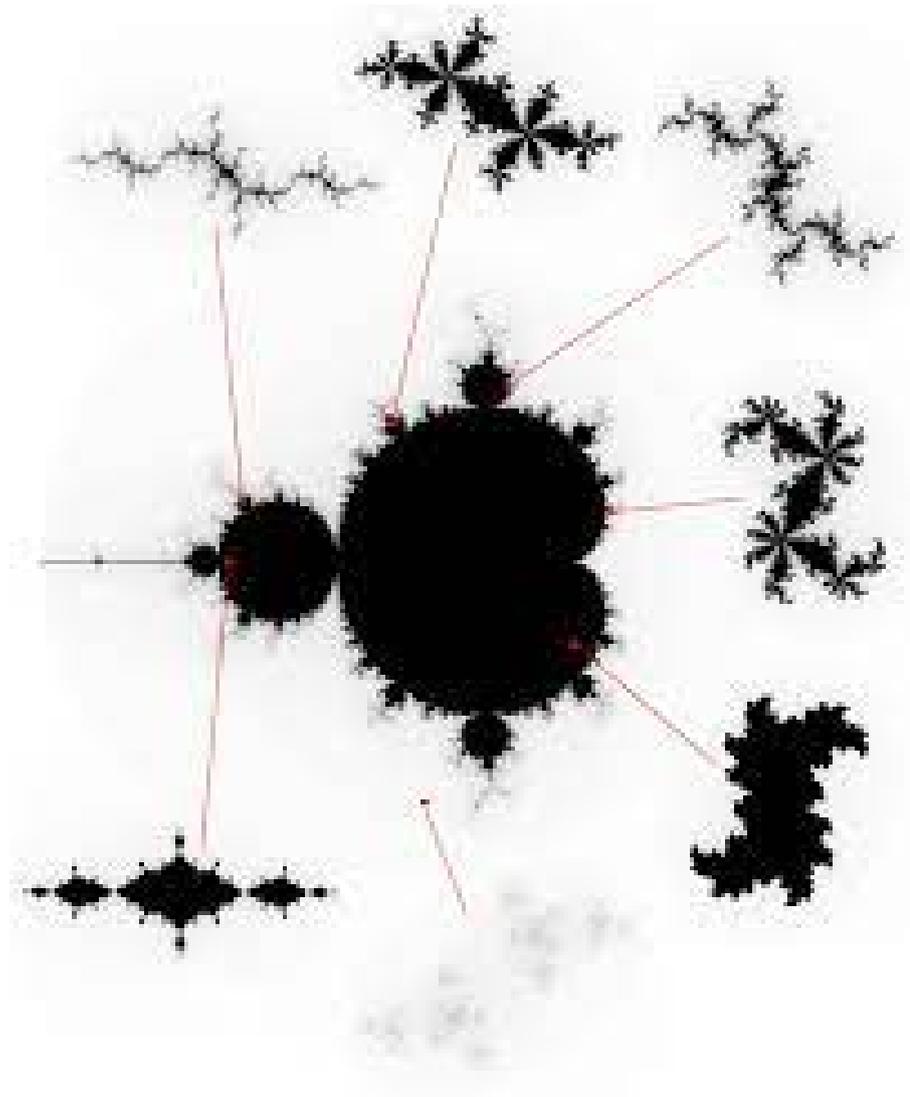


Figure 2.3: julia set

Chapter 3

FRACTALS

Fractal is a new branch of mathematics and art. Perhaps this is the reason why most people recognize fractals only as pretty pictures useful as background on the computer screen or original postcard patterns. The term "FRACTALS" is derived from the Latin word "fractus" which means fragmented or broken. A fractal is a never-ending pattern. Fractals are infinitely complex patterns that are self-similar across different scales. They are created by repeating a simple process over and over in an ongoing feedback loop. Fractal patterns are extremely familiar, since nature is full of fractals. For instance: trees, rivers, coastlines, mountains, clouds, seashells, hurricanes etc.

DEFINITION 1: A complex geometric Pattern exhibiting self-similarity in those small details of its structure viewed at any scale repeat elements of the overall pattern

DEFINITION 2: MANDELBROT DEFINITION A fractal is a non regular geometric shape that has the same degree of non-regularity on all scales.

3.1 CHARACTERISTICS OF FRACTALS

Exact self-similarity: Identical at all scales

1. Fern possess exact self similarity.
2. Each fond branch is similar to the whole fond, and so on. In addition, as we move towards the top of the fern we see a smaller and



Figure 3.1: fern

smaller copy of the whole fern.

Quasi self-similarity :

Approximates the same pattern at different scales may contain small copies of the entire fractal in distorted and degenerate forms.

1. This is a looser form of self similarity.
2. The fractal appears approximately (but not exactly)

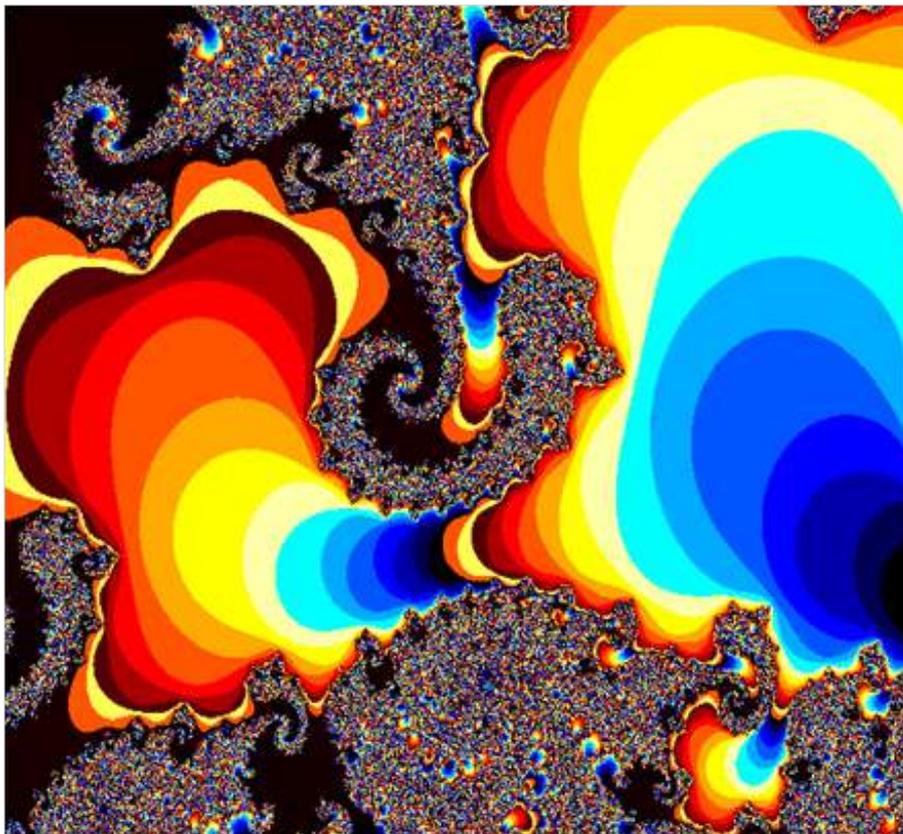


Figure 3.2: mandelbrot satellite

identical at different scales.

3. The Mandelbrot set is a quasi self-similar as the satellites are approximations of entire set but not exact copies.

3.2 SPECIFIC FUNCTION FRACTALS

ITERATED FUNCTION SYSTEM FRACTALS

1. In mathematics, iterated function systems (IFSs) are a method of constructing fractals; the resulting fractals are often self-similar. IFS fractals are more related to set theory than fractal geometry. They were introduced in 1981.

2. IFS fractals, can be of any number of dimensions, but are commonly computed and drawn in 2D. The fractal is made up of the union of several copies of itself, each copy being transformed by a function. The canonical example is the Sierpinski triangle. The functions are normally contractive, which means they bring points closer together and make shapes smaller.

3. Hence, the shape of an IFS fractal is made up of several possibly overlapping smaller copies of itself, each of which is also made up of copies of itself, ad infinitum. This is the source of its self-similar fractal nature.

3.2.1 SIERPINSKI TRIANGLE

The Sierpinski triangle (also called the Sierpinski gasket or the Sierpinski Sieve), is a fractal and attractive fixed set with the overall shape of an Equilateral triangle, subdivided recursively into smaller equilateral triangles. Originally constructed as a curve, this is one of the basic examples of self similar sets, i.e., it is a mathematically generated pattern that is reproducible at any magnification or reduction. It is named after the Polish Mathematician Wac law Sierpinski, but appeared as a decorative pattern many centuries before the work of Sierpinski. 1. Properties: For integer number of dimensions d , when doubling a side of an Object, 2^d Copies of it are created, i.e. 2 copies for 1- dimensional object, 4 Copies for 2- dimensional object and 8 copies for 3- dimensional object. For The Sierpinski triangle, doubling its side creates 3

copies of itself. Thus, the Sierpinski triangle has Hausdorff dimension $\log(3)/\log(2) = \log_2 3 \approx 1.585$, which follows from solving $2^d = 3$ for d . The area of a Sierpinski triangle is zero. The area remaining after each iteration is clearly $\frac{3}{4}$ of the area from the previous iteration, and an infinite number of iterations results in an area approaching zero. The points of a Sierpinski triangle have a simple characterization in barycentric coordinates. If a point has coordinates $(0.u_1u_2u_3\dots 0.v_1v_2v_3\dots 0.w_1w_2w_3\dots)$ expressed as binary numerals, then the point is in Sierpinski's triangle if and only if $u_i + v_i + w_i = 1$ for all i .

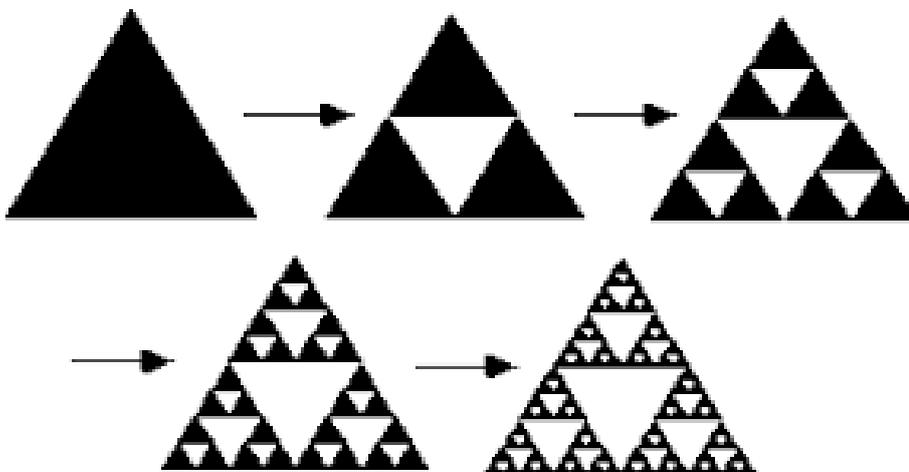


Figure 3.3: sierpinski triangle

3.2.2 VON KOCH CURVE

The genuine Von Koch curve, also called snowflake curve, is derived as the limit of a polygonal contour. At every step, the middle third of every side of the polygon is replaced with two linear segments at angles 60° and 120° . Starting from an equilateral triangle, the two first steps lead to the star-like curves plotted on the left. If one goes on long enough one finally gets the curve right below. Ideally, the process should go on indefinitely, but, in practice, the curve displayed on the screen no longer changes when the elementary side becomes less than the pitch, and then the iterations can be stopped. What is

thus obtained was long considered a mathematical monster, a curve plotted in a bounded domain, but with an infinite length (one easily sees that the length is multiplied by $4/3$ at every step), continuous but nowhere differentiable (i.e. nowhere a tangent can be defined). It is now regarded as an elementary example of fractal –"elementary" because of the simplicity of the construction. The pattern motif can be seen everywhere along the curve, at every scale, from visible to infinitesimal. This feature is called self-similarity.

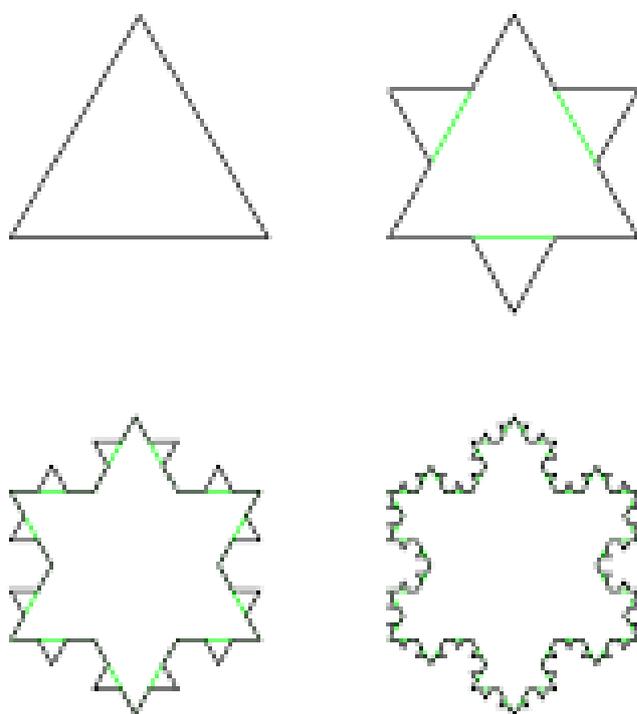


Figure 3.4: von koch curve

3.2.3 CANTOR SET

In mathematics, the Cantor set is a set of points lying on a single line segment that has a number of remarkable and deep properties. It was discovered in 1874 by Henry John Stephen Smith and introduced by German mathematician George Cantor in 1883. Through consideration of this set, Cantor and others helped lay the foundations of

modern point-set topology. Although Cantor himself defined the set in a general, abstract way, the most common modern construction is the Cantor ternary set, built by removing the middle thirds of a line segment. Cantor himself mentioned the ternary construction only in passing, as an example of a more general idea, that of a perfect set that is nowhere dense.

Chapter 4

FRACTAL DIMENSION

The fractal dimension of a set is a number that tells how densely the set occupies the metric space in which it lies. It is invariant under various stretching and squeezing's of the underlying space .Applying traditional method of size measurement to highly irregular fractals leads to a meaningless results. Instead, Mandelbrot and others discovered that to make any meaningful statement about the size of a fractal, they needed to resort to assigning it a dimension value; but in order to do so, concept of dimension had to be expanded. **SELF-SIMILARITY:** Fractals are self-similar at any level of magnification; many things around us look the same way no matter how you magnify them. When parts of some objects are similar to the entire object, we call it self-similar.

4.1 SELF-SIMILARITY DIMENSION

To assign fractals a self-similarity dimension, it is helpful to consider how segments, squares, and cubes can be tiled with a number of smaller tiles such that magnification of each tile by an integer scaling factor (using the same scaling factor for each tile) results in an object congruent to the original. To illustrate this, note that a segment can be tiled using two segment-shaped tiles (meeting at the midpoint of the original segment) so the magnification of each tile by each tile by the scaling factor 2 creates a segment congruent to the original. Similarly, a square can be tiled by four square shaped tiles so that magnification of each tile by four square shaped tiles so that magnification of each tile by the

scaling factor 2 (doubling each side) creates a square congruent to the original.

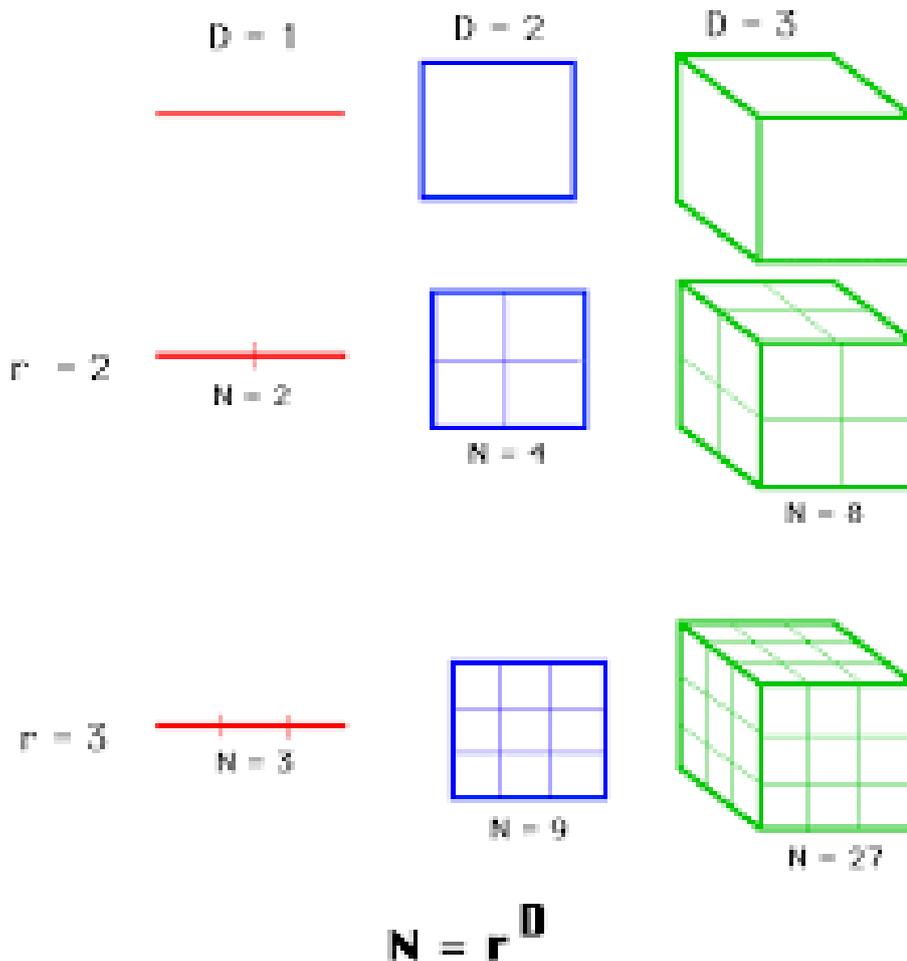


Figure 4.1: self-similarity dimension

4.2 BOX DIMENSION

Self-similarity dimension applies only to sets that are strictly self-similar; there are more generalized dimensions that can be applied to sets that are only "approximately" self-similar, including natural fractals like coastlines. One of these generalizations that moves in the direction of the more esoteric Hausdorff-Besicovitch dimension is called box dimension. Here the term box refers to a segment, a square, or a cube, that is, a d -cube of the appropriate dimension d . To understand how box dimension generalizes self-similarity dimension, recall that the self-similarity dimension d of a set A is given by the equation $N = s^d$, where s is the

scaling-factor and N is the number of tiles in an s -scale tiling of A . solving for d yields, Self-similarity dimension: $d_s = \frac{\ln N}{\ln S}$ (1) when a set A is strictly self-similar and we have determined an appropriate scaling factor s , it is possible to tile the set with congruent s -tiles. Using the number of these tiles as N in Equation (1) above, we can immediately compute the fractal dimension of A . However, when A is not strictly self-similar, we cannot tile it with congruent "shrunk" copies of itself. So in good mathematical fashion, we appropriate such a covering. To do so, we do not attempt to use smaller version of the original set, but instead choose a box-shaped set with a side length l and place a grid of these boxes over the set A . The dimension d of the box chosen depends on the nature of the set A . For example, even though it may be seem that the appropriate box shape for any curve should be that of a segment, curves that are extremely "wiggly" are usually covered with square grid as shown below. With a grid in place, we count the number of boxes that contain at least some portion of the set A . Then we reduce the side-length l and repeat this procedure with the same box shape. Clearly, the number of boxes required varies as l changes since, as we reduce the side length of our boxes to achieve better fits, the number of "covering" boxes will generally increase. We use the notation $N(l)$ to represent the number of covering boxes of side-length l . In theory this process is iterated over and over as l continues to shrink, thus explaining the need for the limit in the definition below.

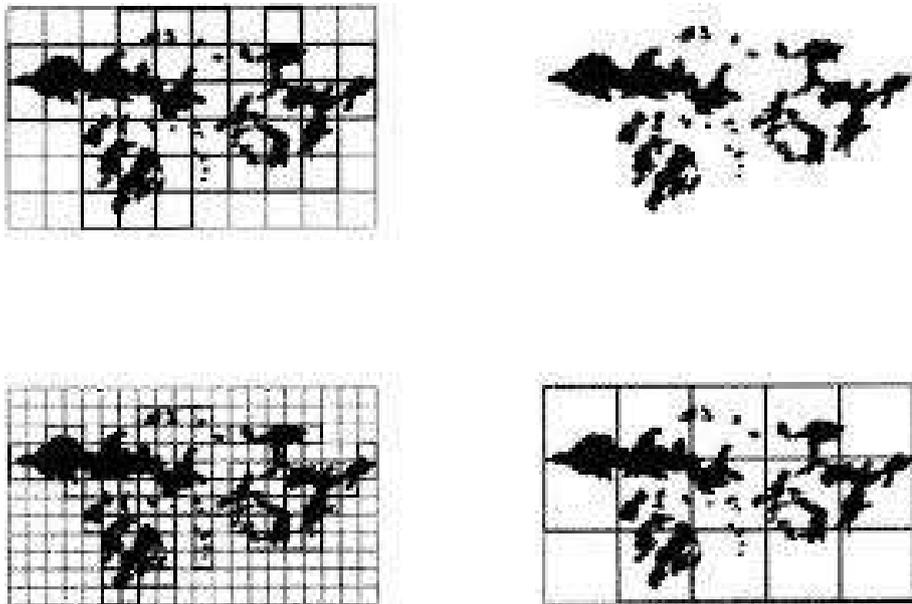


Figure 4.2: box dimension

Chapter 5

APPLICATION OF FRACTALS

5.1 FRACTALS IN BIOLOGICAL SCIENCE

Biologists have traditionally modeled nature using Euclidian representations of natural object or series. Scientists discovered that the basic architecture of a chromosome is treelike, every chromosome consist of many „mini - chromosomes“ and therefore can be treated as fractal. For example, a human chromosome has fractal dimension $d = 2, 3, 4$ (between the plane and the space dimension).Self similarity has been found also in DNA sequences. In the opinion of some biologists fractal properties of DNA can be used to resolve evolutionary relationships in animals.

5.2 FRACTALS IN HUMAN BODY

5.2.1 THE LUNGS

The pulmonary system is composed of tubes, through which the air passes into microscopic sacks called alveoli. The main tube of the system is trachea, which splits into smaller tubes that lead to different lungs. The bronchi are in turn split in to smaller tubes which are even further split. This splitting continues further and further until the smallest tubes called the bronchioles which lead into the alveoli. This description is similar to that of a typical fractal canopy, which is formed by splitting lines: The end points of the pulmonary tubes, the

alveoli are extremely close to each other. The property of end points being inter connected is another property of fractal canopies.

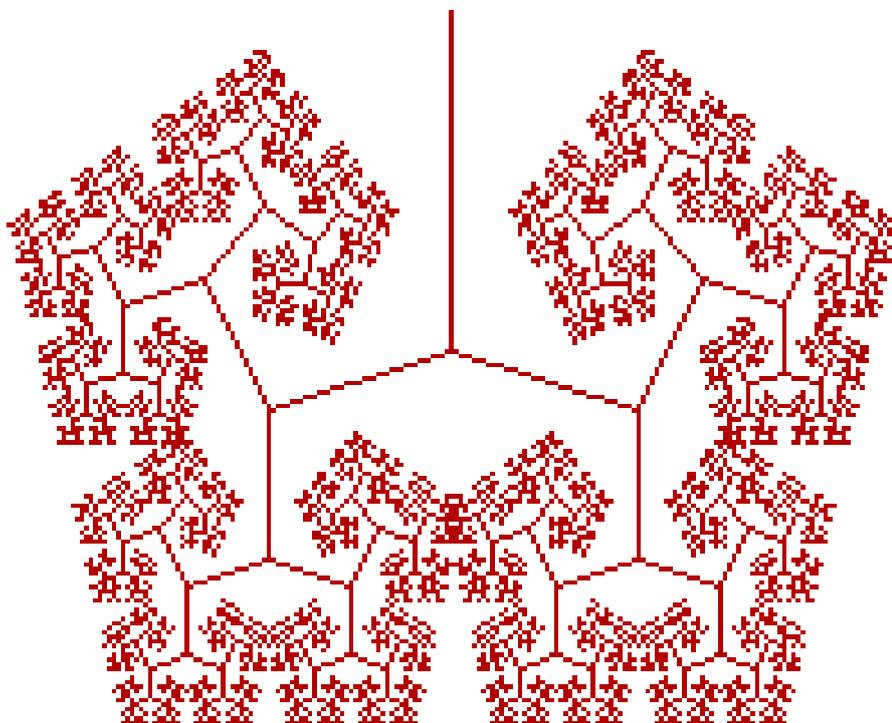


Figure 5.1: fractals in lungs

5.2.2 THE BRAIN

The surface of the brain, where the highest level of thinking takes place contains a large number of folds. Because of this, a human, who is the most intellectually advanced animal, has the most folded surface of the brain as well. Geometrically, the increase in folding means the increase in Intellectuality. Instead of 2, which is the dimension of a smooth surface, the surface of a brain has a dimension greater than 2. In humans, it is obviously the highest, being as large as between 2.73 - 2.79. Here's another topic for science fiction: super-intelligent beings with a fractal brain of dimension up to 3.

5.2.3 MEMBRANES

The surface folding similar to that of a brain was found in many other surfaces, such as the ones inside the cell 21 on mitochondria, which is used for obtaining energy and the endoplasmic reticulum, which is used for transporting materials. The same kind of folding was found in the nasal membrane, which allows sensing smells better by increasing the sensing surface. However, in humans this membrane is less fractal than in other animals, which makes them less sensitive to smells.

5.3 FRACTAL ART

Fractal art is a form of algorithm art created by calculating fractal objects and representing the calculation results as still images, animations, and media. Fractal art developed from the mid-1980s onwards. Fractal art (especially in the western world) is rarely drawn or painted by hand. It is usually created indirectly with the assistance of fractal software, iterating through three phases: setting parameters of appropriate fractal software; executing the possibly lengthy calculation; and evaluating the product. In some cases, other graphic programs are used to further modify the images produced. This is called post-processing.

5.4 FRACTALS IN ECONOMY

In economy perhaps the most important thing is to be able to predict more or less accurately what happens to the market after some time. Until very recently, the dominant theory that was used for this was the so called –portfolio theory. According to it, the probability of various changes of the market can be shown using the standard bell curves:

STANDARD BELL CURVE

Assuming this theory is accurate; we can conclude that very small changes happen very often, while very big changes happen extremely rarely. However, this is not true in practice. Recently, in about 20 years after discovering fractals, Benoit Mandelbrot introduced a new fractal

Student Testing: Normal Distribution

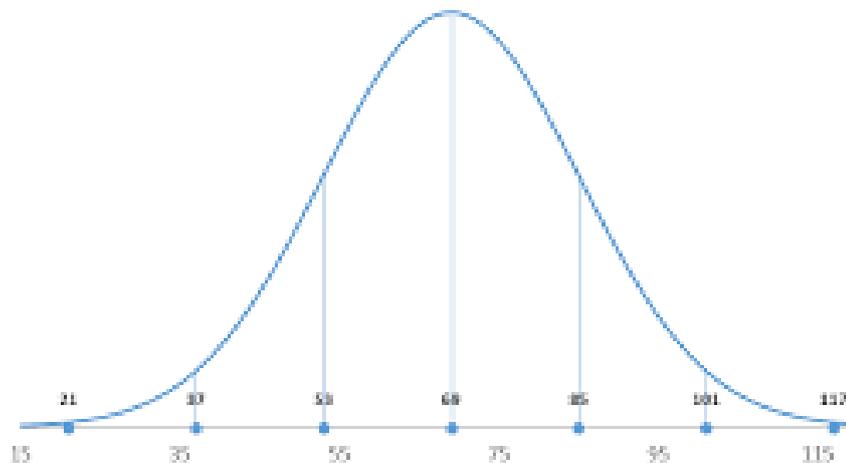


Figure 5.2: standard bell curve

theory that can be used much more efficiently than the portfolio theory to analyze the market. Considered taking a year of market activity and graphing the price for every month. You will still get a broken line with some rise and falls. Now if you take one of the months and graphs it in a detailed way with every week shown, you will get a very similar line with some rises and falls. If you make it more and more detailed, by showing every day, every hour, and even every minute or second you will still get the same, only smaller rises and falls. There is your Brownian self-similarity.

5.5 FRACTALS IN NATURE

Choose a bundle of leaves on a branch. To chaologists, all three of the objects described - the tree, the branch, and the leaves - are identical. To many, the word chaos suggests randomness, unpredictability and perhaps

even messiness. Chaos is actually very organized and follows certain patterns. One purpose of studying chaos through fractals is to predict patterns in dynamical systems that on the surface seem unpredictable. A system is a set of things, - an area of study -A set of equations is a

system, as well as more tangible things such as cloud formations, the changing weather, the movement of water currents, or animal migration patterns. Fractals are used to model soil erosion and to analyze seismic patterns as well.

5.6 FLUID MECHANICS

The study of turbulence in flows is very adapted to fractals. Turbulent flows are chaotic and very difficult to model correctly. A fractal representation of them helps engineers and physicists to better understand complex flows. Flames can also be simulated.

Chapter 6

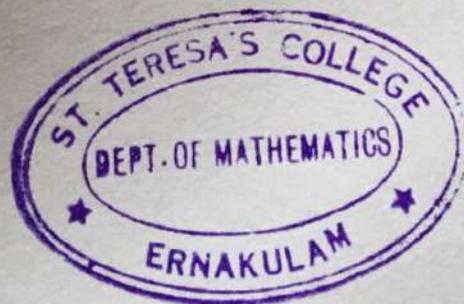
CONCLUSION

The term “fractal” was invented by Mandelbrot to describe geometric shapes that in simplistic terms can be described as very fractured. Fractals have always been associated with the term chaos. One author elegantly describes fractals as “the pattern of chaos”. Fractals depict chaotic behaviors, yet if one looks closely enough; it is always possible to spot glimpses of self-similarity within a fractal. The main property in every fractal object is self similarity .If we zoom on a picture of a mountain again and again we still see a mountain. This is the self-similarity of fractal. In recent years, the science of fractal has grown into vast area of knowledge, with almost all branches of science and engineering gaining from the new insight it has provided. Chemists, biologists, physicists, geologists and economists have all used methods developed in fractal to explain a magnitude to diverse physical phenomena; from trees to turbulence, cities to cracks, music to moon, craters, measles epidemics and much more. Ecologists have found fractal geometry to be an extremely useful tool for describing ecological systems. Many population, community, ecosystem, and landscape ecologists use fractal geometry as a tool to help define and explain the systems in the world around us. As with any scientific field, there has been some dissension in ecology about the appropriate level of Study . Some future applications of fractal geometry to ecology include climate modeling, weather prediction, land management, and the creation of artificial habitats. Many scientists have found that fractal geometry is a powerful tool for

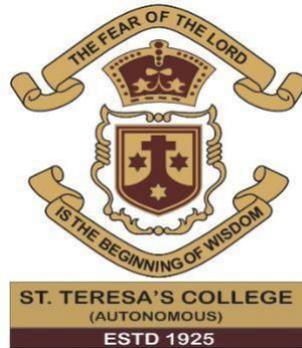
uncovering secrets from a wide variety of systems and solving important problems in applied science. The list of known physical fractal systems and their applications are long and growing rapidly.

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**SYMBOLISM OF FOOD: A STUDY ON CHOCOLAT
BY JOANNE HARRISS**



*Project submitted to St. Teresa's College (Autonomous) in partial fulfillment of
the requirement for the degree of BACHELOR OF ARTS in English
Language and Literature*

By

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DECLARATION

I hereby declare that this project entitled “ Symbolism of Food: A Study on Chocolat by Joanne Harris” is the record of bona fide work done by me under the guidance and supervision of Mrs. Tessa Fani Jose, Assistant Professor, Department of English.

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CERTIFICATE

I hereby declare that this project entitled “Symbolism of Food: A Study on Chocolat by Joanne Harris” by Vismaya Mohan is a record of bona fide work carried out by her under my supervision and guidance.

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March 2022

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An Abstract of the Project entitled

Symbolism of Food: A Study on Chocolat by Joanne Harris

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BA English Language and

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March 2022

Supervising Teacher: Mrs. Tessa Fani Jose

Literature is a space where we cannot fix the boundaries, where we cannot always stick up to the rules. It is a medium through which each writer expresses their emotions and their experiences. In literature, the symbol of food is one of the widely used techniques that indicate different meanings. The context of food is nested within a broader community context, such as the neighbourhood and schools and also social factors. "Chocolat" is a 1999 novel by Joanne Harris. It tells the story of Vianne Rocher, a young single mother. By concerning the themes such as faith, love and religion, issues of identity, mother-child relationships, the emotional resonance of food, and the magic and horror of everyday things Harris explains her view perfectly to the readers. Here, Joanne Harris uses food as a metaphor for change. Harris uses chocolate as a metaphor for both indulgence and guilt, depending on the character's perspective. This project aims to analyse this novel by applying food theory, and cultural theory by Stuart Hall to understand the symbolic function of food in literature and how the symbol of food makes an impact on individuals' culture.

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CONTENTS

	Introduction	1
Chapter 1:	Food, Literature, and Culture: A Theoretical Framework	5
Chapter 2:	Analysis of the Novel	11
	Conclusion	20
	Works Cited	24

Introduction

Literature confirms our specifications and provides us a chance to find our way to express ourselves through verbal or written form about what matters to us. Literature magnifies our sense of self, and in doing so, makes it possible for us to live authentically--both in writing and in our spoken words. There are mainly two types of literature: spoken and written, both of which give freedom of self-expression in many ways. Sometimes it can lend voice to the voiceless and even take the form of a hidden fight.

An example of this can be seen in how most women of past centuries, who were refused the freedom to raise their voices against the atrocities they faced because of male superiority, eventually learned to express themselves in a desperate attempt to escape their compromising position in society. So they decided to express their feelings through literature under male pseudonyms. Many female writers have therefore adopted either male pseudonyms, or gender-ambiguous pseudonyms, for several reasons: to publish without prejudice in male-dominated circles; to experiment with the freedom of anonymity; to encourage male readership, and to find their space in the world of literature by expressing themselves. Some examples of female writers who used male pseudonyms are Mary Ann Evans who went by the pen name, George Eliot, Katherine Harris Bradly and her niece, Edith Emma Cooper by the pen name Michael Field, Meg Howrey and Christina Lynch by the pen name Magnus Flyte and Nora Roberts who went by the pen name JD Robb. This shows the importance of expressing ourselves as well as the importance of literature in everyone's life.

It is impossible to see literature as a random composition of words that aims to straightly convey meaning. It also involves creative as well as imaginative elements that have the power to hold the reader or the person who listens to the work until the very end. For making literature

interesting to the audience or to the reader's, the writer uses various techniques to convey the perfect meaning in a way different from everyday language. They use metaphors, imagery and many other poetic devices to make their work more interesting. The symbol of food is one among them.

The image of food has recently begun to dominate many works of literature. Certain bonds could be found between food and personal identity or social origin because eating is an important part of every culture, not only in literature but also in social life. Food has always played an important role in connection with culture, and this role is an important part of showing respect among communities. People connect eating as something that belongs to the category of basic human activities, which is important for physical as well as social survival. Thus, the image of food in literature has become a dominating factor over time.

For a long time, the image of food in literature has always been very important as one of the major attractive points to the readers. It provides the readers with different ideas according to each of their perceptions. The meaning of the image corresponds directly to the meaning of the image of food in literature and this helps in changing the theme or the idea of the entire work. By using food as an image in literature, it becomes an excellent tool, used to forge a connection or understanding between the world they have created and also the world of the audience. Food can symbolise acceptance, sharing, love, memory, emotions, resistance, preservation, and even cultural acceptance.

Chocolat by Joanne Harris is one such novel that has food as a major image. Harris explains cultural resistance, emotions, and acceptance by using chocolate as a major image. It was during the Easter holidays that she had begun to contour the plot of *Chocolat*. As she thought about her story, she was struck by the incompatibility of the Easter holiday, which is

associated with fasting and self-denial in Christian culture, while the pagan spring renewal festivals held at the same time were full of celebrations and feasts. So she wanted to write a book about the conflict between indulgence and guilt, with a central metaphor. Therefore, she chose to make an image of food as the central theme and she picked chocolate as a metaphor for both indulgence and guilt. Food is thus a central metaphor in the novel.

Joanne Harris was born to an English father and a French mother in Yorkshire. Both of her parents were teachers. There was a division between the English people who didn't speak French and the French families who didn't speak English. Harris began writing at an early age. She was strongly influenced by Grimm's fairy tales and she decided to study modern and mediaeval languages. Her first novel, *The Evil Seed* was published with only limited success. She developed her horror-pastiche to literary ghost stories through her second novel *Sleep, Pale Sister*. *Chocolat*, her third novel was published in 1999, a darkly magical modern folk-tale, thematically based on food. She wrote several novels but her third novel *Chocolat* secured her colossal recognition. It is a magical modern folk-tale centred on Vianne Rocher who is a chocolate shop owner. The success of the novel made her produce many other works.

The novel *Chocolat* presents food as a symbol of temptation and desire, all of which brings a splash of colour and comfort to the town. Vianne Rocher, the protagonist of the story, is represented in opposition to Francis Reynaud, a priest who is the ruler of the town. The suspicious appearance of the Vianne Rocher in the village awakens the celebration of taste and permeates people with a sense of life. Through this, we find food as a gift of love and understanding. In the novel *Chocolat*, food functions as the title, the prime theme, and the leading imagery. The main theme of the novel is the remarkable impact of chocolate upon the townsfolk. Chocolate is symbolically a rich flavoursome feast for the body as well as for the

soul. This project attempts to analyse *Chocolat* by Joanne Harris in the light of food theory and with the application of cultural theory, to find out how the symbol of food refers to the cultural aspects.

Chapter 1

FOOD, LITERATURE, AND CULTURE: A THEORETICAL FRAMEWORK

Literature is broadly any collection of written work. It expresses one's thoughts and imaginations through their works by using language as a medium. Literature is important in everyday life because it connects the individual with larger truths and ideas in society. The aesthetic beauty of the work pleases the readers. It also helps the readers to develop their thinking skills. In addition, it reflects various experiences, ideas, and passions of human beings. It creates a platform for people to record their thoughts and experiences. Through these thoughts, the writers excel themselves by producing their works of art with various themes. Among that food is a symbol that is widely used by many writers. Writers use food to convey memory, emotions, and also cultural nuances. Food symbolises cultural acceptance and cultural resistance in literature. Culture is what makes everyone different, and somehow, culture defines one's way of living, food habits, as well as behaviour. Culture involves the social behaviour, custom, and practices of a particular group of people or society. Everyone lives according to their culture, by following their customs. A major theory that directly links human life with culture is the cultural theory by Stuart Hall.

Hall argues that culture is about '*shared meaning*'. Culture involves the social behaviour and practice of an individual. They carry meanings and values that need to be interpreted by others. The culture of a particular social group may not be the other groups. So they share different meanings and customs with each other as part of socialisation. Cultural studies is both a hassle and a master trope in humanities and qualitative social sciences, blending textual analysis with social and cultural theory and empirical ethnography and focusing on the margins of power over established lines of force and authority.

Stuart Hall in his introduction defines culture and discusses its relationships with language and society (Hall et al. 1). He mentions '*circuit culture*', which is a circulation of how culture is regulated in society through language, which he then argues that it is operated as a representation system. Representation, according to Hall, is a system by which language works by using '*sign*' and '*symbols*' to stand for or to represent ideas, thought, feeling, expression and emotion. However, the term is not limited to spoken or written language only. It is more to stand for or to represent something. For example, a musician uses music to represent his feeling and music uses notes and sounds as its sign or symbols. The spoken language uses sounds to construct meaning, while written language uses letters and words. Similarly, the images of food also symbolise different meanings of life. Emotions can be expressed through the metaphor of food in literature. In literature, food is a significant theme. From ancient literature onwards, a combination of food and literature can be seen. Recent interest in food studies has also opened doors in literary studies to examine how the use of food as a metaphor in literature gives complex ideas and deeper meaning to it. The writers use food and eating to symbolise cultural issues of acceptance, resistance, and preservation, as well as symbols of memory, emotions, narrative history, relationships, power, and consumption.

In the novel *Chocolat* by Joanne Harris, chocolate elicits different meanings and serves to drive the action of the plot. Culture is said to embody the best that has been thought and said in society (1). Hall's version of cultural studies placed a sense of value on how culture was wielded and rejigged by ordinary and marginal social groups. He deemed such people not simply as consumers or victims of governmental power, but as able and actual producers of new social values and cultural language with the prospective to challenge elites.

Culture is correlated with the exchange and production of meanings between social groups. Newmark defines culture as “the way of life and its manifestations that are peculiar to a community that uses a particular language as its means of expression” (Schäffner). Language is always a part of our culture, it is influenced and formed by the culture. Besides, the language of a native speaker of one language may sound strange to others as they do not share a common experience and don't belong to that particular community. Language in literature also portrays different cultures through different characters and plots.

Cultural study is an interdisciplinary field that explores the political dynamics of contemporary culture and its historical backgrounds. Researchers generally scrutinise how cultural practices concern wider systems of power operating through social phenomena. Cultural studies view culture as a changing and persistently interacting set of practices rather than fixed and bounded entities. Culture is not constant; it keeps changing by many influences, and the culture of one society is widely influenced by the ruling class among them. From ancient times, the upper class-lower class system has existed in society. This hierarchy can be based on their caste or their financial status. Hall disregards the relevance of the upper class-lower class system in society. He argues that culture does not incorporate what the educated elites happen to fancy. Hall considers the role of culture in the construction of meaning as primary as it implies sharing conceptual maps and systems of classification and representation.

Yet cultural studies is not physics, sociology, or linguistics. It only draws various themes from these subject areas. Hall argues that this is what differentiates cultural studies from others. He aims for an exploration of representation for the marginalised social groups and the need for cultural change. Hall always stood against the class divisions that existed in the society and the

cultural hierarchy that was relevant at that time. He firmly explains that division in the cultural setting does not have any use in anyone's life.

The study of culture has no origin and it is a discursive formation. Culture is concerned with the various ways that we make sense of the world. "By culture, here I mean the actual grounded terrain of practices, representation, languages, and customs of any specific society. I also mean the contradictory forms of common sense which have taken root in and helped to shape popular life" (Hall 26). Hall argues that culture is concerned with questions and shared meanings. So these meanings are not simply formed, they are generated through signs and, most notably, through language. Cultural studies argue that language cannot be just considered as a neutral medium for the formation of knowledge. Language gives meaning to material objects and social practices, all of which are made understandable in terms that language delimits.

Hall's concept implies that cultures share a universal meaning. The concept of culture is constructed by their society. Society has different groups of people who follow different cultures, they follow their traditions. However, one may belong to a group but still maintain his own identity by having their interpretations. Every concept each one will have its interpretations, its perception. This can be interpreted as achievements of the culture from the past by historians. Anthropologists may interpret it as the cultural value of human beings. Cultural studies is an international, cross-disciplinary approach to studying culture and its effects. This can be interpreted as an approach to studying culture that lies at the intersection of social sciences and humanities most notably literature.

Hegemony is one of the four ideas that are central to cultural studies. It can be defined as a dominant influence. Karl Marx wrote an imminent deal about ideology and class relations. According to Marx "the idea of the ruling class is in a very epoch the ruling ideas: i.e., the class

which is the ruling material force of society, is at the same time its ruling intellectual force" (Marx et al. 64). The hegemony of a culture is not attained through compulsion but requires the same degree of consent from the subordinate or the marginalised class. One way for this is through cultural accommodation. In this hegemonic culture, the dominated or the more influencing people won't allow the subordinates to follow their culture as they do, they draw a few other cultures in without even allowing them to dramatically affect their central ideas and beliefs. By this, their subordinates won't be directly confronted or oppressed by a pure class culture instead of that they see elements of themselves in the culture, elements only.

Co-opting their lived experiences is another method through which the dominant groups draw out the subordinate's cooperation. Here the oppressed or the subordinates are expected to adopt the ideas of the hegemonic culture and they must work and have much of their existence within organisations and structures that are controlled by the dominant groups or the cities. One of the best examples that Hall gives us is the distinction between the west and the east. Ever since the distinction between the east and the west was made, the west has been seen as more advanced, more developed, and modern. This can be considered as one of the reasons to talk or to consider the west as superior and for making it a model for all others. This also places an obligation upon the west to assist the rest, to move up on their social ladder. Hall insists that when we take culture for granted it becomes the dead language.

When we look at the culture of India in the light of hegemony culture we can see the influence of western culture over India. India is a secular country, which respects and accosts all other cultures. According to ancient history, India was the land of Hindus, but as time passed India accepted everyone who sought shelter without considering their culture or tradition. This changed the social setup, and in India, every individual was given the freedom to participate in

any religion and also to convert to other religions of their own choice. The culture of India can be considered one of the oldest cultures in the world with a different language, culture, and beliefs. But the influence of western culture brought about a lot of changes in India. It started during the 19th century when the British established their colony. As mentioned earlier, the west side is considered the supreme authority. They are considered models for the rest of all societies. This led to the emergence of a Westernised subcultural pattern through a section of people who first came in contact with their culture. The people who supported this subcultural pattern also helped them to expand their space on Indian land. They mainly focused on and got support from the urban people but there were some rural groups too, who were more westernised than urban. This affected the caste, family setups and even social institutions. They introduced modern values like humanism, egalitarianism, etc. to Indian value systems. And it also led to the emergence of many political and cultural movements. Therefore, western culture has had a positive and negative impact on Indian culture.

Culture is different in every social group. Some are dominant, some are subordinate. From ancient times, society always involved a particular group that ruled over the rest. As in life portrayed in literature, different cultures are portrayed through different images and narratives. The novel *Chocolat* by Joanne Harris explains two different cultures in the beginning and later portrays the change that occurs to these social setups and people by using chocolate as a central symbol for all the changes. The entire plot of the novel is centred around the main character Vianne Rocher who makes chocolate and spreads a new way and practice of life. It makes an impact on the Lansquenet village. This project aims to analyse this aspect of the novel by applying the cultural theory by Stuart Hall.

Chapter 2

ANALYSIS OF THE NOVEL CHOCLAT

Chocolat is a 1999 novel by the British writer Joanne Harris. It tells the engrossing story of protagonist Vianne Rocher who helps a strict and alienated village of people let down their guard and embrace the sensual pleasures of life, with her exquisite chocolate shop. Her contribution to the village is far more than a healthy dose of sensuality. Vianne aims to awaken a brighter, more fulfilling perspective on life that empowers the village people to shed their dull ways.

Vianne Rocher is a mysterious woman who arrives in the traditional and prim French village of Lansquenot-sous-Cannes, where she opens a chocolate shop that quickly becomes a focal point for resistance to the village priest, Francis Reynaud. By opening a chocolate shop in the village, she aims to bring about some changes, and the image of chocolate presents the meaning of cultural resistance and acceptance in that prim French village. Because the story starts at the time of lent, a period of abstinence for Christians before Easter, the strait-laced village is forbidden from all kinds of indulgence and sensuality at that time. Therefore, none of the village people are allowed to have chocolate from the shop. As Vianne Rocher is a person who doesn't attend church, people start staring at her and her child as they broke their moral code. She is portrayed as an atheist in the novel. When the village priest Francis Reynaud approaches her while she is setting up her new shop, to welcome her to their church and to their belief, she resists and directly tells him that she is not interested in church things. This creates a situation of cultural resistance in that new chocolate shop, as the village people who follow the church orders are also expected to follow the same rules.

The novel opens on Mardi gras. On the quiet street of Lansquenet-sous-Cannes, a parade is progressing past the small shops and the white-painted church. There is a festival happening. Amid the crowd are two recent arrivals: the beautiful Vianne Rocher and her daughter, Anouk. Vianne and Anouk enjoy the festival so much and after walking through the streets and seeing all the festivities, they decide to stay in Lansquenet. Anouk is really happy about the decision as she fell in love with the place after attending the festivities. So they decide to stay there and they take an apartment for rent for the time being and turn an abandoned bakery into a "chocolaterie artisanale," which she calls La Céleste Praline.

Father Reynaud is outraged. It is Lent, a time of austerity and solemnity, and definitely not an appropriate time for opening a shop that encourages indulgence and sensuality. The priest therefore turns against Vianne and he forbids any of the villagers from entering the shop. He says that she is not a good woman as she doesn't follow all the rules of the church. Because she opened up a chocolate shop at the time of lent, she was considered an enemy by the priest. Here at the beginning of the novel, the image of chocolate symbolises the cultural resistance, as the priest stands against Vianne's shop which shows that the entire village people won't agree with her. Here it shows that the culture of Vianne Rocher is different from that of the village people and they resist accepting Vianne as the way she is.

But as time passed, the villagers started entering the shop and enjoying or accepting a different culture. And they tried to taste the delicious chocolates made by Vianne. Each protest that they have given up chocolate for Lent, but Vianne displays an uncanny ability to identify exactly what kind of chocolate would tempt them: "It's your favourite kind." Several of the villagers become regular customers because of the polite and friendly approach of Vianne.

The entire story talks about the changes made by Vianne Rocher and her chocolate shop in that village. The presence of Vianne even changed the social setup and the cultural practices. One day Père Reynaud visits Vianne: it is Sunday, and he didn't see Vianne or her daughter at the church, so when he welcomed her to the church and their community, Vianne explains, "We don't attend, you know." That made him irritated and angry as she didn't accept the normal, cultural system that is followed by the whole people of the village. After that, when the priest comes to know that Vianne is unmarried, his outrage turns to horror. Because of his anger, at the time of preaching, he indoctrinates the citizen against her. By doing so, he makes her his enemy, and enemy of the people in the village. But the woman doesn't pay attention to him. She has already made up her mind to stay there for as long as she wants.

People are attracted to the unsurpassed fragrance of chocolate from the shop and they start coming to the shop. As Vianne is a very friendly and kind person, she soon finds a lot of friends among the village people. Vianne has the magical power to guess people's favourite chocolate and that makes her closer with everyone. She knows most of their problems, secrets, and even their characters. Anouk, Vianne's daughter is also like her affable mother and she finds new friends among the town's children very quickly. But most of the time Anouk seems to be alone as she has an imaginary friend, a rabbit that she plays with.

Day by day, Vianne befriends the village's loners and outsiders, beginning with Guillaume, and an old man whose only friend is his dog, Charly. When Vianne learns that Charly is dying and he has an interest in chocolate, she gives the dog a chocolate that seems to alleviate his symptoms and the dog becomes well again. On another day, a village woman, Joséphine Muscat, enters the shop and steals a box of chocolate almonds from the shop when Vianne was inside the kitchen. By understanding that the old woman is troubled, Vianne

pretends not to notice the theft and befriends Joséphine. She soon learns that Joséphine has been beaten and abused by her husband Paul-Marie and is planning to run away but she is afraid of the community in which she lives. Vianne persuades her to take a job in the chocolate shop instead, and to move in with her. Paul-Marie is furious and so is Père Reynaud, who despite knowing about Joséphine's suffering insists on the sanctity of marriage vows. And the priest was so angry that Josephine took Vianne to support her and to solve her issues instead of him. Joséphine blossoms under Vianne's care and manages to learn all the chores that were previously taken care of by Vianne herself. She becomes a youthful and confident woman who believes in the self. Another friend of Vianne's was an old woman named Armande Voizin, who loved Vianne's hot chocolate. Armande is bickering with her daughter Caroline, who won't allow her son Luc to visit his grandmother but Armande would love to see her grandson. Armande becomes a regular visitor to the shop, drinking Vianne's rich hot chocolate despite her diabetes. Vianne arranges for Armande and Luc to see each other while Luc's mother is busy. Armande identifies Vianne as a 'witch' and although Vianne doesn't approve of the word, she accepts that Armande understands her. It is mentioned that Vianne inherited her powerful intuition from her mother and that she has wandered from village to village her whole life, blown by the wind and fleeing from the "Black Man.". One day Armande's daughter Caroline comes to the shop and confronts Vianne, accusing her of encouraging her mother to ignore the dietary restrictions imposed by her diabetes. Vianne tries to talk with Armande about this; she insists that she will eat whatever she wants and she says that it's her life so she wants to do whatever she wishes to. And Armande also finds happiness with Vianne in her shop.

A group of river gypsies makes their annual mooring near the town. The townsfolk, led by the priest, try to chase them away and they resist welcoming them to the village shops, but

Vianne and her friends give them a warm welcome as she considers herself in the same position as them because she is also a woman who wanders through lots of towns. One of the gipsies, Roux, becomes a regular visitor to the shop and Vianne intuits that he and Joséphine have taken a shine to one another. The gipsies invite Vianne and her friends to a party on their boats. During the party, one of Roux's boats begins to burn. The gipsies suspect arson, and they decide to leave. Roux stays behind, determined to find the culprit.

Later, Armande throws a birthday party. Due to Vianne's influence, they hope that this will give Vianne a good opportunity to get more friends in the city and also more consumers for her shop. The priest's disapproval of the openly atheist Armande has less sway with the villagers than it once did. Almost everyone attends Armande's party, and Armande has an even better time than she had hoped. Afterward, Roux and Joséphine stay behind to clear up, and they spend the night together. On that day, everyone who attended the party enjoyed Vianne's chocolate with all its taste. And they came to love her unique chocolate taste. The next day, Armande dies full of happiness.

When Joséphine returns to Paul-Marie's bar to collect her clothes, he attacks her. The villagers rally behind Joséphine and run Paul-Marie out of town. Joséphine takes over the bar, and she begins to run it with Roux's help.

As all these incidents took place due to the influence of Vianne, Père Reynaud felt utterly defeated because he was the one who administered all the town people and they obeyed him with no back words until Vianne entry. Now everything was changing and no one gave value to his words or followed the church rules anymore as they found their freedom. So he plots to break into her shop and destroy her stock on the day before Easter. However, once inside, he is overcome by temptation and starts eating uncontrollably, breaking his Lenten vows. Vianne finds

him in the morning, asleep in a pile of half-eaten chocolate. Vianne feels that her work is done, and she and her daughter move on once more.

Food customs evoke plenty of associations in different writers' minds. Not only through the peculiar senses of smell and taste can food be perceived, but also through the other senses. It helps to evoke a greater deal of memories and feelings. "Food imagery may appear, therefore, in literature as a source of deeply embedded associations that lead into the depths of individual and cultural memory" (David 2003). This novel explores themes of religious repression, gender, and sensuality through the image of a food that is chocolate in a way that makes it interesting to readers. Here, the image of food stands as a symbol of love, sharing, cultural issues of acceptance and resistance, preservation of culture, memories, and emotions.

At the time when Vianne reached the village and started the shop, she had to face some cultural issues. As it was the time of lent, when she opened the shop, it shows the cultural resistance, because Vianne is an atheist in the novel who doesn't want to go to church. As the villagers resist having chocolate from her shop, it indicates their preservation of culture. When the old man with his only friend, the dog, Charly enters the shop and Vianne gives a piece of chocolate that makes the dog happy showing the chocolate as an image of love. And in the case of Josephine, she comes to the shop and steals a box of chocolate and leaves thinking that Vianne did not see her. In actuality, Vianne had seen Josephine stealing chocolate but she pretended that she didn't. By this, chocolate becomes a symbol of sharing. Later, when Vianne came to know about the abuses faced by Josephine, she gives her support in all its means and shows her a way to be herself. The next character who comes to the shop is Armande Viozin, an old woman who has diabetes and hides it from Vianne to drink her favourite hot chocolate. While drinking this hot chocolate from Vianne's shop for the first time, she is reminded of her childhood memories

by melting the chocolate in her mouth. Individual attitude toward life is symbolised by describing preparing and eating food in detail in many parts of Armandes portion. For instance, it could be found in the birthday party preparation of diabetic Armande, who risks her life with every rapturous mouthful. And that makes her a little sad all the time. It shows the emotions and memories symbolised through the image of chocolate. The party given by Armande with the help of Vianne welcomed lots of people and all of them enjoyed Viannes chocolate and food. Here the image of chocolate acts as something that creates a bond that helps people to bind together. Food brings pleasure to people's lives, although there is a little remaining. Even the last moments of life can be supported by the enjoyment of a luxurious dish.

Here we can see that by analysing this novel in the light of food theory, we come to know how food symbolises emotions. In each person's life food has an inevitable role. In the novel, Armande finds happiness, memories about her mother, and childhood days while having chocolate from Vianne's shop. That shows how chocolate evokes emotions and how it shows happiness in a person. As in real life, in literature also the image or metaphor of food symbolises memories, love, sharing, and all. As we mentioned earlier, the symbol of food doesn't only possess emotions, it also symbolises cultural acceptance, restriction, and preservation. The use of food imagery and metaphor represent complex ideas. Food is often used as a means of retaining their cultural identity. Each one has a different background and according to that their food habits also change. Food and religion are also connected which adds meaning and significance to our lives. Around the world, food, beliefs, and practices are based on their culture or religion. Muslims fast during Ramadan, during these days they won't have food during daylight hours eating and drinking before dawn and after sunset. And during the ancient days, the Jews used to

follow dietary laws, referred to as a kosher diet which is a part of their Jewish scripture. Hinduism and Jainism are other groups of people who only eat vegetarian foods in part. They do not have many meats to avoid harming another living creature. From all this, we can understand that food conveys the religious sentiments of the people. And that makes everyone unique. The role of culture in food etiquette is important. The people in western societies may refer to table manners to this food related-etiquette. It's a phrase that simply illustrates the cultural expectation of eating food. They follow specific ways to have food, unlike eastern culture. Some of them use a spoon and fork, some others use their right hand and some people use only three fingers of their right hand to have food.

These are the signs that show how food symbolises the present physical world. In literature also food is used as a metaphor or image to connect to the cultural practices. The novel *Chocolat* by Joanne Harris, also uses food as a metaphor upon which the story builds. From the beginning of the novel, it is portrayed that the life of the people in the French village is very pious. They follow the order of the priest who rules the land. And it's the time of lent when the novel starts. The cultural setup mentioned in the novel can be compared to Hegemonic culture which is mentioned by Stuart Hall in his cultural theory. Stuart Hall was against Hegemonic culture as she wished to see every social being as the same and he believed in the sense of sharing.

Hegemonic culture or cultural hegemony refers to the domination of a culturally diverse society by the ruling class who manipulate the culture of that society. Here the dominated cultural group is represented by the priest Francis Reynaud, who rules the land and he is the one

who sets the norms of the land. He has control over everything, even over every individual. Reynaud compels everyone to follow the church rule, he is imposing the pious life on the people. But when Vianne Rocher enters the plot slowly the socio-cultural setup of the village changes. She makes the whole change with her chocolate. At first, people resisted accepting a new culture that was against them. Because it was the time of lent Vianne started her chocolate shop. All the people in the village are restricted to having chocolate at the time. So in the beginning the metaphor of food represents cultural preservation, as the village people try to preserve their culture by ignoring chocolate. When Francis Reynaud pays a visit to Vianne's chocolate shop to welcome her to the church, without any preface she tells him that she is not interested in church things, this may indicate her resistance to the culture of the village people. It seems that her culture is different from the culture of the village to which she now belongs. This made the priest angry. Of this outrage, he mentioned her during the preaching and he made all the villagers against her. This all shows the cultural resistance that has been symbolised by food in this novel. As time passed people accepted Vianne and her chocolate even during the time of lent. This shows cultural acceptance. People accepted Vianne which means they accepted a new culture. So, the food, and the chocolate here symbolise a new culture that is resisted at the beginning by village people and later accepted by the same group.

CONCLUSION

It is obvious that the theme of food has gone through certain development and it differs to some extent in each one's perception and style. One of the features is that the theme of food is the fact that in older literature the theme of food is used as a manifestation of togetherness. On the contrary, the issue of food in literature is more private, it symbolises private relationships. All the identity struggles, such as frustration and secret fears, are demonstrated by this symbol. Nowadays food is a topic that is represented in a more compounded form. It is viewed as a favourable symbol in literature.

In the novel *Chocolat* by Joanne Harris, the image of food functions as the main theme and dominant imagery. Here chocolate is the food image that is used in the novel. It is symbolically a rich delicious feast for our soul and our body. It brings about spiritual delight and it also satisfies physical cravings. The novel deals with the fight between the church and chocolate. Here chocolate functions as the main image in the novel and as an opposite trait to the church it may stand for the position of the changing world and the church there for another thing that is still holding back the traditional life which can't accept the modern, changing world. It is the modern lifestyle that is a fascination with food in literature. The ritual of common traditional meals defines social stability. However, people find less time for cooking. The table is missing its traditional significance already. In this present time, not only the larger families but also the nuclear families have been breaking up into incomplete ones. The traditional role of women as producers and providers of food in the home has changed. They go out to work and do not spend afternoons preparing dinners anymore as they have little time for preparation. No one feels the desire to come back home after a long day at work and start preparing a culinary masterpiece. Now cooking is seen as a relaxing activity, but not if you are already exhausted

after the whole day spent in the office. People would like to eat something good, simple, and promptly. Mostly nowadays people get food from the hotels and hesitate to cook food at home. Food is also regarded as an image of something that preserves the culture, cultural acceptance, and also cultural resistance. By avoiding common dining it makes a difference gradually in the culture itself. So in life also food is a good image that shows the social changes that are happening around each one of us. Food can also be understood as "a reflection of what people feel and how they relate to each other, rather than a collection of recipes" (Joanne Harris.co.uk)

Food makes people more confident as is shown in the novel. It is the modern lifestyle that contributes to the fascination with food in literature. As the food stands as a symbol of our culture, the ritual of common traditional meals defines social stability. As in life, the image of food is also important in literature. Food offers a means for powerful imagery in literature. It identifies the mood of the character and the social environment of the story. The image of food also symbolises memory, emotion, relationship, etc. different foods are conducive to different moods and meanings in literature. Because these foods often represent a dichotomous relationship between characters or plot within the work. Here the writer used the image of chocolate as a means for establishing otherness in Vianne's character, as well as working as a unifier amongst the towns' people.

Vianne moves to Lansquenet with little intention to stay for an extended amount of time due to her nomadic nature. She immediately met with disdain from the townspeople. When Vianne started a chocolate shop there it was the time of lent, the time people are restricted from all kinds of provoking things. Lent is a period of potential preparation for Easter. These are the imitation of Jesus Christ's fasting in the wilderness before he began his public ministry. So it's the period of fasting from food and even fasting from unnecessary purchases and people are expected to give the money to charity. Food functions as the title theme and dominant imagery in the novel. Food and

various forms of eating have been brought into literature because of their elementary place in human life and culture. In the novel food is associated with emotions and expressions are evident wherever food is mentioned. By analysing this novel in the light of food theory we can understand the importance of using food as a metaphor in literature. As the new studies open the doors to the study of food theory, literature also confronts the images of food that helps to portray human emotions. It conveys the meaning of love, sharing, and memories that are common in the real world. In most of our life, we believe that good food can bring us happiness, like in literature also using food as a metaphor can convey emotions. Literature is something that has a magical power, which expresses humans' thoughts and experiences through words. But we can't just say that these are just words, these are words with hidden meanings that have the power to evoke our emotions. Writers use many themes and symbols to convey it perfectly. The image of food can be considered one among them. The magic behind every word in literature cannot be explained or defined by someone it should understand by us themselves, everyone is unique in all manners, in our thoughts too. So literature gives us a platform to think from our perspective on every point.

The novel *Chocolat* explains a cultural difference from the beginning itself. There is an opposition between the church and the chocolate. Here we can see that the image of food not only can convey our emotions but also it can express cultural acceptance, resistance, and also the preservation of culture. When we apply the cultural theory by Stuart Hall to the analysis we can see a hegemonic culture that has been existing in the Lansquenet village. The people in the village are forcefully leading a pious life, and they can't ignore the words of the priest Francis Raynaud, who claims the supreme authority of the land himself. He won't allow anyone to restrict church law. But when Vianne comes into the plot the social setup changes slowly, as she has a different culture. It was at the time of lent that she opened a chocolate shop that made the

people and the priest against her. As she was restricted from following the church rules the priest in his outrage made everyone against her. But slowly people got attached to Vianne and her chocolate. Chocolate or Vianne can be considered as a different culture that follows different rituals. When she came to a French village the people were confused and were not able to accept the new culture, they are not open to changes as they can't make their own decision even in the case of their culture because of the priest who forces all of them to follow the church rule. When Vianne came into the plot a new culture invents there, which was restricted and later accepted by the society, at the beginning by restricting chocolate or Vianne they all try to preserve their culture. By accepting a new culture they got free and came to know about the superiority that was led by the priest in the village. By the end of the story, we came to see that Francis Reynaud was found in her chocolate shop of Vianne the next morning after he decided to put her down by intruding into her shop. But the aroma of the chocolate attracted him. By using chocolate as a metaphor, the writer shows us that each culture has its own righteous and satisfactory side that can attract people. As Hall says culture is all about the shared meaning they carry lots of meaning and values that need to be interpreted by others.

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PROJECT REPORT
A STUDY ON THE EFFECT OF SPIRITUAL HEALTH AND
WELL-BEING ON FLOW EXPERIENCE AMONG YOUNG ADULTS

Submitted by:

VISMAYA T.S

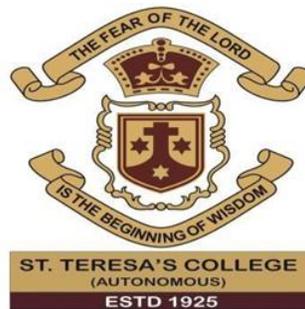
Register No:

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Under the guidance of

MS. ANJITHA VENUGOPAL

In partial fulfillment of the requirement for award of the degree of
B.Sc. PSYCHOLOGY



ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM

Nationally Re-accredited at 'A++' level (4th
cycle) Affiliated to: Mahatma Gandhi

University MARCH 2022

CERTIFICATE

This is to certify that the project report entitled, “THE EFFECT OF SPIRITUAL HEALTH AND WELL-BEING ON FLOW EXPERIENCE AMONG YOUNG ADULTS”, is a bonafide record submitted by MS. VISMAYA T.S, Reg.no. SB19PSY065, in partial fulfillment of the requirements for the award of the Degree of Bachelor of Psychology during the academic year 2019-2022.



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DECLARATION

I, Vismaya. T.S, hereby declare that the study presented in the dissertation entitled, “The Effect of Spiritual Health and Well-Being on Flow Experience among Young Adults”, which is submitted to the Department of Psychology, St. Teresa’s College, Ernakulam is a bonafide record of the research work carried out by me, under the supervision and guidance of Ms.Anjitha Venugopal, Assistant Professor, Department of Psychology, St. Teresa’s College, Ernakulam, in partial fulfillment of the requirements for the degree of Bachelor of Science in Psychology and has not previously formed the basis for the award of any degree, diploma, fellowship, title or recognition before.

Place: Ernakulam

Date

Vismaya T.S.

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Thanking You

Vismaya. T.S.

TABLE OF CONTENTS

SL.NO	TOPIC	
	ABSTRACT	
1	INTRODUCTION	
1.1	Background of the Study	
1.2	Problem statement	
1.3	Need and Significance	
1.4	Scope of the study	
1.5	Objectives of the study	
1.6	Limitations of the study	
2	LITERATURE REVIEW	
	Review of Literature	
3	THEORETICAL FRAMEWORK	
3.1	Flow Experience	
3.2	Spiritual Health	
3.3	Well-Being	
4	RESEARCH METHODOLOGY	
4.1	Objectives	
4.2	Research Design	
4.3	Source of Data	
4.4	Sample Design	
4.5	Sampling Method	

4.6	Method of Data Collection	
4.7	Drafting Questionnaire	
4.8	Data Analysis Technique	
5	DATA ANALYSIS	
6	FINDINGS	
7	RECOMMENDATIONS	
8	CONCLUSIONS	
	REFERENCES	
	APPENDIX	

ABSTRACT

The present study was undertaken to study the effect of spiritual health and well-being on flow experience among young adults. A total sample of 300 young adults, where 150 were male and 150 were female, between the age of 18 and 50 years, living in Kerala. The survey was conducted online through google forms. The objective of the study is to find out whether individuals having high spiritual health and well-being experience flow more compared to others and also to see if there's any influence of gender difference on them. For the collection of data, Spiritual Index of well-being (SIWB), The PERMA-Profilier and Flow Short Scale (FSS) were used. Simple Linear Regression, Spearman's rank correlation and Mann-Whitney U test is used for statistical analysis. Results revealed that there is a significant effect of spiritual health as well as well-being on flow experience among young adults. The result also revealed that there is a relation between spiritual health and well-being among young adults. There is a significant effect of gender difference on spiritual health whereas there is no significant difference of gender on well-being as well as flow experience among young adults.

CHAPTER I

INTRODUCTION

INTRODUCTION

BACKGROUND OF STUDY

The research is conducted to study the effect of spiritual health and well-being on flow or optimal experience among young adults. We took 300 young adults, 150 male and 150 female between the age of 18 to 50 years, engaged in different occupations and studies in Kerala for this study.

Flow is often recognized as a state of intense task-absorption and high cognitive efficacy brought about by intrinsic motivation and a feeling of oneness with the activity in which the person is involved (Emerson, 1998; Jackson & Marsh, 1996; Moneta, 2004). In a flow state, consciousness dims, and in what feels like *something taking over*, the subconscious rises to the forefront of mind, facilitating maximum human performance. Flow is characterized by complete absorption in what one does. Spirituality is defined as ‘living life in the light of one's own spirit’. To live in light of one's own spirit, one needs to realize her/his own soul so and so that not only realize it once but should always be one with it. So the level of spirituality is ‘How near is one with his/her own spirit in living his/her life’. Spirituality is sometimes associated with religion, but spirituality does not mean religion. Spiritual health is enjoying a good connection between mind, body and soul/spirit. Well-being refers to how people experience and evaluate their lives and specific domains and activities in their lives. Professor Ed Diener, one of the world's foremost subjective well-being researchers, defines it as “people's cognitive and affective evaluations of their lives.” In layman's terms, subjective well-being means thinking and feeling that your life is going very well. Wellbeing can be defined and measured objectively and subjectively. In the literature, terms such as “happiness”, “subjective well being”, “thriving”, and “flourishing” are often used interchangeably. But well-being is not simply the absence of negative function, but rather is something more. That is, a lack of negative affect, depression, loneliness, insecurity, and illness is not the same as the presence of positive affect, happiness, social connection, trust, and wellness.

A healthy spirit and well-being can bring life satisfaction, happiness, healthy relationships, positive attitudes, emotions & interests, accomplishments and make life more transcendental or meaningful and worthwhile. Only a healthy spirit in a healthy body can maintain/experience flow. In order to experience/exercise flow, we need to have positive social, physical and psychological well being with a will and determination (a certain level of motivation). The present study is an attempt to understand the impact and relationship of healthy spirituality and well-being on flow experience and how these variables can lead to experience flow often. Optimal level of flow experience helps in increasing outcomes, performance, productivity and achievements.

PROBLEM STATEMENT

To find out whether individuals having high spiritual health and well-being experience flow more compared to others and also to see if there's any influence of gender difference on them.

NEED AND SIGNIFICANCE OF STUDY

One of the most common problems faced by adults, especially students and workers, is the inability to concentrate or get absorbed in what they do (experiencing flow). Lack of interest, procrastination, laziness, stress, anxiety, negative emotions, unhealthy mind-body and social relations, ill past experiences (eg: failures, breakups) and many other factors lead to the inhibition of flow. A healthy spirituality and well-being is the key to fulfillment in life. This study addresses the need to focus on spiritual health and wellbeing of individuals in colleges, universities, and organizations in order to maintain and control flow experience. Controlling flow is as important as experiencing it frequently. That is, flow should be experienced for the right thing at the right time. Sherry (2004) introduced the flow construct to media psychological

research, positing that the experience of flow and media addiction seem to share the same traits: intense focus, temporal distortion, loss of self-consciousness, and high levels of pleasantness. But optimal level of flow experience helps in increasing outcomes, performance, productivity and achievements. This study can also be applied in various disciplines. It also will help to better parent-child relationships, lower divorce rates, better family relationships, academic performance, mental and physical health, enhance self esteem, self efficacy, self concordance and so on. This study can be used by psychologists and counselors engaging in logotherapy, reality therapy, REBT etc.

SCOPE OF THE STUDY

The study is an attempt to understand the effect of spiritual health and well-being on flow experience among young adults. We took 150 male and 150 female, between the age of 18 and 50 years, living in the State of Kerala for this study. There is not much research focusing on the combination of spiritual health, well-being and flow experience or the effect of these variables on flow experience. This study helps to have an improved understanding of the relation among spiritual health, well-being and flow, and also its impact. This study can give insight on the need for enhancing subjective well-being and a healthy mind-body connection to experience and control flow.

OBJECTIVES OF THE STUDY

- To check the effect of spiritual health on flow experience among young adults
- To check the effect of well being on flow experience among young adults
- To assess the relationship between spiritual health and well being among young adults
- To test the significance of spiritual health between male and female
- To test the significant difference of well being between male and female
- To test the significance of flow experience between male and female

LIMITATIONS OF THE STUDY

Even though the study was conducted for people living in Kerala, participation from all the districts has not been successful. Majority of the people were from Kannur, Kozhikode, Malappuram, Palakkad, Thrissur, Ernakulam, Kottayam and Alappuzha. Only a handful of people from other districts had participated in this study. And also the study has been conducted among a general population, it would have been more effective and informative if it had been among a specialized population, such as sportsmen, dancers, music students, working population, students under the age of 18 and adults above 50 years.

CHAPTER II

REVIEW OF LITERATURE

LITERATURE REVIEW

A study on correlation between the life attitude and well being-with spiritual health as the meditory was conducted by Chou,mei-Ju, Tsai,show-sau, Hsu,Hsiu-mei and Wu,Ho-Tang(2014).This study aims showed that explore the mediator's correlation between the teacher's life attitude, spiritual health, and well-being. As far as that study was concerned, there are three limitations. First, according to the literature. Second, religion influences spiritual health as well, so some spirituality scales include religion related dimensions and finally Taiwan teachers are adopted as the research subject in that study, with the background variables such as gender, marital status, and age. In this research found that life attitude and well-being were significantly positive correlative originally.

The Spiritual flow: The influence of religious experience on psychological well-being was conducted by Christian H Monson (2019). One of the primary purposes of this study was to provide evidence that a spiritual flow experience exists and that such experiences have an impact on those who have them. The findings that a spiritual flow experiences exist and that they are beneficial to those individuals who have them extend the research on flow into a previously unexplored domain.

Agnieszka Bożek, Paweł F. Nowak and Mateusz blukacz (2020) was conducted on the relationship between spirituality, health - related behavior and psychological well being. The study was to explore the relations between spirituality, health-related behaviors, and psychological well-being in the context of acquired education. The results indicated that both spirituality and health-related behaviors were directly related with psychological well-being.

Ilaria Coppola, Nadia Rania, Rosa Parisi and Francesca Lagomarsino (2021) conducted research focused on the spiritual well-being and psychological impact of the general population during the lockdown. It was also found that many people and their families experienced situations of great discomfort, stress and fear related not only to the fear of contagion but also to the economic difficulties for those who saw their income reduced due to the closure of

production activities or who experienced situations of loneliness, isolation or conflicts within the home.

Sergi Rufi, Anna Woldarczk and Federico Javoloy (2015) did a study on Flow and emotional experience in spirituality : Difference in interactive and coactive collective rituals. This study seeks to compare flow and emotional experience in interactive and coactive collective rituals. The results indicated that the presence of flow in all three contexts, being higher in the interactive social situations (the Catholic mass and other Sunday group activities) than in the coactive one (the Zen meditation practice).

A study was conducted on Spiritual well being in sports and exercise psychology by Dev Roychowdhury (2019) . Research indicates that spirituality plays a cardinal role in enhancing sporting performance, personal growth, and well-being . The result showed that spiritual well-being plays a significant role in the lives of athletes.

Chao Liu , Hao Chen , Chia-Yi Liu ,wen- Ko Chiou and Rung-Tai Lin (2020) conducted a study The effect of loving- kindness medication on flight attendant spiritualists, mindfulness and subjective well being with 98 flight attendants from Xiamen Airlines in China. That study investigated: (1) the effects of the loving-kindness meditation (LKM)on mindfulness, subjective well-being (SWB), and spirituality and (2) the relationships between mindfulness, spirituality, and SWB. The result indicated LKM may help to improve SWB and spirituality.

A study was conducted on the effective of creative arts therapies to enhance emotional expression, spirituality and psychological well being of newly diagnosed stage 1 and stage 2 breast cancer patient by Ana Puig and Goodwin Linda .The study was to explore the efficacy of a complementary creative arts therapy intervention to enhance emotional expression, spirituality, and psychological well-being in newly diagnosed breast cancer patients by using 39 women from a southern college city and the surrounding rural areas.

Genie Palmer and William Braud (2002) conducted a study on exceptional Human experience, disclosure and a more inclusive view of physical, psychological and spiritual well being. The result indicated that frequent and/or profound EHEs were positively and significantly

related to high levels of meaning and purpose in life, high levels of spirituality, thin or permeable boundaries, and a tendency toward transformative life changes.

Thomas M , Kelley , Jack Pransky and Eric G. Lambert (2016) did a study on realizing improved mindfulness/ flow mental health through understanding three spiritual principles. The result indicated that the study was to support the prediction that insight regarding “thought recognition” and/or “innate health via a clear mind” gained through understanding these spiritual principles will show a significant positive relationship with mindful attention, mindful acceptance, flow experience, and mental health.

A study on contributions of religious beliefs on the development of university student's well being by Joe pong (2018).A total of 27 university students were invited for individual face-to-face in-depth interviews.The findings of the study support and supplement the quantitative findings of Pong (2016) add to the investigation on how and what spiritual well-being of students could be influenced based on religious beliefs. Happiness, love, harmony and devotion are determined for the possible reasons and effects from their religious beliefs in specific domains.

A study was conducted on the association between spirituality and religiousness and mental health by Luciano Magelhaes Vitorino, Giancarlo Lucchetti and Frederick Camelo Leao. The study investigated how different levels of spirituality and religiousness (high spirituality and high religiousness –S/R, high spirituality and low religiousness –S/r, low spirituality and high religiousness s/R and low spirituality and low religiousness – s/r) are associated with quality of life, depressive symptoms, anxiety, optimism and happiness among adults. The study concluded having high levels of both spirituality and religiosity are associated with better optimism, and happiness as compared to those having only spirituality, only religiousness or none of them.

Mohammad sanagoel zadeh and Mehdi Mesri (2019) conducted a study on an exploration of the knowledge components of Spiritual Health based on the quran and hadiths: a qualitative research.The results indicated that the study are useful for evaluating spiritual health and planning for education in order to enhance spiritual well-being and elaborating an Islam-based spiritual health pattern.

A study on spirituality, religion and health: evidence and research direction was conducted by David R Williams and Michelle J Sternthal (2007). The result indicated that the levels of spirituality and religion are relatively high in Australia, and findings on the relationship between religion and health in Australia are similar to those in the US.

K Miller ,P Crawford , A Crawford ,A. Edley and L. Hare -Duke (2019) conducted a study on The experiences of spirituality among adults with mental health difficulties. A systematic review provides evidence of the significant role spirituality plays in the lives of many people who experience mental health difficulties. That indicates the importance of mental health professionals being aware of and prepared to support the spiritual dimension of people using services.

Marino Bonaiuto , yanhui Mao ,Scott Robert and Anastasia psalti (2016) conducted a study on optima experience and personal growth: flow and the consolidation of the place by using 134 local resident from Thessaloniki and 153 residents from Rome. That study examined the relationship between flow experience and place identity, based on eudaimonistic identity theory (EIT) which prioritizes self-defining activities as important for an individual's identification of his/her goals, values, beliefs, and interests corresponding to one's own identity development or enhancement.

A study was conducted by Victor Alexander Martin (2011) to find the optimal Experience of Flow Among Intramural Optimal Experience and flow among intramural officials at the University of Tennessee, Knoxville Officials. That study concluded that attempting to elicit descriptions of flow experiences is difficult.

Eunju Lee (2005) conducted a study to examine the relationship of motivation and flow experience. The results show that study contributes to theory and practice by highlighting the association of procrastination with motivation and flow experience.

In a study of spirituality and psychological well being among breast cancer , conducted by Judith A Schreiber and Dorothy Y Brockopp(2011) . That study was analyzed in order to examine associations among religion, spirituality, and psychological well-being for women diagnosed with breast cancer.

Bryan Leighto Dawson (2007) conducted a study on analysis of procrastination and flow experience by using 62 Psychology and Sociology students. The result indicated that procrastination may be limited by the method of measurement. The use of cut-offs for a continuous measurement may be an ineffective path to understanding the complexities of how procrastination interacts with other variables.

A study on investigated the flow experience key conceptual and operational issues , conducted Sami Abuhamedeh (2020).The results indicated that operationalizing flow as dependent on versus distinct from the task.

Dwight C.K Jse , Jeanne Nakamura and Mihaly Csikszentmihalyi (2002) was conducted on flow experience across adulthood . The result indicated that flow experiences stay the same across adulthood because flow states are volatile and subject to contextual changes.

A study was conducted by Brinthaupt, Thomas M. Shin and Chul M BM (2001) to find the relationship of academic cramming to flow experience. 167 undergraduate students participated in the study and the result indicated that students who normally cram performed better on the test and reported higher flow scores than the non-crammers. Implications for research on flow and study habits are presented.

Thomas P Novak and Donna L Hoffman(2000) conducted a study on measuring the flow experience among web users. That study provided evidence that skill and challenge for using the Web can be reliably measured, and that these measures correlated as anticipated with previous theoretical frameworks of flow.

A study was conducted by Arthur Perttula and Kristian kiili (2017) to find the flow experience in game based learning. That study shows that the meaning of individual characteristics and game mechanics has largely been neglected in the research and provided some baseline evidence about the importance of flow experience in serious games; more robust empirical research needs to be conducted before the results can be generalized.

Sharon G Clarke and John T Haworth (1994) conducted a study on flow experience in the daily lives of sixth - form college students .The Experience Sampling Method was employed to collect data from a sample of 35 sixth-form college students over a period of one week. The

results showed that the positive poles of subjective experience tended to cluster in control rather than flow.

A study on locus of control the flow experience was conducted by Johannes Keller and Frederik Blomann(2008).The study employed an experimental paradigm to document the causal impact of skills–demands compatibility on the emergence of flow and revealed that participants characterized by a strong internal locus of control (LOC) were most sensitive to the manipulation of skills–demands compatibility and experienced flow under conditions of a fit of skills and task demands, whereas individuals with a weak internal LOC did not enter the state of flow.

Julia Schuler and sibylle Brunner(2009) conducted a study on the rewarding effect of slow experience on performance. The result concluded that hypothesis showing that flow during a marathon race is related to future running motivation, but is not directly linked to race performance. Instead, race performance was predicted by pre-race training behavior which again was fostered by flow during the training (Study 3). The descriptive flow courses of the retrospective and the experience-sampling flow measures were comparable but also showed important differences.

A study on the impact of service system design and flow experience on customer satisfaction in online financial services was conducted by David Xin Ding, Paul Jen-Hwa Hu, Rohit Verma and Don G Wardell. The result indicated the important antecedents and consequences of flow experience in online financial services and suggest the viability of using a dual-layer experience construct to investigate customer satisfaction.

J Matias Kivikangas(2006) conducted a study on Psychophysiology of flow experience . That study concluded that psychophysiological methods offer well-established indices for studying emotions. Using a digital game as a flow elicitor for a group of gamers these methods provided a look into the emotional concomitants of flow.

RESEARCH GAP

The research gap is that the recent studies didn't focus on this combination of mind-body/spiritual-subjective well-being to study flow experience and the effect of gender difference on them.

CHAPTER III

THEORETICAL FRAMEWORK

FLOW EXPERIENCE

In positive psychology, a flow state, also known colloquially as *being in the zone*, is the mental state in which a person performing some activity is fully immersed in a feeling of energized focus, full involvement, and enjoyment in the process of the activity. In essence, flow is characterized by the complete absorption in what one does, and a resulting transformation in one's sense of time. According to Csikszentmihalyi (2008), the researcher who coined the term 'flow', it is a state in which people are so involved in an activity that nothing else seems to matter; the experience is so enjoyable that people will continue to do it even at great cost, for the sheer sake of doing it. Csikszentmihalyi makes a distinction between what is pleasurable versus enjoyable. The former are activities like sex, eating, watching TV, and sleeping. Examples of enjoyable activities are sports, recreational adventure, writing, art, and more. Flow experiences are active, while pleasurable experiences are typically passive and fleeting. Flow is neither good nor bad. It simply is. Flow can lead to experiencing life more fully and intensely. We can experience more meaning. It also can strengthen how we define who we are (Csikszentmihalyi, 2009).

The concept of the flow (or optimal experience) was firstly described by Woodworth (Woodworth, 1918, cited in Rheinberg, 2008) who observed the effortless absorption of both adults and children in certain activities. Since then, many researchers have tried to figure out and explain why people are highly motivated by and committed to certain activities without obvious external rewards. Flow is described as a "psychic compass orienting psychological selection and supporting the developmental trajectory each individual autonomously builds and follows throughout life" (Massimini & Delle Fave, 2000), and it was included in the Authentic Happiness Model by Seligman (2002).

Csikszentmihalyi (1975/2000) was the first to conduct systematic empirical research to investigate the subjective phenomenology of intrinsically motivated or autotelic activities. The term autotelic (auto = self & telos = goal) refers to activities that have a purpose in and of themselves and are considered as rewarding apart from any potential external reward resulting from them. Later, the term was also used to describe an autotelic personality (Boniwell, 2012).

Csikszentmihalyi identified flow by interviewing chess players, rock climbers, dancers, composers, athletes and other individuals who have as a goal the pursuit of enjoyment and by asking them to report their experiences and source of pleasure. The same procedure was followed for professionals, specifically surgeons, whose extrinsic rewards such as money, fame, and prestige could justify their efforts and involvement.

The idea of flow (Csikszentmihalyi, 1975), while a singular and unique concept, was formulated from pre-existing concepts and ideas concerning intrinsic motivation. First, Groos (1901) and Bühler (1930) discuss the idea of *Funktionslust*, the pleasurable sensation that an organism experiences when it is functioning according to its physical and sensory potential. In other words, when a person reaches the limits of sensory (i.e. touch, sight, sound, smell, taste) input and physical abilities, they experience a pleasing sensation.

Secondly, Hebb (1955) and Berlyne (1960) proposed that experiences must possess a novel quality to be enjoyable. Third, White (1959) and De Charms (1968) emphasize that the basic issue of any intrinsic activity is whether the person does the act for personal reasons or external pressures. Enjoyment is experienced if the person does the act for intrinsic reasons while the act is seen as work or drudgery if external forces are seen as the cause. To put it simply, play is an activity that one is free to enter and free to leave.

Lastly, the work of Cailliois (1958), which attempted to classify autotelic (i.e. intrinsically rewarding) activities, greatly influenced the conceptualization of flow. Four basic human needs are met by such activities: competition, the need to control the predictable, to transcend limitations through fantasy, pretense, and disguise; and to transcend limitations through an altered state of consciousness. It is important to note that Callois (1958) also believed that novelty and freedom were essential for enjoyment.

Characteristics of flow:

According to Csíkszentmihályi, the nine characteristics of flow that were identified include: challenge skill balance, merging of action and awareness, clear goals, unambiguous feedback, total concentration, sense of control, loss of self consciousness, time transformation (time speeds up or slows down), and autotelic experience. It is important to remember that all of the components of flow are interdependent, with each affecting the occurrence of each other. While many of these components may be present, it is not necessary to experience *all* of them for flow to occur.

The challenge-skill balance, also known as the CS balance, is a golden rule of flow. The CS balance concerns the perceptions of the individual in regards to the challenges posed by the situation and their ability to meet those challenges (Jackson & Csikszentmihalyi, 1999). The balance occurs when the individual believes that he or she possesses the prerequisite skills to conquer the challenge, which is more difficult than normal for the person. It is important to remember that the subjective interpretation of the individual determines the occurrence of the CS balance, not the possible objective evaluation.

The second characteristic of flow, merging of action and awareness, describes the unity of movement and thought in the individual. This unity is a result of the mind and body working at their limits. Self-awareness is lost as involvement becomes so deep that the activity becomes automatic and spontaneous. Clear goals, the third component of the flow experience, direct the attention and actions of the individual, leaving little room for second-guessing and distraction. These goals can be pre-determined or impromptu in nature. Knowing what decisions and corresponding actions are necessary each second of an activity is very conducive to a flow experience. An individual receives feedback from internal sources (i.e., mind and body) and external sources (i.e., teachers, boss, coach, teammates, opponents, partners, setting, and equipment). When an individual is experiencing flow, unambiguous feedback, the fourth component, is critical. Being certain that everything is going well, the person knows that he or she is on track and on the path to reaching his or her goals.

Concentration on the task at hand is the fifth characteristic of the flow experience. This dimension describes the total absorption of the individual in the activity. His or her thoughts and focus lie in the moment, not the past or future. Extraneous thoughts are non-existent. This does not imply that the individual is unaware of his or her external environment but that he or she does not see the external environment as a distraction, but as an integral part of the activity.

A sense of control occurs when an individual is in flow. Pervaded by feelings of invincibility and infallibility, the sixth component of flow instills a great deal of confidence in the person. A sense of control is not possible if the individual does not perceive that he or she possesses the necessary skills to complete the task. It is important to remember that the sense of control is effortless, not requiring any action on the part of the individual.

Loss of self-consciousness, the seventh component of flow, simply describes the absence of self-doubt and self-concern. Everyday worries and negative thoughts are excluded from conscious awareness in flow. Since this loss of self-awareness occurs when one is completely absorbed in the activity or task, this component is closely related to the merging of action and awareness. However, feedback from the mind and body is not ignored but interpreted differently than normal.

During flow, the passage of time can be perceived differently. Transformation of time, the eighth component of the flow experience, is experienced differently. Most descriptions of the flow experience involve the slowing of time in which seconds seem to expand to minutes. Some accounts also describe the acceleration of time, hours passing like minutes. According to Jackson and Csikszentmihalyi (1999), this altered sense of time is a result of the total concentration of the flow experience.

The final characteristic of the flow experience, autotelic experience, is an end result of the previous flow components. An autotelic experience is intrinsically rewarding and prompts an individual to pursue the task for the sake of participation alone. External rewards or motivation is not needed. Enjoyment and having fun are evidence of an autotelic experience

What is also noteworthy in flow is the lack of emotions during the actual process. Flow-ers seem to be almost beyond experiencing emotions, probably due to the absence of self-awareness. However, after the occurrence of flow, an increase in positive emotions is experienced). The weakness of the operational flow model to measure all nine components and avoid theoretically inconsistent results finally led to its reformulation by Csikszentmihalyi and Csikszentmihalyi (1988). The revised model, commonly referred to as the four channel model or the quadrant model of flow, suggests that flow can be achieved only under circumstances where both challenge and level of skills are greater than the weekly average (Csikszentmihalyi & LeFevre 1989). This obviously more complex model divides experience in four central states—flow, anxiety, boredom, and apathy—represented as quadrants of a challenge by the skills Cartesian system. According to this model, if both challenge and skills in carrying out an activity are above weekly average, then flow is achieved. Apathy state, suggests that both challenge and skills are low, thus it is the only additional state but also the least positive and desirable one (Moneta, 2012). Other proposed models and/or measurement methods for flow followed after this revision: (1) The experience fluctuation model by Massimini & Carli , (2) The absolute difference regression model by Moneta & Csikszentmihalyi and (3) The Componential Approach by Moneta.

Entering flow presupposes the existence of a balance between the perception of one's skills and the perception of the activity's difficulty level. According to Csikszentmihalyi, in case that challenges exceed skills the individual firstly becomes vigilant and then anxious, while, on the other hand, when skills exceed challenges the individual experiences relaxation and then boredom. Changes in subjective state offer feedback and therefore feeling anxious or bored impels individuals to either adjust the level of skills to the challenge or the opposite, so as to get rid of these unwanted feelings and re enter flow state. Hybrid empirical flow models distinguish antecedents and aspects of flow. In these models, concentration to flow, goals, feedback, and balance are flow antecedents while control, merging, autotelic experience, self-consciousness and time are the core characteristics of the flow experience. Following abundant studies, the experience of flow has been proved to be present and common across several settings, types of activity, and lines of culture, class, gender and age, while it has also received a neurophysiological underpinning.

The benefits of flow:

In addition to making activities more enjoyable, flow also has a number of other advantages, such as:

- Better emotional regulation: With increased flow, people also experience more growth toward emotional complexity. This can help people develop skills that allow them to regulate their emotions more effectively.
- Greater enjoyment and fulfillment: People in a flow state enjoy what they are doing more. Because the task becomes more enjoyable, people are also more likely to find it rewarding and fulfilling.
- Greater happiness: Research also suggests that flow states may be linked to increased levels of happiness, satisfaction, and self-actualization.
- Greater intrinsic motivation: Because flow is a positive mental state, it can help increase enjoyment and motivation. Intrinsic motivation involves doing things for internal rewards.
- Increased engagement: People in a flow state feel fully involved in the task at hand.
- Improved performance: Researchers have found that flow can enhance performance in a wide variety of areas including teaching, learning, athletics, and artistic creativity.
- Learning and skill development: Because the act of achieving flow indicates a substantial mastery of a certain skill, people have to keep seeking new challenges and information in order to maintain this state.
- More creativity: Flow states often take place during creative tasks, which can help inspire greater creative and artistic pursuits.

Anyone can experience flow. Young and old can achieve flow. People who have psychiatric disorders like schizophrenia have difficulty because they can't ignore distractions from external stimuli. They're unable to distinguish between relevant and irrelevant information. Self-conscious people may lack the confidence necessary to pursue a challenging task. Self-centered people may lack the intrinsic motivation needed to doggedly pursue a challenge to completion. People who behave in ways that go against their goals (known as alienation) may

not establish clearly defined objectives for their tasks. People who experience an environment in which the norms aren't clearly defined may become confused.

The dangers of flow:

With flow having become such a popular notion and a desirable state, there are disadvantages for flow also. In fact, the activities in which flow is found can be morally good or bad. Gambling, for example, especially games like bridge or poker, has all the conditions necessary for flow – they are challenging and require a high level of skill to stand any chance of winning.

Even activities that are morally good or neutral, like mountain climbing, chess or Playstation, can become addictive, so much so that life without them can feel static, boring and meaningless. A simple non-gambling game on your computer, like solitaire, which many people use to 'switch off' for a few minutes, can take over your life. This happens when, instead of being a choice, a flow-inducing activity becomes a necessity.

Other Optimal Experiences

Flow is not the only optimal experience that we know of. A humanistic psychologist, Abraham Maslow, (1908-1970) coined the term *peak experience* to describe intensely joyous and exciting moments in the lives of every individual. In these moments, we feel more whole, integrated, aware of ourselves and deeply happy.

We have a sense of transcendence, awe, unity and meaningfulness in life. Often these experiences have a spiritual quality about them. The peak moments are often inspired by intense occurrences – moments of love, exposure to great art or music, the overwhelming beauty of nature or even tragic events. Maslow, like Csikszentmihalyi with regard to flow, believed that all individuals are capable of peak experiences, but those who achieved self-actualisation are more likely to have them. Although many characteristics are shared (e.g. absorption, spontaneity, loss of time), peak experience differs from flow in the presence (rather than loss) of the sense of self, the rarity of its occurrence and having almost a mystical quality about it. Whilst flow experiences

are encouraged, Maslow cautioned against seeking peak experiences for their own sake. We have a long way to go in learning about the optimal states of human existence. Little is known about *microflow* activities (such as doodling), *shared*, rather than individualized, flow, in which the whole is greater than the sum of its parts (like in a musical jam session) or a *plateau experience* (which is a continuous peak experience).

SPIRITUAL HEALTH

At the core, humans are spiritual beings. Spirituality can be viewed in a variety of ways from a traditional understanding of spirituality as an expression of religiosity, in search of the sacred, through to a humanistic view of spirituality devoid of religion. Health is also multi-faceted, with increasing evidence reporting the relationship of spirituality with physical, mental, emotional, social and vocational well-being. Human spirituality is increasingly being recognized as a real phenomenon and not merely a “mental illusion” . Spirituality can mean many things in popular usage, and is often understood differently by different people. While retaining a certain ambiguity, its current range of application extends from traditional institutional religion to occult practices. In general, the term appears to denote approaches to discovering, experiencing, and living out the implications of an authentic human life.

Twenty-four separate meanings for the word „spirit“ are listed in the Oxford English Dictionary. The general meaning underlying all the uses is that of an animating or vital principle which gives life, transcending the material and mechanical. It refers to the essential nature of human beings, their strength of purpose, perception, mental powers, and frame of mind. “Spiritual” may refer to higher moral qualities, with some religious connotations and higher faculties of mind”.

- *Spirituality is innate*

Consensus is reported in the literature for spirituality being posited at the heart of human experience, and it being experienced by everyone. Not only is it believed that each individual has spiritual needs, but also it is claimed that human spirituality in a very real sense unifies the whole person and is an inbuilt feature of the human species that develops from the

beginning of an individual's life (or not) depending on prevailing conditions. Spirituality can thus be seen as a fundamental, vital component of being human.

- Spirituality is emotive

The notion of spirituality is emotive. It touches people's hearts because it deals with the very essence of being. It is important for people in positions of influence to remember that they cannot be neutral, or value-free, but must try to be objective in examining the concepts of spirituality and spiritual health, especially as they relate to young people.

- Spirituality and religion

A variety of opinions prevails on the nature of any relationship between spirituality and religion. Some people equate spirituality with religious activity, or use the words interchangeably. Horsburgh maintains that religion focuses on ideology and rules (of faith and belief systems), whereas spirituality focuses on experience and relationships which go beyond religion. Seaward asserts that spirituality involves connection to a divine source whatever we call it. But, spirituality does not have to include "God-talk" according to Jose and Taylor.

Abraham Maslow, reputed by many to be the father of humanistic psychology, and John Dewey, a founder of the philosophical school of Pragmatism, both consider spirituality to be part of a person's being, therefore, prior to and different from religiosity.

- Spirituality is dynamic

The spirit is dynamic. It must be felt before it can be conceptualized. In keeping with this view, terms like "spiritual growth" and "development" are used to express the vibrant nature of spirituality. A person's spiritual health can be perceived to be high or low. If it is static, there is neither growth nor development, nor spiritual life. The spiritual quest is like being on a journey: If you think you've arrived, you haven't yet begun, or you are dead.

Five types of spirituality are believed to exist in the United States, namely humanistic spirituality with focus on human spirit with no claim to a higher power; unmoored spirituality focusing on energy, connection, and nature; and three types of moored spirituality based on Eastern religions; or Western religions with evangelical, or conservative, bases. These five types of spirituality could just as easily be grouped into the three categories described as, god-oriented, worldly-oriented with an idolatrous stress on ecology or nature, or humanistic, stressing human

potential or achievement. An attempted integration of the divergent views described spirituality as the ancient and abiding human quest for connectedness with something larger and more trustworthy than our egos—with our own souls, with one another, with the worlds of history and nature, with the invisible winds of the spirit, with the mystery of being alive. Spirituality is concerned with a person's awareness of the existence and experience of inner feelings and beliefs, which give purpose, meaning and value to life. Spirituality helps individuals to live at peace with themselves, to love (god) their neighbor, and to live in harmony with the environment. For some, spirituality involves an encounter with God, or transcendent reality, which can occur in or out of the context of organized religion, whereas for others, it involves no experience or belief in the supernatural.

Ellison suggested that spiritual well-being arises from an underlying state of spiritual health and is an expression of it, much like the color of one's complexion and pulse rate are expressions of good (physical) health. Fehring, Miller and Shaw supported this view by adding, spiritual well-being is an indication of individuals' quality of life in the spiritual dimension or simply an indication of their spiritual health. In the framework definition of spiritual well-being (SWB) proposed by the National Interfaith Coalition on Aging (NICA), in Washington DC, four main themes appeared as SWB was seen as the affirmation of life in a relationship with God, self, community and environment that nurtures and celebrates wholeness. These relationships can be developed into four corresponding domains of human existence, for the enhancement of spiritual health:

- relation with self, in the Personal domain
- relation with others, in the Communal domain
- relation with the environment, in the Environmental domain, and
- relation with transcendent Other, in the Transcendental domain.

Personal domain—wherein one intra-relates with oneself with regards to meaning, purpose and values in life. Self-awareness is the driving force or transcendent aspect of the human spirit in its search for identity and self-worth.

Communal domain—as shown in the quality and depth of interpersonal relationships, between self and others, relating to morality, culture and religion. These are expressed in love, forgiveness, trust, hope and faith in humanity.

Environmental domain—beyond care and nurture for the physical and biological, to a sense of awe and wonder; for some, the notion of unity with the environment.

Transcendental domain—relationship of self with some-thing or some-One beyond the human level (i.e., ultimate concern, cosmic force, transcendent reality or God). This involves faith towards, adoration and worship of, the source of Mystery of the universe.

This definition outlines the inter-connective and dynamic nature of spiritual health, in which internal harmony depends on intentional self-development, coming from congruence between expressed and experienced meaning, purpose and values in life at the Personal level. This intentional self-development often eventuates from personal challenges, which go beyond contemplative meditation, leading to a state of bliss, perceived by some as internal harmony.

WELL-BEING

Well-being is defined as a sense of health and vitality that arises from your thoughts, emotions, actions, and experiences. When we have well-being, we feel happy, healthy, socially connected, and purposeful most of the time. Well-being is the experience of health, happiness, and prosperity. It includes having good mental health, high life satisfaction, a sense of meaning or purpose, and ability to manage stress. More generally, well-being is just feeling well.

5 Major Types of Well-Being:

- Emotional Well-Being. The ability to practice stress-management and relaxation techniques, be resilient, boost self-love, and generate the emotions that lead to good feelings.

- Physical Well-Being. The ability to improve the functioning of your body through healthy living and good exercise habits.
- Social Well-Being. The ability to communicate, develop meaningful relationships with others, and maintain a support network that helps you overcome loneliness.
- Workplace Well-Being. The ability to pursue your interests, values, and life purpose in order to gain meaning, happiness, and enrichment professionally.
- Societal Well-Being. The ability to actively participate in a thriving community, culture, and environment.

Theories of Well-being:

The three main theories of well-being are *hedonism*, *desire theories*, and *objective list theories*.

HEDONISM

Hedonism is the view that well-being consists in, and only in, the balance of positive over negative conscious experiences. On this view, the only basic welfare goods are pleasant experiences such as enjoyment and contentment. Conversely, the only basic welfare bads are unpleasant experiences such as pain and misery.

The hedonistic conception of happiness is broad: It covers not only paradigmatic instances of sensory pleasure—such as the experiences of eating delicious food or having sex—but also other positively valenced experiences, such as the experiences of solving a problem, reading a novel, or helping a friend. Hedonists claim that all of these enjoyable experiences are intrinsically valuable. Other goods, such as wealth, health, justice, fairness, and equality, are also valued by hedonists, but they are valued instrumentally. That is, they are only valued to the extent that they increase happiness and reduce suffering.

what makes hedonism controversial is that it implies that:

1. *All* happiness is intrinsically good for you, and all suffering intrinsically bad.
2. Happiness is the *only* basic welfare good, and suffering the only basic welfare bad.

DESIRE THEORY

Desire theories hold that well-being consists in the satisfaction (minus frustration) of desires or preferences.

According to desire theories, what makes your life go well for you is simply to get whatever it is that you want, desire, or prefer. Importantly, our preferences can be satisfied without our realizing it, so long as things in reality are as we prefer them to be. Desire theories may be motivated by the thought that what makes your life go well for you must ultimately be up to you.

OBJECTIVE LIST THEORY

Both hedonism and desire theories are monist. They suggest that well-being consists of a single thing—either happiness or desire satisfaction. In contrast, while objective list theorists usually agree that happiness is an important component of well-being, they deny that it is the only such component; consequently, objective list theories are pluralist.

Objective list theories hold that there are a variety of objectively valuable things that contribute to one's well-being.

In addition to happiness, these lists commonly include loving relationships, achievement, aesthetic appreciation, creativity, knowledge, and more. Crucially, these list items are understood as basic or intrinsic goods; they are valuable in themselves, not because of some instrumental benefit they provide. The list is called objective, because its items are purported to be good for you regardless of how you feel about them. The same list applies to everyone, though different lives may end up realizing different goods from the list, so there may still be many different

ways of living an excellent life. On this view, some things (such as love and happiness) are inherently more worth caring about than others, and it makes your life go better if you attain more of the things that are truly good or worth pursuing.

Objective list theories do not necessarily imply that people would benefit from being forced to pursue objective goods against their will. Autonomy could be a value on the list, and happiness certainly is; either of these is apt to be severely thwarted by such coercion. Still, one notable implication is that if you are able to change someone's preferences from worthless to worthwhile goals, this is likely to improve their well-being (even if they are no more satisfied, subjectively speaking, than before).

Objective list theories are thus in a good position to explain which preference-changes are good or bad for you (a potential advantage over desired theories). And the inclusion of values beyond just happiness yields more plausible verdicts than hedonism in "experience machine" cases.

PERMA THEORY OF WELL-BEING

Abraham Maslow (1962) was one of the first in the field of psychology to describe “wellbeing,” with his characteristics of a self-actualized person. The description of self-actualization is a foreshadowing of the PERMA model, which outlines the characteristics of a flourishing individual and Wellbeing Theory. In developing a theory, Seligman (2012) selected five components that people pursue because they are intrinsically motivating and they contribute to wellbeing. These elements are pursued for their own sake and are defined and measured independently of each other .

There are five building blocks that enable flourishing – **Positive Emotion, Engagement, Relationships, Meaning, and Accomplishment** (hence **PERMA**) – and there are techniques to increase each.

Positive Emotion: This route to well-being is hedonic – increasing positive emotion. Within limits, we can increase our positive emotion about the past (e.g., by cultivating gratitude and forgiveness), our positive emotion about the present (e.g., by savoring physical pleasures and mindfulness) and our positive emotion about the future (e.g., by building hope and optimism).

Unlike the other routes to well-being, this route is limited by how much an individual can experience positive emotions. In other words, positive affectivity is partly heritable and our emotions tend to fluctuate within a range. Many people are, by disposition, low in experiencing positive emotion. Traditional conceptions of happiness tend to focus on positive emotion, so it can be liberating to know that there are other routes to well-being, described below.

Engagement: Engagement is an experience in which someone fully deployed their skills, strengths, and attention for a challenging task. According to Mihaly Csikszentmihalyi, this produces an experience called “flow” that is so gratifying that people are willing to do it for its own sake, rather than for what they will get out of it. The activity is its own reward. Flow is experienced when one’s skills are just sufficient for a challenging activity, in the pursuit of a clear goal, with immediate feedback on progress toward the goal. In such an activity, concentration is fully absorbed in the moment, self-awareness disappears, and the perception of time is distorted in retrospect, e.g., time stops. Flow can be experienced in a wide variety of activities, e.g., a good conversation, a work task, playing a musical instrument, reading a book, writing, building furniture, fixing a bike, gardening, sports training or performance, to name just a few.

Relationships: Relationships are fundamental to well-being. The experiences that contribute to well-being are often amplified through our relationships, for example, great joy, meaning, laughter, a feeling of belonging, and pride in accomplishment. Connections to others can give life purpose and meaning. Support from and connection with others is one of the best antidotes to “the downs” of life and a reliable way to feel up. Research shows that doing acts of kindness for others produces an increase in well-being.

From an evolutionary perspective, we are social beings because the drive to connect with and serve others promotes our survival. Developing strong relationships is central to adaptation and is enabled by our capacity for love, compassion, kindness, empathy, teamwork, cooperation, self-sacrifice, etc.

Meaning: A sense of meaning and purpose can be derived from belonging to and serving something bigger than the self. There are various societal institutions that enable a sense of meaning, such as religion, family, science, politics, work organizations, justice, the community, social causes (e.g., being green), among others.

Accomplishment: People pursue achievement, competence, success, and mastery for its own sake, in a variety of domains, including the workplace, sports, games, hobbies, etc. People pursue accomplishment even when it does not necessarily lead to positive emotion, meaning, or relationships.

The Benefits of Well-Being

Research demonstrates that well-being is not only valuable because it feels good, but also because it has beneficial real-world consequences. Compared to people with low well-being, individuals with higher levels of well-being:

- Perform better at work
- Have more satisfying relationships
- Are more cooperative
- Have stronger immune systems
- Have better physical health
- Live longer
- Have reduced cardiovascular mortality
- Have fewer sleep problems
- Have lower levels of burnout

- Have greater self-control
- Have better self-regulation and coping abilities
- Are more prosocial

CHAPTER IV

RESEARCH METHODOLOGY

OBJECTIVES

- To check the effect of spiritual health on flow experience among young adults
- To check the effect of well being on flow experience among young adults
- To assess the relationship between spiritual health and well being among young adults
- To test the significance of spiritual health between male and female
- To test the significant difference of well being between male and female
- To test the significance of flow experience between male and female

HYPOTHESIS

- H0:** There is no significant effect of spiritual health on flow experience among adults
H1: There is a significant effect of spiritual health on flow experience among adults
- H0:** There is no significant effect of well-being on flow experience among adults
H1: There is a significant effect of spiritual health on flow experience among adults
- H0:** There is no significant relationship between spiritual health and well being among young adults
H1: There is a significant relationship between spiritual health and well being among young adults
- H0:** There is no significance of spiritual health between male and female
H1: There is a significance of spiritual health between male and female

5. **H0:** There is no significant difference of well being between male and female
H1: There is a significant difference of well being between male and female

6. **H0:** There is no significance of flow experience between male and female
H1: There is a significance of flow experience between male and female

RESEARCH DESIGN

Research design is the framework of research methods and techniques chosen by a researcher. The present study was quantitative in nature.

SOURCES OF DATA

The primary data was collected through conducting online surveys using Google Form, for people living in Kerala between the ages of 18 to 50. Flow Short Scale (FSS), the PERMA Profiler for well-being and Spirituality Index of Subjective Well Being (SIWB) are the tools used for the survey. Secondary data was collected through referring journals, articles and websites.

SAMPLE DESIGN

The sample is selected as per the convenience of the researchers through online surveys using Google form. The sample of young adults (both male and female) are collected from those living in Kerala only. Correlational design is used for this study

SAMPLE SIZE

The sample taken is 150 male and 150 female living in Kerala between the ages of 18 to 50 (young adults).

SAMPLING METHOD

The sample for the study is drawn using convenience sampling. It is a non-probability sampling where the sample is taken from a group of people easy to contact or to reach.

METHOD OF DATA COLLECTION

Data is collected through conducting online surveys using google form, for peoples between the age of 18 to 50 (young adults), residing in Kerala. The sampling method employed in this study is convenience sampling. The male and female are taken equal number, i.e., 150 for each sex.

DRAFTING A QUESTIONNAIRE

The assessment tools used in this study are Flow Short Scale (FSS), the PERMA Profiler for well-being and Spirituality Index of Subjective Well Being (SIWB). Both these scales are standardized scales.

1) Flow Short Scale (FSS)

Flow was measured with the Flow Short Scale (Rheinberg, Vollmeyer, & Engeser, 2003). FSS evaluates all nine components of flow experience with ten items over a 7-point Likert scale ranging from a minimum of 1 (not at all), a midpoint of 4 (partially) and a maximum of 7 (very much). The Flow Short Scale has been validated by Rheinberg et al. (2003) and by Engeser & Rheinberg (2008). The internal consistency reliability was reported to be $\alpha = .92$. The scale can be interpreted via two factors, the fluency of the examined activity (first 6 questions) and the absorption while conducting the activity (the remaining 4 questions). If the participants scored the item at 5 points or more, they were considered to have answered the item correctly. The FSS is scored by adding each item score, varying from 1 to 7, and dividing the total marks obtained in each question by the total number of items.

2) The PERMA Profiler

The well being was measured using the PERMA profiler developed by Dr. Martin Seligman, distinguished Professor of Psychology at the University of Pennsylvania and one of the founders of the field of positive psychology, defined 5 pillars of wellbeing: PERMA (positive emotion, engagement, relationships, meaning, accomplishment). The PERMA-Profiler measures these five pillars, along with negative emotion, health and overall happiness. Questions are on an 11-point Likert scale ranging from 0 (not at all) to 10 (completely).

Scores are calculated as the average of the items comprising each factor:

- Positive Emotion, $P = \text{mean} (P1, P2, P3)$
- Engagement, $E = \text{mean} (E1, E2, E3)$
- Relationships, $R = \text{mean} (R1, R2, R3)$
- Meaning, $M = \text{mean} (M1, M2, M3)$
- Accomplishment, $A = \text{mean} (A1, A2, A3)$
- Overall Well-being PERMA = $\text{mean} (P1, P2, P3, E1, E2, E3, R1, R2, R3, M1, M2, M3, A1, A2, A3, \text{hap})$
- Negative Emotion, $N = \text{mean} (N1, N2, N3)$
- Health, $H = \text{mean} (H1, H2, H3)$
- Loneliness Lon (single item)

All items are worded in a positive direction whereby higher scores equate to better wellbeing. Internal consistency of PERMA was good, with Cronbach's alpha ranging from 0.80–0.93 except Engagement ($\alpha = 0.66$).

3) The Spirituality Index of Well-Being

The Spirituality Index of Well-Being (SIWB) by Daaleman, T. P. & Frey, B. B. (2004). It is a 12-item instrument that measures one's perceptions of their spiritual quality of life. The scale is divided into two subscales: (1) self-efficacy subscale and (2) life-scheme subscale. Each item is answered on a 5-point scale ranging from 1 (Strongly Agree) to 5 (Strongly Disagree). Items 1-6 make up the Self-Efficacy Subscale and Items 7-12 make up the Life Scheme

Subscale. Scoring is kept on a continuous basis. The internal consistency reliability of SIWB was good, for the self-efficacy subscale, $\alpha = .86$, for the life scheme subscale, $\alpha = .89$ and for the total scale $\alpha = .91$.

DATA ANALYSIS TECHNIQUE

The statistical analysis was done using SPSS statistics, a statistical analysis software. Simple Linear Regression is used to find the effect of spiritual health and the effect of well-being on flow experience among young adults. Spearman's rank correlation is used to assess the relationship between spiritual health and well-being among young adults. Mann-Whitney U test is used to test the gender difference on spiritual health, well-being and flow experience.

CHAPTER V
DATA ANALYSIS

The aim of the present study was to study the effect of spiritual health and well-being on flow experience among young adults. The data obtained included responses from 300 participants, out of which 150 were male and 150 were female. The data was collected through an online survey using google form and the statistical analysis was done using SPSS statistics. The Kolmogorov-Smirnov and the Shapiro-Wilk test were used to find the normality of the data obtained and since the data is not normally distributed, non-parametric tests were used for further analysis.

Simple Linear Regression is used to find the effect of spiritual health and the effect of well-being on flow experience among young adults.

Table 5.1

Regression Analysis Predicting the Effect of Spiritual Health on Flow Experience among Young Adults

	R	R Square	p	B
Constant				34.970
Spiritual health	.274	.075	<.001	

It is found that 7.5% of the variance in flow experience can be explained by one's spiritual health. The p value obtained is <0.001, which indicates that overall the regression model statistically significantly predicts the outcome variable (flow experience). Hence the null hypothesis is rejected and the alternative hypothesis is accepted. That is, there is a significant effect of spiritual health on flow experience among young adults.

Table 5.2

Regression Analysis Predicting The Effect of Well-Being on Flow Experience among Young Adults

	R	R Square	p	B
Constant				16.809
Well-being	.650	.423	<.001	

It is found that 4.23% of the variance in flow experience can be explained by one's well-being. The p value obtained is <0.001, which indicates that overall the regression model statistically significantly predicts the outcome variable (flow experience). Hence the null hypothesis is rejected and the alternative hypothesis is accepted. That is, there is a significant effect of well-being on flow experience among young adults.

Spearman rank correlation is used to find the relationship between spiritual health and well-being among young adults

Table 5.3

Correlation between Spiritual Health and Well-Being among Young Adults

Independent Variable	Dependent Variable	r	p	N
Spiritual health	Well-Being	.479**	<.001	300

The table 5.3 indicates that there is a positive correlation between spiritual health and well-being among young adults ($r = .479$). Since the p value 0.001 is lesser than 0.05, the null hypothesis is rejected. Thus, the null hypothesis is rejected and the alternative hypothesis is accepted. That is, there is a significant relationship between spiritual health and well-being among young adults.

Mann-Whitney U test is used to determine whether there is any gender difference on spiritual health, well-being and flow experience.

Table 5.4

Significance of spiritual health between male and female

Variables	Gender	N	Mean Rank	Mann-Whitney U	p
Spiritual Health	Male	150	136.85	9202.000	.006
	Female	150	164.15		

The results from the Mann-Whitney U (test table 5.4) showed a significance level of 0.006 for spiritual health among young adults. Since 0.006 is lower than 0.05, there is a significant gender difference on spiritual health among young adults. Hence the null hypothesis is rejected

and the alternative hypothesis is accepted. That is, there is a significance of spiritual health between male and female

Table 5.5

Significant difference of well being between male and female

Variables	Gender	N	Mean Rank	Mann-Whitney U	p
Well-Being	Male	150	146.27	10615.500	.398
	Female	150	154.73		

The results from the Mann-Whitney U (test table 5.5) showed a significance level of 0.398 for well-being among young adults. Since 0.398 is greater than 0.05, there is no significant gender difference on well-being among young adults. Hence the null hypothesis is accepted and the alternative hypothesis is rejected. That is, there is no significant difference of well-being between male and female

Table 5.5

Significance of flow experience between male and female

Variables	Gender	N	Mean Rank	Mann-Whitney U	p
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Flow	Male	150	155.87	10444.500	.283
Experience	Female	150	145.13		

The results from the Mann-Whitney U (test table 5.6) showed a significance level of 0.283 for flow experience among young adults. Since 0.283 is greater than 0.05, there is no significant gender difference on flow experience among young adults. Hence the null hypothesis is accepted and the alternative hypothesis is rejected. That is, there is no significance of flow experience between male and female.

CHAPTER VI
FINDINGS

FINDING

- The result indicates that there is a positive significant effect of spiritual health on flow experience among young adults. The individuals having higher spiritual health tend to experience flow more when compared with others.
- The result indicates that there is a positive significant effect of well-being on flow experience among young adults. The individuals having higher subjective well being tend to experience flow more often than others.
- The result indicates that there is also a significant relationship between spiritual health and well-being among young adults
- There is a significance of spiritual health between male and female
- There is no significant difference of well-being between male and female
- The result also indicates that there is no significance of flow experience between male and female

CHAPTER VII
RECOMMENDATIONS

RECOMMENDATION

Further studies can be done with considering large geographical areas, i.e., including other states of the country. A cross-cultural study will be very beneficial to assess the effect of the same from different nations and cultures. Studies can also be conducted for children and teenagers and people in their late adulthood. The study may also be continued using the effect of place identity on the same. And also studies can include specific populations such as sports or artists, professional and non-professionals, etc.

CHAPTER VIII

CONCLUSION

CONCLUSION

The present study was primarily conducted to determine the effect of spiritual health and well-being on flow experience among young adults. It consists of 150 male & 150 females between the ages of 18 to 50 years, living in Kerala for this study. The tests conducted were simple linear regression, Spearman rank correlation, and Mann-Whitney U test. It is found that there is a positive effect of spiritual health on flow experience as well as a positive effect of well-being on flow experience among young adults. It is found that there is a significant relationship between spiritual health and well-being among young adults. It is found that there is a significance of spiritual health between male and female (gender difference). It is also found that there is no significant gender difference on well-being as well as flow experience among young adults.

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APPENDIX

TITLE: "The Effect of Spiritual health and Well-being on Flow Experience among Young Adults."

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Key Instructions

The purpose of the study is to find out the effect of spiritual health as well as well-being on flow experience among young adults, especially those who are in their early and late 20's.

For the study we require the participation of individuals in their young adulthood, i.e., between 18-50 years

There are no risks to your safety as the questionnaire does not contain any sensitive or controversial items. The participation of you in this project will be directly beneficial to understand your subjective well being and focus on daily activities as well as your goals. YOU can stop taking the test at any point they choose.

Taking part in this research project is voluntary. Please take time to read this entire form and ask questions before deciding whether to take part in this research project.

This form collects your data which is strictly used for research purposes only and it will be kept confidential. It will only take 10 minutes of your time to fill the questionnaire. There are no right or wrong answers, feel free to choose the option that most describes you.

APPENDIX I
SOCIODEMOGRAPHIC DETAILS

Name/Initial:

Age:

Gender:

Educational qualification:

Occupation:

Area of residence:

APPENDIX-II

SPIRITUAL INDEX OF WELL-BEONG (SIWB)

INSTRUCTIONS

Some statements are given in the following pages. Read each statement and indicate how much you agree or disagree with each statement by marking in the appropriate statement. Please make sure that all statements are answered and respond honestly. None of the responses are right or wrong.

Sl. No.	Statements	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
1	There is not much I can do to help myself					
2	Often, there is no way I can complete what I have started					
3	I can't begin to understand my problems					
4	I am overwhelmed when I have personal difficulties and problems					
5	I don't know how to begin to solve my problems.					
6	There is not much I can do to make a difference in my life					
7	I haven't found my life's purpose yet					
8	I don't know who I am, where I came from, or where I am going					

9	I have a lack of purpose in my life					
10	In this world, I don't know where I fit in					
11	I am far from understanding the meaning of life.					
12	There is a great void in my life at this time.					

APPENDIX-IV

FLOW SHORT SCALE (FSS)

INSTRUCTIONS

Some statements are given in the following pages. Read each statement and mark at the level where you have felt it not at all to very much. Please make sure that all statements are answered and respond honestly. None of the responses are right or wrong.

Sl. No.	Statement	Not at all-1	2	3	Partly-4	5	6	Very much-7
1	I feel just the right amount of challenge							
2	My thoughts/activities run fluidly and smoothly							
3	I do not notice time passing							
4	I have no difficulty concentrating							
5	My mind is completely clear							
6	I am totally absorbed in what I am doing							
7	The right thoughts/movements occur of their own accord							
8	I know what I have to do each step of the way							
9	I feel that I have everything under control							
10	I am completely lost in thought							

DEVELOPMENT AND EVALUATION OF WATERMELON SEED BASED COOKIES

Submitted By,

ADHARSHA MATHEW P (Reg. No: VB19FPT001)

ANAGHA BIJU (Reg. No: VB19FPT005)

DIYAMOL JOHNY (Reg. No: VB19FPT012)

FAZEEN VH (Reg. No: VB19FPT016)

SONA BINU (Reg. No: VB19FPT034)

Under the Guidance of,

MS. GEETHANJALY PHILIP

*In partial fulfillment of requirements for the award of degree of Bachelor of
Vocational studies*

B. Voc FOOD PROCESSING TECHNOLOGY



ST. TERESA'S COLLEGE (AUTONOMOUS), ERNAKULAM

COLLEGE WITH POTENTIAL FOR EXCELLENCE

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Kottayam-686560

2022

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