Marian Quest

A Bi annual Multidisciplinary Research Journal

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MARIAN RESEARCH FORUM

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St.Mary's College (Autonomous)

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Thoothukudi

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Editorial

Greetings from the Editorial Desk!

Welcome to the Marian Quest Multidisciplinary Journal, a dynamic platform dedicated to exploring the convergence of diverse fields of study and fostering cross-disciplinary discourse. Our journal is committed to nurturing intellectual curiosity and inspiring innovative thinking by bringing together scholars, researchers, and experts from various backgrounds to share their unique perspectives and insights.

In today's intricate and interconnected world, interdisciplinary research holds an increasingly pivotal role. Our journal provides a fertile ground for delving into the synergies between different disciplines. As global challenges like climate change, social inequity, and technological progress persist, it is incumbent upon us to collaborate in search of groundbreaking solutions. Through the facilitation of interdisciplinary research and partnerships, we stand to unearth novel viewpoints that have the potential to drive transformative shifts.

We extend an earnest invitation to scholars, researchers, and faculty members across all disciplines to contribute their work to the Marian Quest Journal. We warmly welcome research articles, reviews, and other forms of scholarly expression that delve into the intersections of diverse fields of study. The Editorial Team is steadfast in upholding the utmost standards of academic excellence, providing a platform that champions both rigorous and inventive scholarship.

Our gratitude goes to the valued members of the Marian Research Forum, dedicated reviewers, insightful authors, our esteemed Principal, the Secretary, and a panel of experts who have generously lent their unwavering support, effort, and encouragement towards the realization of this Journal. We remain optimistic that this journal will continue to serve as a pivotal channel for the scholarly discourse of St. Mary's College (Autonomous), Thoothukudi.

Best wishes,

The Editors
Marin Quest, Marian Research Forum
marianresearchforum@gmail.com

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Guidelines for Submission of Articles

Marian Quest the Bi-annual Multidisciplinary Research Journal of St. Mary's College (Autonomous), Thoothukudi, publishes articles of high reputation and innovation. The articles intended for publication must be typed in A4 size format, 1.5 line space and Times New Roman Font 12. Tamil papers should be in Bamini Font. The latest writing manual for MLA Hand book should be followed in Literature articles. Footnotes, References, Citation Marks should also be included in the research paper.

For reviewing and correction purpose, kindly send one hard copy with the soft copy. Full paper generally consists of the title, pictures, charts, graphs etc., along with Footnotes.

Instructions to contributors (for Science Articles)

Title : It should be short & informative

Keywords : Five or six keywords indicating the contents of the manuscript.

Address of Authors : It includes author's name, institution name, telephone number (office only), and e-mail address. Author for correspondence should be indicated with an asterisk (*).

Main Heading : Each article should be divided into the following main headings: Abstract, Introduction, Materials and Methods, Results and Discussion, Conclusion, Acknowledgement and References.

All articles are, as a rule, referred to experts in the subject concerned. Those recommended by the referees alone will be published in the journal.

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BHARAT RATNA ATAL BIHARI VAJPAYEE

Antony Arputha Jerolin.A

Department of History, St. Mary's College (Autonomous),Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India

Abstract

Atal Bihari Vajpayee was not only the dynamic Prime Minister of India but also a man of high integrity. The simplicity of nature was the main attraction of his personality. He was also the most reputed leader of the history of Indian politics. Shri Atal Bihari Vajpayee contributed to Indian politics in multiple ways. He made a major contribution to strengthening democracy in true spirit of the ideal enshrined in Constitution. Shri Atal Bihari Vajpayee has dedicated over sixty years of his life in services of country of which five decades in Parliament. He is an orator par excellence, whose speech are listened with attention by friends and foes inside and outside Parliament. As a Parliamentarian, he used Parliament as an educational forum as well as political weapons and enhanced the prestige of parliamentary institution. The present paper is an honest attempt to attract the attention of the readers and researchers towards the role and contribution of Atal Bihari Vajpayee in Indian Politics.

Keywords*: Atal Bihari Vajpayee, Indian Politics, Strengthening, Democracy, Contribution, Constitution, Excellence, Forum.*

Introduction

Atal Bihari Vajpayee was an Indian politician who served three terms as the 10th Prime Minister of India, first for a term of 13 days in 1996, then for a period of 13 months from 1998 to 1999, followed by a full term from 1999 to 2004.

Vajpayee was one of the co-founders and a senior leader of the Bharatiya Janata Party (BJP). He was one of the founding members of the Bharatiya Jana Sangh, a party linked to the Hindu organisation Rashtriya Swayamsevak Sangh (RSS), of which he was the president between 1968 and 1973.

He was a member of the Rashtriya Swayamsevak Sangh, a Hindu nationalist volunteer organisation. He was the first Indian prime minister not of the Indian National Congress to serve a full term in office. He was also a renowned poet and a writer.

He was a part of 'Quit India Movement'. For some time he worked as a journalist. He was also a good poet. Later, he joined politics. He founded the Bharatiya Janata Party. He used his knowledge and experience to strengthen it..

Vajpayee as Prime Minister

Vajpayee was sworn in as prime minister in May 1996 but was in office only 13 days, after failing to attract support from other parties. In early 1998 he again became Prime Minister, in elections in which the BJP won a record number of seats, but he was forced to make a shaky alliance with regional parties. In 1999 the BJP increased its seats in parliament and consolidated its hold on Government.

During a BJP conference in Mumbai in November 1995, BJP President Advani declared that Vajpayee would be the party's prime ministerial candidate in the forthcoming elections. Vajpayee himself was reported to be unhappy with the announcement, responding by saying that the party needed to win the election first.

Second Term Vajpayee Ministry: 1998–1999

After the fall of the two United Front Governments between 1996 and 1998, the Lok Sabha was dissolved and fresh elections were held. The 1998 general elections again put the BJP ahead of others. A number of political parties joined the BJP to form the National Democratic Alliance (NDA), and Vajpayee was sworn in as the prime minister. The coalition was an uneasy one, as apart from the Shiv Sena, none of the other parties espoused the BJP's Hindu-nationalist ideology. Vajpayee has been credited for managing this coalition successfully, while facing ideological pressure from the hard-line wing of the party and from the RSS. Vajpayee's government lasted 13 months until mid-1999 when the All India Anna Dravida Munnetra Kazhagam (AIADMK) under J. Jayalalithaa withdrew its support. The government lost the ensuing vote of confidence motion in the Lok Sabha by a single vote on 17 April 1999. As the opposition was unable to come up with the numbers to form the new Government, the Lok Sabha was again dissolved and fresh elections were held.

Nuclear Tests

Pokhran-II

In May 1998, India conducted five underground nuclear tests in the Pokhran desert in Rajasthan, 24 years after its first nuclear test in 1974. Two weeks later, Pakistan responded with its own nuclear tests making it the newest nation with declared nuclear capability. While some nations, such as France, endorsed India's right to defensive nuclear power, others including the United States, Canada, Japan, Britain and the European Union imposed

sanctions on information, resources and technology to India. In spite of intense international criticism and steady decline in foreign investment and trade, the nuclear tests were popular domestically. In effect, the international sanctions imposed failed to sway India from weapon sing its nuclear capability. US sanctions against India and Pakistan were eventually lifted after just six months.

Lahore Summit

In late 1998 and early 1999, Vajpayee began a push for a full-scale diplomatic peace process with Pakistan. With the historic inauguration of the Delhi-Lahore bus service in February 1999, Vajpayee initiated a new peace process aimed towards permanently resolving the Kashmir dispute and other conflicts with Pakistan. The resultant Lahore Declaration espoused a commitment to dialogue, expanded trade relations and mutual friendship and envisaged a goal of denuclearised South Asia. This eased the tension created by the 1998 nuclear tests, not only within the two nations but also in South Asia and the rest of the world.

AIADMK's withdrawal from coalition

The AIADMK had continually threatened to withdraw from the coalition and national leaders repeatedly flew down from Delhi to Chennai to pacify the AIADMK general secretary J. Jayalalithaa. However, in May 1999, the AIADMK did pull the plug on the NDA, and the Vajpayee administration was reduced to a caretaker status pending fresh elections scheduled for October 1999

Kargil War

The Indian army responded with Operation Vijay, which launched on 26th May 1999. This saw the Indian military fighting thousands of militants and soldiers in the midst of heavy artillery shelling and while facing extremely cold weather, snow and treacherous terrain at the high altitude. Over 500 Indian soldiers were killed in the three-month-long Kargil War, and it is estimated around 600–4,000 Pakistani militants and soldiers died as well. India pushed back the Pakistani militants and Northern Light Infantry soldiers. Almost 70% of the territory was recaptured by India. Vajpayee sent a "secret letter" to U.S. President Bill Clinton that if Pakistani infiltrators did not withdraw from the Indian territory, "we will get them out, one way or the other" - meaning he did not rule out crossing the Line of Control (LoC), or was the use of nuclear weapons.

After Pakistan suffered heavy losses, and with both the United States and China refusing to condone the incursion or threaten India to stop its military operations, General Pervez Musharraf was recalcitrant and Nawaz Sharif asked the remaining militants to stop and withdraw to positions along the LoC. The militants were not willing to accept orders

from Sharif but the NLI soldiers withdrew. The militants were killed by the Indian army or forced to withdraw in skirmishes which continued even after the announcement of withdrawal by Pakistan.

Third Term: 1999–2000

The 1999 general elections were held in the aftermath of the Kargil operations. The BJP-led NDA won 303 seats out of the 543 seats in the Lok Sabha, securing a comfortable and stable majority. On 13 October 1999, Vajpayee took oath as the prime minister of India for the third time.

A national crisis emerged in December 1999, when Indian Airlines flight IC 814 from Kathmandu to New Delhi was hijacked by five terrorists and flown to Taliban-ruled Afghanistan. The hijackers made several demands including the release of certain terrorists like Masood Azhar from prison. Under pressure, the government ultimately caved in. Jaswant Singh, the minister of external affairs at the time, flew with the terrorists to Afghanistan and exchanged them for the passengers.

In March 2000, Bill Clinton, the President of the United States, paid a state visit to India. This was the first state visit to India by a U.S. president in 22 years, since President Jimmy Carter's visit in 1978. President Clinton's visit was hailed as a significant milestone in relations between the two nations. Vajpayee and Clinton had wide-ranging discussions on bilateral, regional and international developments. The visit led to expansion in trade and economic ties between India and the United States. A vision document on the future course of Indo-U.S. relations was signed during the visit.

2001 Attack on Parliament

On 13th December 2001, a group of masked, armed men with fake IDs stormed Parliament House in Delhi. The terrorists managed to kill several security guards, but the building was sealed off swiftly and security forces cornered and killed the men who were later proven to be Pakistan nationals. Vajpayee ordered Indian troops to mobilise for war, leading to an estimated 5,00,000 to 7,50,000 Indian soldiers positioned along the international border between India and Pakistan. Pakistan responded by mobilising its own troops along the border. A terrorist attack on an army garrison in Kashmir in May 2002 further escalated the situation. As the threat of war between two nuclear capable countries and the consequent possibility of a nuclear exchange loomed large, international diplomatic mediation focused on defusing the situation. In October 2002, both India and Pakistan announced that they would withdraw their troops from the border.

2002 Gujarat Violence

In February 2002, a train filled with Hindu pilgrims returning to Gujarat from Ayodhya stopped in the town of Godhra. A scuffle broke out between Hindu activists and Muslim residents, and the train was set on fire, leading to the deaths of 59 people. The charred bodies of the victims were displayed in public in the city of Ahmedabad, and the Vishwa Hindu Parishad called for a state wide strike in Gujarat. These decisions stoked anti-Muslim sentiments. Blaming Muslims for the deaths, rampaging Hindu mobs killed thousands of Muslim men and women, destroying Muslim homes and places of worship. The violence raged for more than two months, and more than 1,000 people died. Gujarat was being ruled by a BJP government, with Narendra Modi as the chief minister. The state government was criticised for mishandling the situation. It was accused of doing little to stop the violence, and even being complicit in encouraging it.

2002–2004

In late 2002 and 2003 the government pushed through economic reforms. The country's GDP growth exceeded 7% every year from 2003 to 2007, following three years of sub-5% growth. Increasing foreign investment, modernisation of public and industrial infrastructure, the creation of jobs, a rising high-tech and IT industry and urban modernisation and expansion improved the nation's international image. Good crop harvests and strong industrial expansion also helped the economy.

In May 2003, he announced before the parliament that he would make one last effort to achieve peace with Pakistan. The announcement ended a period of 16 months, following the 2001 attack on the Indian parliament, during which India had severed diplomatic ties with Pakistan. Although diplomatic relations did not pick up immediately, visits were exchanged by high-level officials and the military standoff ended. The Pakistani President and Pakistani politicians, civil and religious leaders hailed this initiative as did the leaders of the United States, Europe and much of the world. In July 2003, Prime Minister Vajpayee visited China, and met with various Chinese leaders. He recognised Tibet as a part of China, which was welcomed by the Chinese leadership, and which, in the following year, recognised Sikkim as part of India. China–India relations improved greatly in the following years.

Vajpayee remained a bachelor for his entire life. He adopted and raised Namita Bhattacharya as his own child, the daughter of longtime friend Rajkumari Kaul and her husband B. N. Kaul. His adopted family lived with him.

Death

Vajpayee had a stroke in 2009 which impaired his speech. His health had been a major source of concern; reports said he was reliant on a wheelchair and failed to recognise people. He also had dementia and long-term diabetes. For many years, he had not attended any public engagements and rarely ventured out of the house, except for checkups at the All India Institutes of Medical Sciences.

On 11th June 2018, Vajpayee was admitted to AIIMS in critical condition following a kidney infection. He was officially declared dead there at 5:05 pm IST on 16 August 2018 at the age of 93.[143][144] Some sources claim that he had died on the previous day. On the morning of 17 August, Vajpayee's body, draped with the Indian flag, was taken to the Bharatiya Janata Party headquarters where party workers paid their tributes until 1 pm. Later that afternoon at 4 pm, Vajpayee was cremated with full state honours at Rashtriya Smriti Sthal near Raj Ghat, and his pyre was lit by his foster daughter Namita Kaul Bhattacharya. Thousands of people and many dignitaries attended his funeral procession, including Prime Minister Narendra Modi and President Ram Nath Kovind. On 19 August, his ashes were immersed in Ganga river at Haridwar by Kaul.

Reactions and Tributes

India reacted to Vajpayee's death with grief and thousands of tributes poured in through social media platforms. Thousands of people paid their respects during his funeral procession. A seven-day state mourning was announced by the Central Government throughout India. The national flag flew half-mast during this period.

Conclusion

Although considered a pragmatist, Vajpayee assumed a defiant posture in the face of Western criticism of India’s testing of several nuclear weapons in 1998. He had earlier been praised for his conciliatory gestures toward India’s Muslim minority. In 2000 his government began an extensive program of divestment of public funds from several key state-run industries. In 2002 Vajpayee’s government was criticized for its slowness in reacting to riots in Gujarat in which some 1,000 people (primarily Muslims) died. Nevertheless, in 2003 Vajpayee made a concerted effort to resolve India’s long-running feud with Pakistan over the Kashmir region. Under his leadership, India achieved steady economic growth, and the country became a world leader in information technology, though the poorer elements of Indian society often felt left out of the economic prosperity. In 2004 his coalition was defeated in the parliamentary election, and he resigned from office. Vajpayee announced his

retirement from politics at the end of 2005. In late December 2014, he was awarded the Bharat Ratna, India's highest civilian honour.

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TRAVELOGUE OF MEGASTHENES

Gowsiga Devi. R

Department of History, St. Mary's College (Autonomous),Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India

Abstract

The ancient Greeks knew of the existence of India as early as the heroic times, for articles of Indian merchandise are mentioned in The Homeric poems. But they had little real knowledge of the land. Megasthenes was a Greek diplomat, historian and ethnographer whose extensive writings about the cultures of India gave an insight into the lives of ancient Indians during the rule of Chandragupta Maurya. Although his book, the *Indica* was lost in the currents of time, it has been reconstructed to a certain extent using literary sources from later authors. Megasthenes was the first person to describe ancient India, and for that reason he has been called 'the father of Indian history'. Megasthenes gives the detailed description of the personal life of Chandragupta Maurya. He led it very splendid life and his palace was unique in its beauty. Megasthenes has thrown a good deal of light on the Municipal administration of the Mauryan capital, i.e. Pataliputra. Megasthenes has written some strange things about the Indian society. Megasthenes 'Indica' is a very important source of Indian history. Indica has importance in the reconstruction of ancient India under the Mauryan Empire. It shows the rich culture and economy of India and also helps us to understand the administration, diverse culture, and philosophy of Ancient Indian people.

Keywords: *Homeric poems, Megasthenes, Greek diplomat, ethnographer, Indica, Pataliputra*

Introduction

The ancient Greeks knew of the existence of India as early as the heroic times, for articles of Indian merchandise are mentioned in The Homeric poems. But they had little real knowledge of the land. They considered it to be an *Eastern Ethiopia*, resembling Egypt. This analog - proved a fruitful source of error, for example the division of the body politic into seven castes by Megasthenes is mainly to be traced to this source. Till the Persian wars had no knowledge of India and have little detailed definite information regarding Megasthenes himself. 'Megasthenes was sent on an embassy to Sandrokottos at Palim- bothra'. 'He remained for some time with the Indian King, and wrote a history of Indian affairs, that he might hand down to posterity a faithful account of all that he had witnessed.' "Megasthenes, the historian lived with Seleukos Nikator." "Megasthenes who lived with Sibyrtios the satrap of Arachosia and who says that he often visited Sandrakottos, King of the Indians", - these are some of the scanty references to Megasthenes in our ancient authorities. From these

source “Megasthenes was the representative of Seleukos at the court of Sibyrtios, Satrap of Arachosia, and that he was sent from hence as the King’s ambassador to Sandrakottos at Palim- bothra.” His stay in India cannot be determined, but he probably set out for Palimbothra between 302 and 288 B. C.

Megasthenes

Megasthenes was a Greek diplomat, historian and ethnographer whose extensive writings about the cultures of India gave an insight into the lives of ancient Indians during the rule of Chandragupta Maurya. Although his book, the *Indica* was lost in the currents of time, it has been reconstructed to a certain extent using literary sources from later authors. Megasthenes was the first person to describe ancient India, and for that reason he has been called "the father of Indian history". Megasthenes became an ambassador for Seleucus I to the court of Chandragupta Maurya in Pataliputra.

Greek Ambassador

Chandra Gupta Maurya was the founder of the Maurya dynasty. The Greek traveller Megasthenes visited the court of Chandra Gupta Maurya. Megasthenes is an ambassador of Seleucus I Nikator to Chandragupta Maurya in Pataliputra He visited India during the reign of Chandragupta Maurya, but when he came to India or how long he stayed in the country is uncertain. Date of Megasthenese’s visit or visits to Indian is uncertain and still disputed among scholars. He visited the Mauryan capital Pataliputra, but it is not certain which other parts of India he visited. He appears to have passed through the Punjab region in north-western India, as he provides a detailed account of the rivers in this area. He must have then traveled to Pataliputra along the Yamuna and the Ganga rivers. During his tenure in India he observed and noted the culture, daily routine, social structure etc of the people of the Mauryan Empire. The compilation of his works today is known as *Indica.*

Indica

Megasthenes Indica can be reconstructed using the portions preserved by later writers as direct quotations or paraphrases. The parts that belonged to the original text can be identified from the later works based on similar content, vocabulary and phrasing, even when the content has not been explicitly attributed to Megasthenes. Later writers such as Arrian, Strabo, Diodorus, and Pliny refer to Indica in their works of these writers; Arrian speaks most highly of Megasthenes, while Strabo and Pliny treat him with less respect. The first century Greek writer Strabo called both Megasthenes and his succeeding ambassador Deimachus liars, and stated that “no faith whatever” could be placed in their writings. As per historians, Indica served a legitimizing purpose for Seleucus I and his actions in India. It depicts

contemporary India as an unconquerable territory, arguing that Dionysus was able to conquer India, because before his invasion, India was a primitive rural society. Dionysus urbanization of India makes India a powerful and impregnable nation.

Megasthenes 'Indica' is a history of Mauryan India written by the Greek writer Megasthenes. The original work has since been lost, although pieces of it have survived in later Greek and Latin works. Megasthenes 'Indica', according to the text reconstructed by J. W. McCrindle, depicts India as follows:

Society

Megasthenes has provided very valuable information regarding the Indian society in the Mauryan period. Slavery is prohibited under a law enacted by ancient Indian sages. The law treats everyone equally, yet it permits the property to be dispersed unequally. India's population is split into seven endogamous and hereditary castes. They were Philosophers, Farmers, Herders, Artisans, Military, Overseers, Councillors and Assessors.

Division of the Indian Society

According to Megasthenes, the Indian society was divided into seven classes or 'castes': (i) The first class was that of the Philosophers who were though small in number, the most honoured members of the society (ii) The second class was composed of the king's councilor's who were in-charge of the various departments and gave consultation to the ruler when asked for (iii) The soldiers constituted the third class and were represented by the Kshatriyas (iv) The fourth class was of the minor officers who helped the King and the Governors in the discharge of their duties (v) The fifth class was that of the who constituted the bulk of the population; (vi) The sixth class was composed of the merchants, traders, artisans and boatmen who controlled the trade and commerce of the country (vii) The seventh class comprised the hunters and such other men who made their living by hunting and keeping cattle.

Lifestyle of the People

According to Megasthenes, the Indians were very truthful people. Theft was very rare. They had faith on each other and litigation was not so common. The Brahmans occupied a high place in the society and they were respected everywhere. The people were happy and prosperous. They led a very simple life and did not lock their houses. The slave system was not then known in India. But he writes that the people had no fixed hours of meals, and they went on eating all the time. They took wine very rarely and that too on certain occasions and sacrifices. Megasthenes was much impressed by the sugarcane "reeds that produce honey without bees" and cotton, which he described as the 'vegetable wool'.

When the Indians have supper, a table is set in front of each individual, similar to a tripod, and the liquor is made from rice rather than barley. There are golden bowls on top of it, into which they first put rice, boiled like barley, and then many delicacies prepared according to Indian recipes. They like finery and decoration, despite their style's fundamental simplicity. Their robes are gold-embroidered and embellished with costly stones**,** and they also wear floral muslin outfits. Some have assistants strolling behind them holding umbrellas over them since they value beauty and use every gadget at their disposal to improve their appearance.

Strange Description of Indian Society

Megasthenes has written some strange things about the Indian society. He writes, "There are some people who had one eve in the middle of their fore-head and there are others who had no nostrils. There are some tribes in India who had ears reaching down to their feet so much so that they could sleep in them. There are to be found in India dog-headed men." It appears that Megasthenes had written these things on heresy. These are mere fables and cannot be believed. It is because of such accounts that Strabo regards Megasthenes a liar and his account full of fables. Again according to Dr. V.A. Smith, "His work has sometimes discredited unfairly because he permitted himself to embellish his text by the insertion of certain incredible marvels on heresy testimony."

Flora and Fauna

India features a number of mountains with various types of fruit trees and is home to a diverse range of animal species. Because of the amount of food on Indian land, Indian elephants are significantly stronger than Libyan elephants. Elephants are extensively tamed and trained for battle. Elephants have a gestation period of 16 to 18 months, and the oldest elephants can live up to 200 years.

Economy

Indian soil is rich in gold, silver, copper, and iron. A variety of tools, weapons, decorations, and other things are made from tin and other metals. India's plains are extremely fertile, and irrigation is commonly used**.** Rice, millet, a grain called bosporum, other cereals, pulses, and other food plants are the principal crops. Because rain occurs in both summer and winter, so there are two agricultural cycles every year. Rice, millet, bosporus, and sesamum are seeded around the summer solstice. Wheat is seeded in the winter. There have never been any famines in India.

Administration

King

Megasthenes gives the detailed description of the personal life of Chandragupta Maurya. He led a splendid life and his palace was unique in its beauty. The king did not sleep in one room for two continuous days. He did not favour meeting the people too much. He left his palace only on four occasions (i) to accompany his armies in the battle-field, (ii) to administer justice, (ii) to perform sacrifices (iv) to go on hunting expeditions. Special spies had been appointed for the safety of the ruler. A great number of these spies were women. From Megasthenes, it is evident that Chandragupta Maurya showed a great respect to his Chief Minister Chanakya (or Kautilya) who lived in a small hut near the royal palace.

Military

Chandragupta Maurya maintained a huge army which was about seven lakhs in number. It comprised 6,00,000 infantry, 30,000 cavalry, about 1,000 elephants and 8,000 chariots, each chariot having three men in it. Megasthenes states that the whole administration of the army was in the hands of Army Department consisting of 30 members. This department was further divided into six boards of five members each. These boards were in charge of (i) Infantry, (ii) Cavalry, (iii) Fleet, including ships and boats, (iv)War - chariots, (v) War - Elephants, and (vi) Transport and Supplies.

Administration of Pataliputra

Megasthenes had thrown a good deal of light on the municipal administration of the Mauryan capital, i.e. Pataliputra. It was a magnificent city and was situated on the confluence of the Ganges and the Son. It was encircled on all sides by a strong wooden wall. A special moat about 600 feet broad and thirty feet deep was surrounding the whole city to make it more secure from any attack from any quarter whatsoever. This channel was always filled with water from the Son River. The royal palace was made of wood and was unique in its beauty and magnificence. It was provided with beautiful parks, artificial lakes and every means of enjoyment. To manage the affairs of Pataliputra a special committee of 30 members have been organised. This committee was divided into six boards of five members each. Each board was assigned special duties and they were in charge of (i) Arts and crafts; (ii) comforts of the foreigners and strangers; (ii) registration of births and deaths; (iv) checking of weights and measures for the promotion of trade; (v) manufactured goods and their sale; and (vi) collection of Municipal taxes.

Conclusion

Modern scholars such as E. A. Schwanbeck, B. C. J. Timmer have characterized Megasthenes as a generally reliable source of Indian history. Schwanbeck finds faults only with a Megasthenes description of the Gods worshipped in India. Brown is more critical of Megasthenes, but note that Megasthenes visited only a small part of India, and must have relied on others for his observations: some of these observations seem to be erroneous, but others cannot be ignored by modern researchers. Thus, although he was often misled by the erroneous information provided by others, his work remained the principal source of information about India to some of the subsequent writers.

Megasthenes 'Indica' is a very important source of Indian history. Indica has importance in the reconstruction of ancient India under the Mauryan Empire. It shows the rich culture and economy of India and also helps to understand the administration, diverse culture, and philosophy of Ancient Indian people.

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FORMATIVE YEARS OF AURANGZEB

Angel. P

Department of History, St. Mary's College (Autonomous),Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India

Abstract

Aurangzeb (1658 – 1707 A.D.) is depicted as an extremely oppressive ruler by many historians, who have simultaneously portrayed him as a fanatical Muslim. They claim that by imposing Islamic law on the institutions of the Mughal Empire, Aurangzeb alienated the overwhelming Hindu populace, which eventually proved fatal it. The exploitation of Aurangzeb's image provides modern elites with a politically useful tool to manipulative religious sentiment by creating powerful symbols. Some historians even go so far as to blame Aurangzeb for the poor inter-religious relations in present-day South Asia. However, the seventeenth century in Indian history was when aspiring regional peasant groups like the Sikhs, Jats and Marathas started with increasing success to challenge the dominance of the traditional landed elites. The impact of socio-economic factors on centre-periphery conflicts during this period provides a strong case for academic debate on whether Aurangzeb's religious policies were a cause or the result of increased class/caste struggles.

Keywords: Aurangzeb, Muslim, Mughals, Marathas, Viceroyal, Deccan

Introduction

The history of Aurangzeb is practically the history of India for sixty years. His own reign (1658-1707) covers the second half of the seventeenth century and stands forth as a most important epoch in the annals of our country. Under him the Mughal Empire reached its greatest extent, and the largest single state ever known in India from the dawn of history to the rise of the British power was formed. From Ghazni to Chatgaon, from Kashmir to the Karnataka, the continent of India obeyed one sceptre. Islam made its last onward movement in India in this reign.

The empire thus formed, while un-precedence in size, was also one political unit. The reign of Aurangzeb is also marked by the upspringing of the Maratha nationality out of the ashes of their short-lived kingship and by the appearance of the Sikh sect in the role of

warriors and armed opponents of the ruling power. Thus the supreme factors of Indian history in the 18" and early 19" centuries owe their origin to Aurangzeb's reign and policy.

Early Life

Muhi-ud-din Muhammad Aurangzeb, who ascended the throne of Delhi as Alamgir, was the sixth child of Shah Jahan and Mumtaz Mahal. He was born at Dohad in the night of 24" October 1618 A.D. From 1622 till the end of his father's reign, Shah Jahan was under the old Emperor's disfavour and was driven into rebellion in self-defence. But the prince's efforts were unsuccessful, and he had at last to submit to his father and give up his young sons, Dara and Aurangzeb, as hostages. These two reached Jahangir's court at Lahore in June 1626. Shortly afterwards Jahangir died, Shah Jahan ascended the throne and the two boys were brought to him at Agra by Asaf Khan on 26 February 1628.

Thus, at the age of ten he came to a settled life; and arrangements were evidently now made for his regular education. Mir Muhammad Hashim of Gilan is recorded as his teacher. Bernier speaks of MullaSalih as his old teacher, but the Persian histories do not bear this statement out. That Aurangzeb had a natural keenness of mind and quickly learnt what he read, can readily believe. His correspondence proves that he had thoroughly mastered the Quran and the Traditional Sayings of Muhammad (Hadis) and was ever ready with apt quotations from them. He spoke and wrote Arabic and Persian like a scholar. Hindustani was his mother tongue, the language used by the Mughal Court in private life. He had some knowledge of Hindi, too, and could talk and recite popular sayings in that language. Aurangzeb wrote Arabic in a vigorous and masterly naskh hand. In this he used to copy the Quran.

Two such manuscripts of his transcription he presented to Mecca and Medina, after richly binding and illuminating them. Painting he never appreciated. Music he banished from his Court, in the outburst of devotion which marked the completion of the tenth year of his reign. Fine china-ware he liked. But he had none of his father's passion for building. No masterpiece of architecture, no superb or exquisite mosque, hall, or tomb marks his reign

All that he built were common place necessary things, such as the mosques which marked the scenes of his victories and the numberless sarais which he built along the imperial highways running to the south and the west Except one, the Pearl Mosque in the Delhi palace, which was begun on 10thDecember 1080 and completed in 5 years at a cost of one lack and

sixty thousand Rupees, (A.D 488). Its mosque at Lahore is not the best one in that city. The tomb of his wife Dilras Banu at Aurangabad was his grandest building.

On 13th December 1634, he got his first post in the Mughal peerage, with the rank of a Commander of ten thousand horses. Next September he was sent to the Bundela expedition (1685) in order to learn the art of war and the control of men by actual experience.

Aurangzeb's First viceroyalty of the Deecan

Towards the close of Akbar's reign, the Mughal Empire began to expand southwards beyond the Narmada river. Shah Jahan on his accession in 1627, which just followed Malik Ambar's death, began a vigorous policy in the Deccan. The affairs of the Deccan having been at last settled and the Mughal boundary clearly marked and publicly recognized by the local princes, Shah Jahan returned to Northern India, leaving Aurangzeb (14th July, 1636) as viceroy of the Deccan, with his seat at Aurangabad.

This town, founded by Malik Ambar, at the village of Khirki, was allowed by Shah Jahan to be named Aurangabad after his third son. Aurangzeb married four wives. By them he had 10 children both boys and girls. They are Zeb- un-Nisa, Zinat-un-Nisa, Zundat-un-Nisa, Muhammad Azan, Muhammad Akbar, Muhammad Sultan, Muhammad Muazzam, Badr-un-Nisa, Mr-un-Nisa, Muhammad Kambakhsh.

Episode of HiraBai

Besides the above four there was another woman whose supple grace, musical skill, and mastery of blandishments, made her the heroine of the only romance in the puntan Emperors life. Hira Bai surnamed Zainabadi was a young slave-girl in the keeping of Mir Khall, who had married a sister of Aurangzeb's mother. During his viceroyalty of the Deccan, the prince paid a visit to his aunt at Burhanpur.

There while strolling in the park of Zainabad on the other side of the Tapti, he beheld Hira Bai unveiled among his aunt's train. The artful beauty "on seeing a mango-tree laden with fruits, advanced in mirth and amorous play. jumped up, and plucked a mango, as if unconscious of the princes presence." The vision of her matchless charms stormed Aurangzeb's heart in a moment, With shameless importunity he took her away from his aunt's house and became utterly infatuated with her."

So much so, that one day she offered him a cup of wine and pressed him to drink it. All his entreaties and excuses were disregarded, and the helpless lover was about to taste the forbidden drink when the sly enchantress snatched away the cup from his lips and said, "My object was only to test your love for me, and not to make you fall into the sin of drinking "Death cut the story short when she was still in the bloom of youth. Aurangzeb bitterly grieved at her loss and buried her close to the big land at Aurangabad.

End of First Viceroyalty

Aurangzeb's first viceroyalty of the Deccan ended strangely in his disgrace and dismissal, in 1644. At Jahanara's intercession the Emperor restored Aurangzeb to his favour and on 16" February 1645, sent him off to Gujarat as Governor. His viceroyalty of this province ended in January 1647, when he was appointed to Balkh. But even in this brief period of less than two years he showed his administrative capacity and firmness.

After the Balkh expedition, Aurangzeb acted as governor of Multan and Sindh from March 1648 to July 1652. During this period he was twice called away from his province to lay siege to Kandahar and to try to wrest that fort from the Persians, (January to December 1649 and March to July 1652), His new province contained the wildest and most untractable Afghan and Baluch clans What Aurangzeb could do in that short time was to strike down the most notorious brigand chieftains and secure a nominal profession of allegiance to the Emperor from the border clans.

Second Viceroyalty of the Deccan

On his return from Kandahar to Kabul, Aurangzeb was appointed subahdar of the Deccan for the second time (1652). After nine months halt at Burhanpur on the way, he arrived at his capital, Aurangabad in November 1653 and there spent the next four years, leaving it only to invade Golkonda and Bijapur and finally departing on Delhi. 5 February 1658 to contest the throne of Delhi.

Since Aurangzeb had laid down the viceroyalty of the Deccan in May 1644, the Mughal administration there had not prospered. True, the country enjoyed unwanted repose, but much cultivated soil had lapsed into jungle, the cultivators had declined in number and resources, and the revenue had fallen off greatly. This wretched state of things was the natural result of a succession of short viceroyalties and incompetent viceroys.

On his arrival in the Deccan, Aurangzeb was faced with a serious financial difficulty. Everywhere Aurangzeb found signs of maladministration, the work of his predecessors. The actual collection was sometimes only one-tenth of the normal assessment. The new viceroy found it impossible to make both ends meet. At this time the civil and military expenditure of the Deccan, exclusive of the salary derived by the officers from their jagirs, produced an annual deficit of Rs. 20,36,000, which was made good by drawing on the reserve stored in the treasuries of the Deccan.

The financial wrangle between father and son dragged on for years. Shah Jahan wished to put a stop to the drain of money to the Deccan, and here was Aurangzeb asking for cash from other provinces in the place of jagirs in the Deccan. When appointing him to the Deccan, Shah Jahan had urged Aurangzeb to pay special attention to the improvement of the peasantry and the extension of cultivation. Aurangzeb had promised to do his best for these objects. He only pleaded for a sufficiently long tenure and the men and moneynecessary for his purpose, as the depopulation and ravage caused by a generation of warfare, followed by ten years of maladministration, could not be undone in two or three years. Very soon his viceroyalty was destined to become memorable forever in the history of land-settlement in the Deccan.

Causes of Aurangzeb's differences with the Emperor

Aurangzeb's second viceroyalty of the Deccan was marked by a series of wrangles with his father. Either Aurangzeb's enemies had got hold of the Emperor's ears, or the latter failed to appreciate the prince's difficulties in the South. Aurangzeb was misunderstood, suspected, and unjustly reprimanded from the very beginning of his term of office. And the bitterness of feeling thus aroused was one of the reasons why the War of Succession was conducted so heartlessly and unscrupulously.

Conclusion

Aurangzeb is known as "The Last Great Mughal Emperor," who controlled the country nearly sixty years. Many detractors claim that his brutality and religious behaviour rendered him unfit to manage his empire's heterogeneous populace. His private life was simple poius and austere. He was not a slave to his passions and scrupulously obstrained from including in prohibited food, drink or dress. He was an ardent student of Muslim theology

and an expert Caligraphist, and tried to "Educate his children in scared law". But it is a pity that he seldom encouraged art and letters.

The only literary production which received his patronage was the "Fatawa--Almalgiri" which has been regarded as "the greatest Digest Muslim Law" made in India. He was a pious Muslim, and with the zeal of a puritan. He scrupulously observed the injunctions of the holy Quran". The imposition of Sharia and Jizya religious fees on non-Muslims, as well as the doubling of custom tariffs on Hindus and the destruction of temples, sparked a religious revolt against him, leading to his downfall. The character and policy of a personality like Aurangzeb is indeed a perplexing task. Some have taken into consideration mainly his faults and not his good qualities, which they have mostly ignored. The Emperor's three surviving sons fought one another in a war of succession.

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AN EVALUATION OF *PORTUNUS PELAGICUS* SHELL EXTRACT FOR ANTIOXIDANT ACTIVITY

Muthulakshmi. B and Dr. Jemma Hermelin Jesy Diaz

PG and Research Department of Zoology, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tami Nadu, India

ABSTRACT

The present study has been carried to investigate the antioxidant activity in the methanolic shell extracts of *Portunus pelagicus*.The total antioxidant activity was found to be higher at the concentration of 1000µg/ml (37.69mg/g of extract) and lower at the concentration of 200µg/ml (10mg/g of extract) and the percentage of NO scavenging activityvaried in between 32% to 65%.The percentage of inhibition was increased with increasing concentration. The result of present study revealed that methanolic shell extracts of *P.pelagicus* showed good antioxidant activity.

Keywords: *Portunus pelagicus*, Antioxidant, Crab shell, Percentage of inhibition.

INTRODUCTION

Marine invertebrates offer a rich source ofpotential drugs with excellent biological activities. Approximately 6,500 bioactive compounds have been isolated from the marine organisms [(1).]Crabs are one of the extremely diversified and leading groups among crustaceans and considered as healthy food for humans because they contain more nutrients. Most of the marine crabs occurring along the Indian coasts are belonging to the family portunida[(2)].The shells of the crustaceans composed of chitin which forms a chitinoproteic complex with proteins. The crustacean shell has high potential of bioactive compounds with antimicrobial, antioxidant and antitumor activities [(3)].

Free radicals are harmful to the body. The instability and reactivity of free radicals due to the electrons in the outer shell attack specific biomolecules in the body such as proteins and lipids [(4)]. Presence of abnormal amount of free radicals in the body leads to oxidative stress. To maintain normalcy, there is a balance between the quantity of free radicals and antioxidants that are produced by the body. Due to increased concentration of free radicals in the body, additional supplements of antioxidants are needed to be consumed.

Antioxidants are compounds capable of either delay or inhibit the oxidation process which occurs under the influence of atmospheric oxygen or reactive oxygen species. Antioxidants are involved in the defense mechanism of the organism against free radicals.

Natural antioxidants can play a more important role in the health of mankind because of having antivirus, anti-inflammatory, anticancer, antitumor and liver protection properties[5&6]. Oxidative stress is involved in the pathology of cancer, arteriosclerosis, malaria and rheumatoid arthritis and could be play a role in neurodegenerative disease and ageing processes [7]. Current research in the free radicals have confirmed that food items rich in antioxidants play an essential role in the prevention of cardiovascular disease,cancer and neurodegenerative disease, including Parkinson's and Alzheimer diseases, as well as inflammation and problems caused by cell and cutaneous aging [8].

Antioxidant arises, as environmental supplements or pharmaceutical products, which contains as active principle an antioxidant compound. Among the most important exogenous antioxidants, vitamin E, vitamin C, B- carotenoid, flavonoids, minerals can derive from natural sources (Vitamins, flavonoids, anthocyanins, some minerals compounds) but can also be synthetic compound, like butythyds[9]. There is an increasing interest in antioxidants, to prevent the presumed deleterious effects of free radicals in the human body as well as the deterioration of fats and other constituents of foodstuffs [10].Therefore, in recent years, interests have been developed for searching effective natural antioxidants, since they can protect human body from free radical and retard the progress of many chronic diseases. It possible to reduce the chronic disease and prevent disease progression by either enhancing the body's natural antioxidant defenses or by supplement with dietary antioxidants [11].

MATERIALS AND METHODS

Collection and preparation of shell extracts:

In the present study the animals (*Portunuspelagicus*) were collected from Gulf of Mannar, Thoothukudi coastal region by trawl catch, brought to the laboratory, cleaned and washed with fresh sea water to remove all impurities. The shells were broken and the soft tissues were removed and washed thoroughly with distilled water. Shell was dried under the sunlight and powdered with the help of mortar and pestle. Approximately 10 grams of shell powder was immersed in methanol and were incubated for 48 hours in a dark place. Then they filtered through filter paper. Samples were centrifuged at 5000 rpm for 15 min in rotary evaporator. The precipitate was collected and it was stored for further use.

Total antioxidant activity:

The total antioxidant activity was evaluated by phosphomolybdenum method described by Prieto *et al.,* (1999)[12]. 1.0 ml of the extract was mixed with 1.0ml of the standard reagent solution (0.6mM sulphuric acid, 28mM sodium phosphate and 4 mM ammonium molybdate). The tubes were capped and incubated in a thermal block at 95ºC for 90 min. After incubation, the tubes were cooled to room temperature for 20-30 min and the absorbance of the reaction mixture was measured at 695nm against a reagent blank. The total antioxidant capacity was expressed as milligram of Ascorbic Acid Equivalence (AAE) per gram of extract.

% Antioxidant activity = Abs sample/ Abs Std x 100

Nitric Oxide Scavenging Activity

Sodium nitroprusside (SNP) was used for generation of NO and it was measured by the Griess reagent (1% sulphanilamide, 0.1% naphthyl ethylene diamine dichloride (NED), and 3% phosphoric acid). SNP spontaneously generates NO in aqueous solution at physiological pH [13] results in production of nitrite ions by its interaction with oxygen, whose estimation is done by Griess reagent. Scavengers of NO compete with oxygen leading to reduced production of NO. Different concentrations (200–1000 µg/mL) of shell fractions dissolved in ethanol and water was mixed with SNP (10 mM) in phosphate buffer saline (PBS) and incubated at 25°C for 3 hours. The samples were then reacted with griess reagent, and absorbance was recorded at 540 nm of chromophore formed as result of diazotization of nitrite with sulphanilamide, and subsequent coupling with NED was done using microplate reader and compared to positive control, ascorbic acid. The ethanol was used as standard.

Nitric oxide scavenged (%) = (Acontrol−Atest)/Acontrol×100

RESULTS

Total antioxidant activity

The total antioxidant activity was found to be higher in the methanolic shell extract of *P.pelagicus* at the concentration of 1000µg/ml (37.69mg/g of extract) and lower at the concentration of 200µg/ml (10mg/g of extract). The activity was found to decrease in the order of the concentration as 1000>800>600> 400>200 (Plate-1 and Fig-1). Antioxidant activity was compared with the standard ascorbic acid.

Plate 1: Total antioxidant activity in the shell extract of *P.pelagicus*

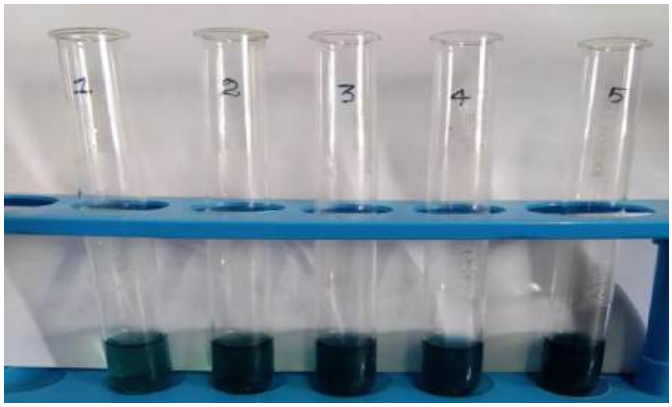
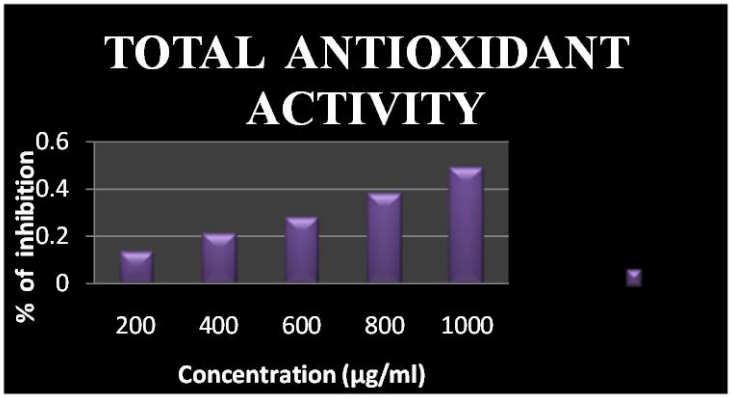


Fig 1: Percentage of inhibition (Total antioxidant activity) in the shell extract of *P.pelagicus*



Nitric Oxide scavenging activity

The percentage of inhibition varied in between 32% to 65%. The percentage of inhibition was increased with increasing concentration. At 200µg/ml concentration the inhibition was 32.3%, at 400µg/ml it was 46.54%, at 600µg/ml, 800µg/ml and 1000µg/ml the inhibition was 48.56%, 60% and 64.52% respectively. The results showed that the extract exhibited dose dependent NO scavenging activity (Plate-2 and Fig-2).

Plate 2: Nitric Oxide scavenging activity in the shell extract of *P.pelagicus*

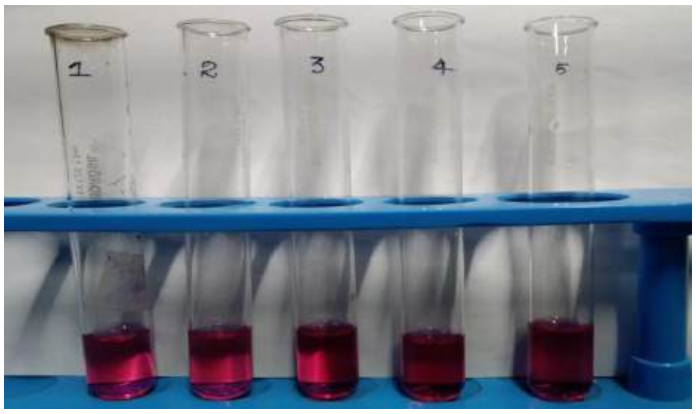
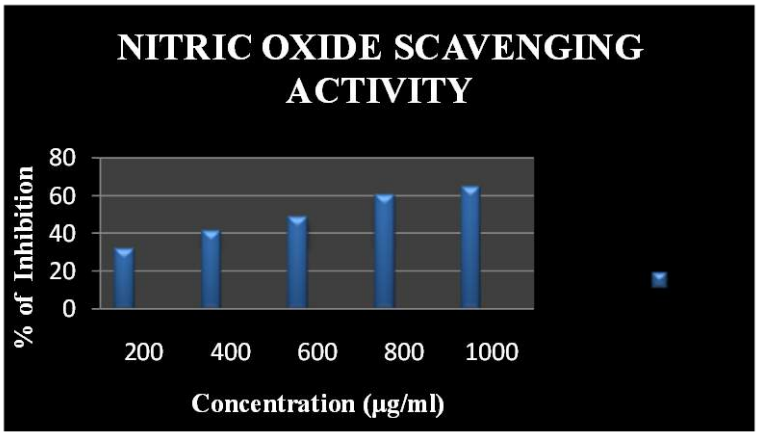


Fig 2: Percentage of inhibition (Nitric Oxide scavenging activity) in the shell extract of *P.pelagicus*



DISCUSSION

Antioxidant activity is fundamental property and much important for life. Many of the biological functions such as anti-mutagenicity, anti-carcinogenicity and anti-aging, originate from this property [(14)]. Therefore, in recent years, interests have been developed for searching effective natural antioxidants, since they can protect human body from free radical and retard the progress of many chronic diseases.

In the present investigation total antioxidant activity of the shell extract was measured spectrophotometrically by phosphomolybdenum method. The total antioxidant activity was found to be higher in the methanolic shell extract of *P.pelagicus* at the concentration of 1000µg/ml (37.69mg/g of extract) and lower at the concentration of 200µg/ml(10mg/g of extract). This study is in corroborated with the findings of Soundarapandian*et al.*, 2014[(15)].

He reported that the total antioxidant activity of soft shelled crab, *Charybdis lucifera* exhibited maximum antioxidant potential of 49% and minimum effect of 32% was recorded in hard shelled crab.

Sudhakar (2011)[16]recorded the total antioxidant activity ranged from 28.52% to 80.26% at varying concentrations (0.5 to 10 mg/ ml) in *P. sanguinolentus* crab shell chitosan sample. Likewise Shiny Kachhap (2019)[17]reported that the chitosan extracted from carapace of *Sartorianaspinigera* showed total antioxidant activity. The percentage of inhibition was found to be 29.73 %, 33.78%, 50%, and 62.16 % at 50 µg/ml, 100 µg/ml, 200 µg/ml and 400 µg/ml concentrations respectively.

The results of the present study shows that the methanolic shell extract of *P.pelagicus*exhibit good NO antioxidant activity. The percentage of inhibition varied between 32% to 65%. The percentage of inhibition was increased with increased concentration of 400µg/ml to 1000µg/ml of concentration. The results showed that the extract exhibited dose dependent NO scavenging activity. Similar study was carried by Shiny Kachhap (2019)[17]in the chitosan extracted from carapace of freshwater edible crab *Sartorianaspinigera.* Percentage of scavenging activity of chitosan against nitric oxide anion was found to be 21.95 %, 35.49%, 46.90%, and 66.04% at 0.5 mg/ml, 1 mg/ml, 5 mg/ml and 10 mg/ ml concentration respectively. Chitosan concentration showed positive correlation with its percent scavenging activity, indicating that as concentration of chitosan increased, its scavenging activity against nitric oxide free radical also increased.

But in contrast to the present study Wan Roslina*et al.,(*2017)[18]studied the antioxidant activity by DPPH method in the muscle extract of mud crab of *S. serrata.* The extracthad a maximum antioxidant activity with 49% inhibition. The antioxidant activity of DPPH resulting from the hydrolysis of *Portunuspelagicus*chitooligosaccharides ranging from 2.27 to 5.21µmolTE/g (SiskaAmellia and DedinFinatsiyatullRosida 2023)[19]. The present study shows that the antioxidant capacity of shell extract is highly efficient in scavenging the free radicals. Thus the waste shell extract can be encouraged to be used as a natural antioxidant in pharmaceutical industry.

CONCLUSION

Crabs are commercially important and fetch high price as there is a rapidly expanding demand for crab meat both in local and international market. Crabs are found in all type of environment.The industrial processing of marine product creates large amount of bio waste. These bio wastes mainly consists of crab shell which may cause environmental pollution. Marine wastes can be recycled in an appropriate way and the components extracted were

found to have nutritional value and other pharmacological applications. Thus the effective utilization of crab shell waste enhances biomedical research for the development of natural drug for many chronic diseases without side effects and at the same time can reduce environment pollution. Hence the present investigation is said to have a specific influence on health as a low-coast natural substitute to overpriced drugs.

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EVALUATION OFANTIDIABETIC, ANTIOXIDANT AND GC-MS ANALYSIS OF MARINE PUFFER FISH *DIODON HYSTRIX* FROM THOOTHUKUDI COAST

J. Michael Theres Renisha and S. Selvi

PG and Research Department of Zoology, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tami Nadu, India

ABSTRACT

The marine biota is the largest source for novel discovery of natural products or bio similarities such as pharmacological metabolites and medicines. Many bioactive compounds isolated from various marine organisms, especially from fishes leads to the development of new drugs and therapeutic agents. The antidiabetic activity of methanol extracts of skin and muscle of *Diodon hystrix* was assessed by alpha amylase inhibition assay. The muscle exhibited the strongest antidiabetic activity with 36 %, 48 %, 60%, 84% and 84.8% at 200 µg, 400 µg, 600 µg, 800 µg, and 1000 µg respectively. The TAA free radical scavenging activity of methanol extracts of skin and muscle of *D. hystrix*was evaluated. The muscle exhibited the strongest antioxidant activity with 64 %, 76 %, 88%, 96% and 98.40% at 200 µg, 400 µg, 600 µg, 800 µg, and 1000 µg respectively. Methanol extracts of skin has been subjected to GC – MS analysis. The GC – MS profiling of methanol extract of skin revealed the presence of fourteen bioactive compounds with antioxidant, antimicrobial, antidiabetic, antineoplastic agents, antiepileptics, antidotes, immunomodulators and immunostimulants activities. These results revealed that the extracts of puffer fish *Diodon hystrix* possess potent bioactive compounds that can be further explored and utilized in pharmaceutical industry for the development of drugs.

Keywords:*Diodonhystrix,*antidiabetic activity, antioxidant activity, GC – MS analysis, skin and muscle.

INTRODUCTION

The sea is immense almost unexploited source of new potentially useful biologically active substance[1]. By-products obtained from marine sources may supply bioactive molecules, such as collagen, peptides, polyunsaturated fatty acids, antioxidant compounds, and chitin, as well as catalysts in biodiesel synthesis[2].Puffer fishes are the second most poisonous vertebrate in the word [3]. The skin and certain other internal organs of puffer fish are highly toxic to humans. Puffer fish poisoning is considered to be the common cause of fish poisoning along the Asian coast[4].

This fish is known to carry tetrodotoxin (TTX) [5,6,7], which is known a non-protein organic compound (amino perhydroquinazoline) and one of the strongest marine paralytic

toxins today. Tetrodotoxin (TTX) is one of the best known non-protein marine toxins because of its frequent involvement in fatal food poisoning [8, 9].

Diabetes mellitus is a chronic metabolic disorder, is one of the most important problems in public health nowadays [10]. It is characterized by high levels of glucose in the blood due to the impaired secretion of insulin insensitivity [11]. Worldwide the number of adults suffering from diabetes will increase from 194 million in 2003 to nearly 380 million in 2030 [12]. Currently, the available therapy for diabetes includes insulin and various oral antidiabetic agents such as sulfonylureas, thiazolidinedione's, and α-glucosidase inhibitors. Hence antidiabetic drug discovery has shifted to focus on natural product and plant sources having minimal side effects. One of the most potent method to induce experimental diabetes mellitus is chemical induction by alloxan and metformin hydrochloride. It is a well-known diabetogenic agent that is used to induce type I and type II diabetes in experimental animals [13].Globally 90–95% of people were affected with type-2 diabetes. Obesity-related to high calorie diet and sedentary way of life causes biochemical abnormalities and high glucose concentration in the blood which re-duces β-insulin sensitivity and leads to insufficient secretion of insulin by β-cells of the pancreas [14, 15].

An antioxidant is something that fights oxidation. Radical peroxidation of lipids is prevented by antioxidants. Because they are willing to surrender their own electrons to free radicals, antioxidants are effective. The chain process of oxidation is stopped when a free radical receives an electron from an antioxidant and no longer needs to attack the cell[16]. Antioxidants lower the level of low density lipoprotein - cholesterol, thus preventing plaque deposition in the blood vessels. It is beneficial in cancer prevention [17]. Many naturally occurring antioxidant compounds in main ingredients used for the preparation of Traditional Chinese medicine have been identified as free radical or active oxygen scavengers [18,19,20]. Anti –oxidative compounds play an important role in various fields such as medical (to treat cancer, cardiovascular disorders and chronic inflammations), cosmetics (Anti - aging process) and others [21].

A mass spectrometer is also used in understanding kinetics and mechanisms of unimolecular decomposition reactions. GC-MS is highly efficient tool widely used to analyse semi volatile and volatile organic personal care products as extremely low levels from environmental samples [22].

An antidiabetic property of bioactive components from fish and milk was reported by Zhou *et al.,*[23]. Marine organisms with anti-diabetic properties was reported by Drugs,[24]. Muscle extract of *Arothronimmaculatus* regulates the blood glucose level and the antioxidant

system in high-fat diet and streptozotocin induced diabetic rats was reported byKaleshkumar*et al.*,[25]. Antioxidant activity of fermented meat sauce and isolation of an associated antioxidant peptide was reported byNugroho*et al*[26].

Quantitative determination of fatty acids from oil using GC - MS method and H-NMR spectroscopy was reported by Bratu*et al.*,[27]. Characterization of odor-active compounds in cooked meat of farmed obscure puffer (*Takifuguobscurus*) using gas chromatography-mass spectrometry-olfactometry was reported by Tao *et al.*,[28].

In India, studies on puffer fish are very limited. Hence, the aim of the present study is to assessantidiabetic, antioxidant activity and GC - MS analysis of tissue extracts of *Diodonhystrix* collected from Thoothukudi Coast.

MATERIALS AND METHODS

Collection of Specimen

Specimens of the puffer fish *D.hystrix* were collected from fishing harbour Thoothukudi. They were kept in an ice-box and transported to the laboratory. The samples were maintained in a deep freezer at -20^{o}C until use.

Preparation of methanol extract

The preparation of methanol extract was followed by Chellaram*et al.*, [29]. 10 g of dry powdered tissue was soaked in methanol and kept in an orbital shaker for 72 hours. The extract was filtered through Whatman No.1 filter paper, centrifuged at 15,000 rpm for 30 minutes and the solvent was concentrated by rotary evaporator (VC 100A Lack Rotavapor at 30^{o}C) with reduced pressure to give a dark brown gummy mass. The resultant residue was stored at 4^{o}C for further analysis.

Antidiabetic Activity

The α-amylase activity of *D.hystrix* was measured according to the modified method of Fei *et al.*,[30]. The α-amylase was dissolved in phosphate-buffer saline (0.02 mol/l, pH 6.8) at a concentsration of 0.1 mg/ml. The various concentrations of sample solutions (200, 400, 600, 800 and 1000 µg/ml) were mixed with the α-amylase solution (0.25 ml) and incubated at 37°C for 5 min. Then the reaction was initiated by adding 0.5 ml 1.0% (w/v) starch substrate solution to the incubation medium. After incubation at 37°C for 3 min, the reaction was stopped by adding 0.5 ml reagent (1% dinitrosalicylic acid, 0.05% Na2 SO3, and 1% NaOH solution) to the reaction mixture and boiling at 100°C for 5 min. After cooling to room temperature, the absorbance (Abs) at 540 nm was recorded by a spectrophotometer. The inhibition percentage was calculated by the following equation:

Inhibition (%) = [(Abs1 - Abs2)/ Abs1] × 100

Antioxidant Activity

Total Antioxidant Activity (TAA) by Phosphomolybdenum assay TAA was estimated by phosphomolybdenum assay [31]. Sample of concentration 1000 µg/ml were taken in individual test tubes and made up to 1 ml using distilled water and 2 ml of Molybdate reagent solution (0.6 M sulfuric acid, 28 mMsodium Phosphate and 4 mM ammonium molybdate). The test tubes were incubated at 95^0C for 90min. After incubation, the tubes were cooled to room temperature for 20-30 min and the absorbance of the reaction mixture was measured at 695 nm. All experiments were performed in triplcates and the results were expressed as mean ± SD. Ascorbic acid was used as the positive reference standard.

% Antioxidant activity = Abs sample/ Abs Std * 100

GC-MS Analysis

GC-MS analysis of methanol extracts of *D.hystrix* was carried out by following method of Hema*et al.*,[32]. GC-MS method is a direct and fast analytical approach for identification of chemical compounds. The importance of the study is due to the biological activity of these compounds. Analysis was performed by using a GC, Varian CP 3800 and MS, Saturn 2200 (VF 5ms 30 X 0.25 system) equipped with Elite-1, fused silica capillary column composed of 5% phenylArylene-95% Dimethyl poly siloxane. The system comprising a COMBIPAL autosampler set under the following conditions: helium (99.999%) was used as carrier gas at a constant flow of 1ml/min and an injection volume of 1µl EI was employed (split ratio of 1:10) injector temperature 250°C; the oven temperature was programmed from 100-270°C at the rate of 5°C; total GC running time was 63 minutes. Interpretation on mass spectrum of GCMS was done by using the database of National Institute Standard and Technology (NIST) having more than 62,000 patterns. The mass spectrum of the unknown component was compared with the spectrum of the known components stored in the NIST, WILEY and FAME-8 library. The name, molecular weight and structure of the components of the test materials were ascertained.

RESULTS AND DISCUSSION

The antidiabetic activity of methanol extract of skin and muscle was assessed by alpha amylase inhibition assay. The muscle exhibited the strongest antidiabetic activity. The results were shown in Fig 1 and 2. The antioxidant activity of skin and muscle extracts and positive control (ascorbic acid) was assessed based on their ability to scavenge the TAA free radicals by Phosphomolybdenum assay. The free radical scavenging activity of methanol extracts of skin and muscle of *D.hystrix* was evaluated. The muscle exhibited the strongest

antioxidant activity. The results were shown in Fig 3 and 4. Fourteen chemical compounds were identified in the skin extract of *D.hystrix* through GC - MS study (Table – 1).

The methanol extract of skin and muscle of puffer fish *D.hystrix* was observed for its antidiabetic and antioxidant activity. α- amylase is a digestive enzyme, which has a major role in the conversion of complex starch into smaller oligosaccharides. Inhibitor of α-amylase enzyme helps to delay the hydrolysis of the starch which in turn leads to the reduction of glucose absorption and ultimately leads to lesser postprandial blood glucose level[33]. Wang *et al*., [34] have reported that HFD induction for 4 weeks and STZ injection at 30 mg/kg forms the best model for the development of diabetes. However, the present study is required in order to explore the mechanism in which the bioactive compounds of *D.hystrix* influence to control diabetes.

Qiao*et al*.,[35] reported that the recombinant protein had a strong ability to scavenge hydroxyl radicals, protect superhelical DNA plasmids from oxidative damage, and protect L929 cells from H_2O_2 toxicity through in vitro antioxidant activity. Epideminologic studies have suggested that some antioxidants of dietary constitute exhibit antioxdidant properties may be acting as naturally occurring anticancer agents and may explain some of the difference of being intake [36]. Crude extracts of liver, skin, muscle and ovary of *A.hispidus* were subjected for the evaluation of antioxidant activity using DPPH radical scavenging activity test. Results of the present study showed that the methanol extracts of skin and muscle of puffer fish *D.hystrix*exhibited antioxidant activity.Sparkman *et al*., [37]reported that the mass GC – MS is an analytical method that combines the features of Gas Chromatography and Mass Spectrometry to identify different substances within a test sample. Yotsu*et al*., [38]stated that GC – MS analysis is an indirect method to detect TTX in a crude extract which is difficult to purify in other advanced analysis method.Kirimer*et al*., [39]determined TTX and fatty acid contents of five specimens of *L. sceleratus* by LC – MS/ MS analysis in skin. Detection of tetrodotoxin in puffer fish using GC - MS was reported by Man *et al*.,[40]. In the present study totally 14 compounds were identified in skin extract with antioxidant, antimicrobial,antidiabetic, antineoplastic agents, antiepileptics, antidotes, immunomodulators and immunostimulant activities.

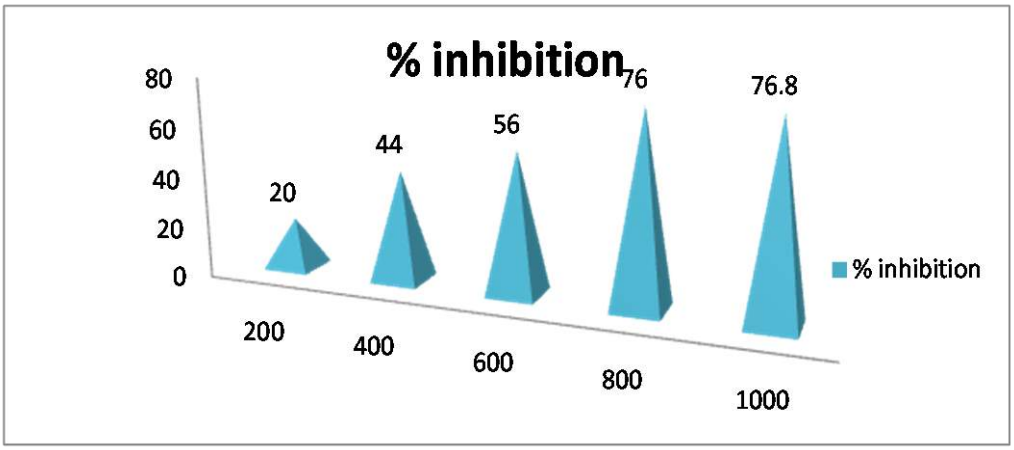

Fig 1 Antidiabetic activity of alpha amylase inhibition assay of skin of *Diodonhystrix*

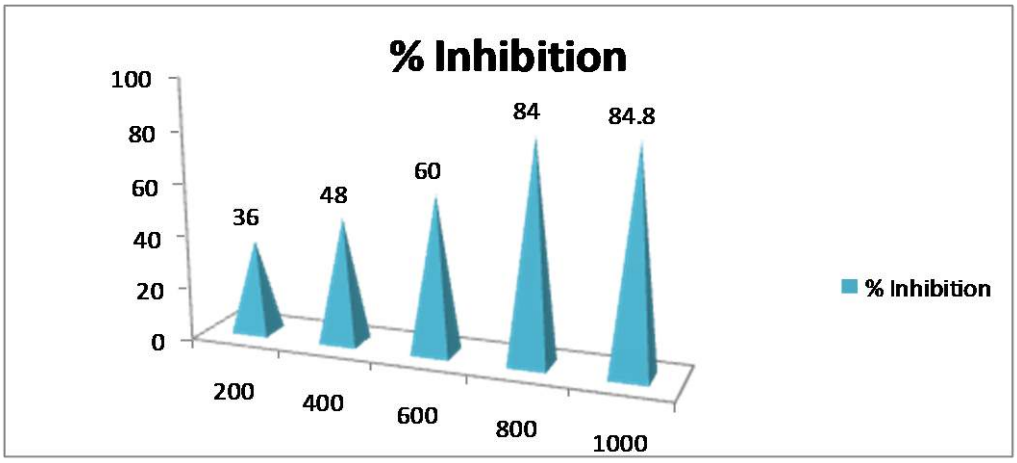

Fig 2 Antidiabetic activity of alpha amylase inhibition assay of muscle of *Diodonhystrix*

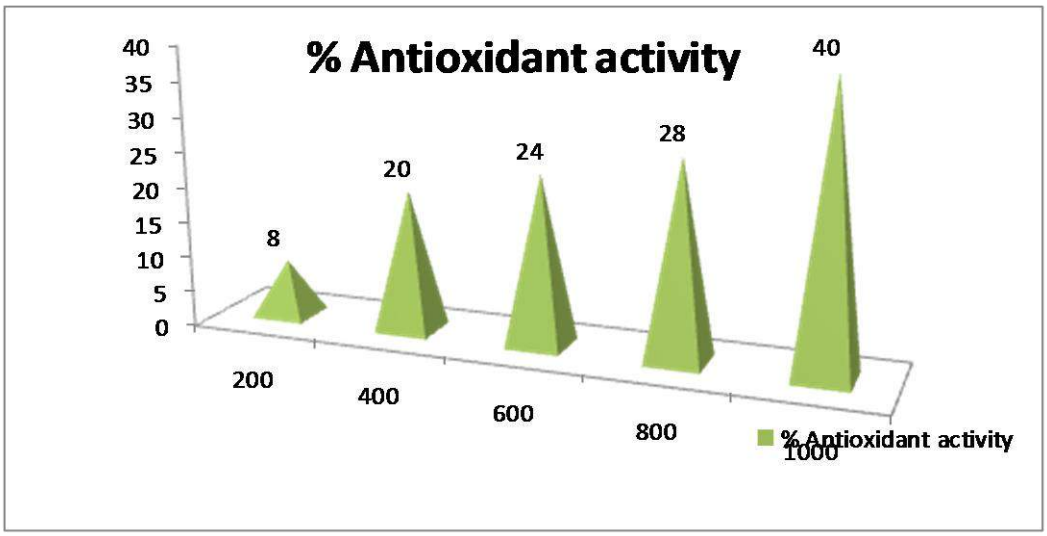

Fig 3 Antioxidant activity of phosphomolymbdenum assay of skin of *Diodon hystrix*

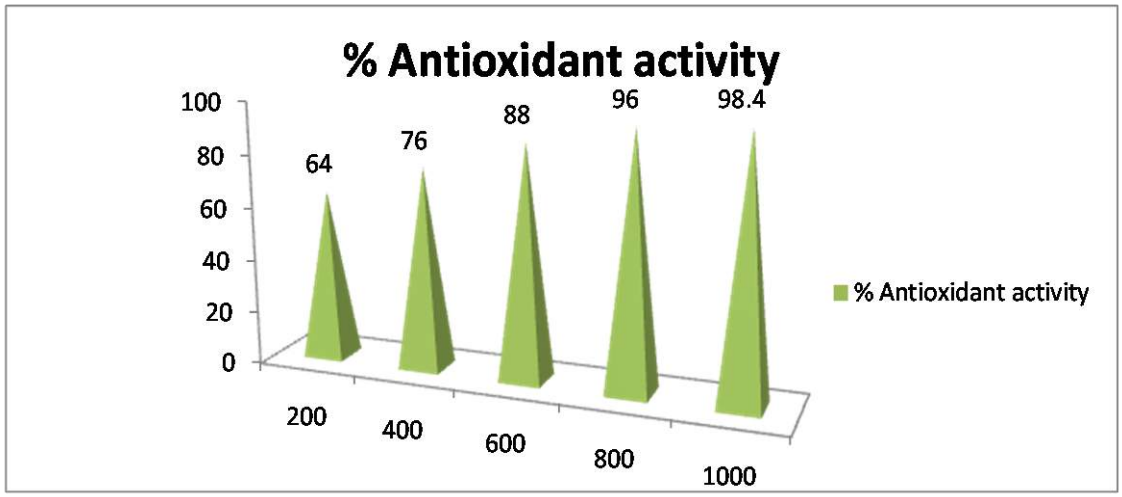

Fig 4 Antioxidant activity of phosphomolybdenum assay of muscle of *Diodonhystrix*

Table: 1 Activity of compounds identified in the skin sample of *Diodon hystrix* (GC – MS Study)

S.No.	RT	Name of the compound	Molecular formula	Molecular weight	Peak area%	Activity
1.	8.658	2-AcetylbenzoicAcid	$C_9H_8O_3$	164.16	27.78%	Anti- aggregatory Anti-inflammatory
2.	8.658	Phenol, 2-amino-4	$C_{16}H_{15}N_3OS$	297.4	27.78%	Antimicrobial Antioxidant Anti- inflammatory
3.	8.658	Phthalic acid, 2-ethoxyethyl	$C_{14}H_{18}O_5$	266.29	27.78%	AntimicrobialAntifungal Gram positive
4.	12.403	1-Propene, 3-azido-	$C_3H_5N_3$	83.09	6.84%	Anticancer Antibacterial Antifungal
5.	12.403	Thiirane	C_2H_4S	60.12	6.84%	Anti-tumour Anti-metastatic Potential inhibitor
6.	12.403	Hydrazine,1,1-dimethyl	$C_8H_{20}N_2$	144.26	6.84%	Antioxidant NitrosaminesAnti-nematocides Antimicrobial
7.	14.057	Acetamide2-Fluoro	C_2H_4FNO	77.06	4.06%	Antioxidant Antimicrobial
8.	14.057	Ethylenimi ,N -chloro	C_2H_4CIN	77.51	4.06%	Antimicrobial Antibiotics Anti-bacterial
9.	14.105	Silane,(11-fluoroundecyl)	H_4Si	32.117	45.00%	Antioxidant Antimicrobial
10.	14.105	2-Hexenal	$C_6H_{10}O$	98.14	45.00%	Antifungal Insecticidal activity Anti nematicidal
11.	14.105	1H-Imidazole,4,5-dihydro-2,4	$C_3H_4N_2$	68.08	45.00%	Antifungal Antibacterial Anticancer Antidepressant Anti-leishmanial
12.	14.294	4-Fluorohistamine	$C_5H_4N_2$	129.14	16.33%	Antioxidant, Anti – bacterial
13.	14.294	1-Hexanamine2-ethyl-	$C_{16}H_{35}N$	241.46	16.33%	Antimicrobial, Antitumor
14.	14.294	1-Azabicyclo(3,1,0 hexane)	C_5H_9N	83.13	16.33%	Anti-fungal, Anti-bacterial

Conclusion

In the present study the methanol extract of skin and muscle of puffer fish *D.hystrix* has been examined for their antidiabetic, antioxidant activity and GC – MS analysis. The muscle exhibited the strongest antidiabetic and antioxidant activity. The GC – MS profiling of methanol extract of skin revealed the presence of fourteen bioactive compounds. These results revealed that the extracts of puffer fish *Diodonhystrix* possess potent bioactive compounds that can be further explored and utilized in pharmaceutical industry for the development of drugs.

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EFFECTIVENESS AND THE STRATEGIES USED IN BYJU'S - LEARNING APP AMONG THE STUDENTS

R. Heaven Celin and P.Banumathi

PG and Research Department of Commerce, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

As technology advances, education is progressing towards a better phase. Online education has started overtaking the conventional classroom approach. Byjus now caters to almost 300 million students in India. The app uses 3-D animation, motion graphics and visual effect technique to provide an immersive learning. This paper aims at analyzing the effectiveness of Byju's App and strategies used by the app. It focuses on a group of high school and higher secondary students from CBSE, Matriculation and State Board and analyse their feedback to inspect how the App promotes personalized learning and also the satisfaction level of the students.

KEYWORDS

Online class, app, education, learning, students, school, internet.

INTRODUCTION

Byju's app was developed by Think and Learn Pvt Ltd, established by Byju Raveendran and Divya Gokulnath in 2011. The main objective of BYJU is to provide online video lectures for coaching students in grades 1 through 12 and those studying for competitive examinations like the Common Admission Test (CAT), Graduate Record Examination (GRE) and Graduate Management Admission Test (GMAT). It focuses on a group of high school and higher secondary students from CBSE, Matriculation and State Board and analyse their feedback to inspect how the App promotes personalized learning and also the satisfaction level of the students. This paper aims at analyzing the effectiveness of Byju's App and strategies used by the app. It is a real challenge for one marketing campaign to target two really different audiences of a different age group and thinking process, but BYJU's surely managed to find that link which drives decision-making among its audience. If the customer is willing to take the plan but do not have enough funds to pay. Solution - BYJU's provide EMI facility for their customers with duration of 12 months, so that they can pay the amount slowly per month with small installments. If they unable to pay that also then the Business Development Association has a option to reduce the package

For eg : if the package is of 50,000 then it can be reduced to 40,000 and some of the classes will be cut off from that package

MATERIALS AND METHODS

STATEMENT OF THE PROBLEM:

This topic is chosen because the study helps to understand various strategies and different varieties of teaching & learning efficiencies and effectiveness of learning ability and capacity of knowledge gained through this online learning platform.

E-learning being completely new to India and growing popularity of smart phones and internet connectivity has given a platform to digital education. Byju's meets with various problem while learning / studying; Its major problem arises because of non – availability of network, loss of data or wifi connection, inconvenience / loss of power supply, high cost of payment for learning an ordinary courses, may not be budget friendly for lower middle class students, inconvenience in timing of class hours for learners etc. There may be lack of different variety of courses for learners who are in search of innovation & exposure.

OBJECTIVES OF THE STUDY:

1. To study the business model and strategy of Byju's learning app.
2. To identify the satisfaction level of students in using Byju's learning app.
3. To understand the new techniques that is used to deal with challenges faced by competition.
4. Use SWOT analysis for Byju's app performance evaluation.

RESEARCH METHODOLOGY

Sampling design	Convenient sampling method
Period of the study	December 2022 – March 2023
Data used	Primary and Secondary data
Test for analysis	Percentage Analysis, Likert scale method, Correlation method, Chi – square test, Garrett ranking method.

LIMITATIONS OF THE STUDY:

➢In the attempt to make this project authentic and reliable every possible aspect of the topic was kept in mind.

➢The time limit is one of the main factors to conduct the study effectively.

➢The different views and opinions provided by the respondents were subjected to personal bias.

RESULTS AND DISCUSSIONS

TABLE 1

FACTORS AGREE WITH THE LEVEL OF BYJU'S

Factors	Strongly agree	Agree	Neutral	Disagree	Strongly disagree	Total score	Mean score	Rank
Learning is same in class and at home on the internet at BYJU'S	65	128	72	4	4	273	3.64	I
I believe that learning on the Byju's class is more motivating than a regular course	65	108	81	10	3	267	3.56	II

Inference:

The Table 1 shows that the respondents were asked to rank the level of Byju's app on a given scale. As regards to the factors of Byjus app, it is found that learning is same in class

and home on the internet at Byju's was ranked as I and the factor that learning on Byjus is more motivating than a regular course was ranked as II.

TABLE 2

RANKING FOR LEVEL OF SATISFACTION IN BYJU'S

Rank	**100 (Rij – 0.5) / Nij**	**Percent position**	**Garret value**
1	100 (1-0.5) / 5	10	76
2	100 (2-0.5) / 5	30	61
3	100 (3-0.5) / 5	50	50
4	100 (4-0.5) / 5	70	40
5	100 (5-0.5) / 5	90	25

Factors	**R1**	**R2**	**R3**	**R4**	**R5**
It is very useful app for education	38	18	13	1	5
It makes my studies easier	14	26	26	4	5
Knowledge provided by the app is very effective	21	28	13	8	5
Orientation exams provided by the app is very effective	17	16	25	11	6
Doubts are delivered in a timely manner	17	18	23	10	7
Tutors are knowledgeable about the subject they teach	22	27	17	6	3

I am happy to recommended the app to my friends	24	16	22	7	6
Learning tougher topics is made easier and simple in Byju's app	16	29	12	11	7
I am satisfied with pricing the Byju's app	21	14	20	12	8
Byju's app is a good substitute for tuitions	18	20	16	14	7

Factors	**1**	**2**	**3**	**4**	**5**	**Total score**	**Mean score**	**Rank**
It is very useful app for education	2888	1098	650	40	125	4801	64.01	I
It makes my studies easier	1064	1586	1300	160	125	4235	56.46	V
Knowledge provided by the app is very effective	1596	1708	650	320	125	4399	58.65	III
Orientation exams provided by the app is very effective	1292	976	1250	440	150	4108	54.77	X
Doubts are delivered in a timely manner	1292	1098	1150	400	175	4115	54.86	IX

Tutors are knowledgeable about the subject they teach	1672	1647	850	240	75	4484	59.78	II
I am happy to recommended the app to my friends	1824	976	1100	280	150	4330	57.73	IV
Learning tougher topics is made easier and simple in Byju's app	1216	1769	600	440	175	4200	56	VI
I am satisfied with pricing the Byju's app	1596	854	1000	480	200	4130	55.06	VII
Byju's app is a good substitute	1368	1220	800	560	175	4123	54.97	VIII

Inference:

Table 2 reveals that the respondents were asked to rank the level of satisfaction on a given scale. As regard to the level of satisfaction in Byjus app, it is found that the Byjus is a useful app for education was ranked as I, Tutors are knowledgeable about the subject they teach, Knowledge provided by the app is very effective, Recommended the app to my friends, makes my studied easier, Learning tougher topics is made easier and simple, satisfied with pricing, good substitute for tuitions, Doubts are delivered in a timely manner and Orientation exams provided is very effective are ranked as II, III, IV, V, VI, VII, VIII, IX and X respectively.

TABLE 3

DIGITAL APPROACHES TO LEARN IN BYJU'S

Digital approaches	**No. of. Respondents**	**% of Respondents**
Animations	34	45
Whiteboard and Pen	12	16
Power point presentation	18	24
Digital pen and Slate	11	15
TOTAL	75	100

Source: Primary data

Inference:

Table 3 reveals that 45 percent of the respondents are motivated for learning by Animations in Byjus, 16 percent of them are motivated by Whiteboard and pen, 24 percent of them are motivated by PowerPoint presentation and 15 percent of them are motivated by digital pen and slate.

Thus, most of the respondents i.e. 45 percent are motivated by the Animations factor in Byjus.

FINDINGS:

- Major proportion i.e.57% of the respondents came to know about Byju's through advertisement.
- Major proportion i.e.45% of the respondents is motivated by the Animations factor in Byju's.
- Major proportion i.e.47% of them has used Byju's for understanding the concept.
- While ranking the influential factors it is found that learning is same in class and at home on the internet at Byju's was ranked first.
- While ranking the influential factors it is found that Byjus is a useful app for education was ranked as I with the mean score of 64.01.
- Major proportion i.e.53% of the respondents does not use any other app other than Byju's.
- Major proportion i.e.36% of the respondents is attracted with the feature of advanced digital board.

SUGGESTIONS:

- Byju's should try to provide good learning experience at free of cost or at reasonable low price for all students.
- Byju's should introduce new learning ideas and techniques for students.
- They should make students to learn in an easy and in an understandable way.
- They should try to reduce cost of fees and charges, for learning.
- They should provide scheduled time tables for various class students.
- Make Byju's learning app as an individual educational institution.

CONCLUSION:

The main lesson to be learned from Byju's marketing plan is to concentrate on target market and brand awareness. They helped pupils realise that they may change their dull study habits into engaging ones. The business understood that it would never be successful if it didn't dispel this notion. They started the "Keep Learning" campaign to promote the advantages of online learning. BYJUs has just captured the Indian market with his impressive teaching and marketing techniques on education. It now has greater goals, greater challenges, and greater team support. This project helps the researcher to know about the student's satisfaction on Byju's learning app. The Byjus app is known for its self placed learning experience by enabling the students crack down difficult concepts. These innovations are highly helpful for the students to understand the basic concepts and enable them to prepare for exams. From this study, it is clear that Byju's app has transformed Indian education scenario by effectively incorporating constructive methods of teaching and learning. Even though Byjus is a good learning app, there are many other online tuition apps prevailing in the recent days. So Byjus should improve their performance and they should also adopt the technology as and when it is updated to sustain their users.

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- https://www.semanticscholar.org/

CUSTOMER`S PREFERENCE AND ATTITUDE TOWARDS E-BANKING

Sherina Aasmi. T and D. Daisy Bai

PG and Research Department of Commerce, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT:

Information technology is considered as a key driver for the changes taking place around the world. Electronic banking is the most inventive service offered by the banks. The transformation from traditional banking to e-banking has been a dramatic change. The evolution of e-banking started from the use of Automatic teller Machines and telephone banking (ATM), direct bill payment, electronic fund transfer (EFT) and the revolutionary online banking. This study determines the consumer's perspective on the adoption of E-banking. There will be huge acceptance of E-banking with the passage of time with growing awareness and education. A great many people are shifting to E banking and are readily accepting the usefulness of this option. It allows customers to manage their accounts from any place at any time for minimum cost.

As time factor, is very much important for all the people in this modernized world, so if we are waiting in a queue spending the precious time which will lead us to go backward. So, the customers don't want to waste their precious time for waiting in a queue. The internet creates perfect market conditions where customers have access to more information and can more compare rates and financial products offerings, internet reduces the barriers to enter many banks have found that internet banking has actually added to the cost. This study is made to identify the customer preference and attitude towards E-Banking and analyse the various aspects like satisfaction level and problem faced by the customer while using E-Banking service. This study was conducted among 120 respondents of Thoothukudi city. The data was analysed using statistical tools viz.., ranking and chi-square test.

Key words: E-banking, Internet, Preference, Challenges.

INTRODUCTION

Banks are financial institution whose primary activity is to act as a payment agent for customers to accept deposits and lend money. Banks are receiving, keeping and lending money. Financial sector plays a key role in the economic growth of a country. When various bank products are made available to customers through an electronic distribution channel, it is collectively referred to as E-Banking. Over a long period of time banks have been utilizing electronic and telecommunication modes for distributing a wide range of value-integrated products or services. Electronic banking is increasingly becoming a "need to have" than a

"nice to have" service. Thus, E-Banking now is more of a norm rather than an exception in many developed countries due to the fact that it is the cheapest way of providing banking services.

Customers are offered with a number of E-Banking facilities like operative account statement, demat, visa transfer, fund transfer, RTGs, NEFT, mobile recharge and portfolio management. Insufficient inventions that have transmuted the business of banking as expeditiously as the E-Banking revolution. Services offered by banks are application through online for a majority of services such as loans, credit cards, savings account, mortgages, etc., insurance products can be bought using internet banking, booking railway tickets online, etc. Another area where E-Banking is making headway to online shopping industry. These services turn out to be a great service for those who are short on time. E-Banking services have afforded banks the opportunities to impress customers which encourage them to keep coming back. In today's world it would be difficult to see any bank in the country that does not render one form of electronic banking service. The present study is the customers preference and attitude towards E-Banking.

REVIEW OF LITERATURE

R. Samundeswari, (2019) in her paper, 'E-Banking in India' states that E-Banking is one of the major parts of E-financing and customers can access it with ease from anywhere in the world. It has made possible to conduct some banking transactions from anywhere like making payments and transfer funds to third party, details of account, etc. She has concluded that the bank will be just a click away from customer around the clock.

Piola Jennel J. Capina,(2022) This research analysed 'The effectiveness of E-Banking to customer life service', It determined the experiences and difficulties met by the respondents in terms of online payment transaction, online fund transfer, and online shopping. It has been found effective in providing good customer life service as respondents would opine that online payment can save time, money and effort. From a commerce perspective, this study emphasizes that there remain strong points of development towards the integration of E-Banking to daily life transactions of customers and other prospects.

STATEMENT OF THE PROBLEM

E-Banking provides a convenient and effective way to manage to manage finance that is easily accessible at 24 hours a day and 7 days a week. On the other hand, e banking has certain problems such as lack of knowledge to operate the technology, set-up cost, legal

issues, lack of relationship among banker and customer, security and privacy issues. So, banks have to be dynamic in their technology to satisfy the customers. For some people the user-friendly technology really simplifies their lifestyle, while for the others it is very much threatening and complex. Therefore, it is necessary to study the preference, attitude and perception of customers towards the user-friendly technology offered by the banks.

OBJECTIVES OF THE STUDY

1. To study the customers perception towards E-Banking service.
2. To ascertain the adoption and usage level of customers towards E-Banking services.
3. To find out the problems faced by customers while availing E-Banking facilities.

RESEARCH METHEDOLOGY

Primary Data

Primary data were collected by framing a questionnaire. A set of questionnaires was prepared and were given to public to analyse the usage of E-Banking.

Secondary Data

The secondary data were collected from websites, magazines, books and journals.

SAMPLE DESIGN	
Population size	Unknown
Sample size	120 respondents
Sampling method	Convenience sampling
Data collection method	Structured questionnaire
Period of study	4 months
Tools used	Likert's Five Point Scale Technique, chi-square test,.

RESULTS AND DISCUSSION:

TABLE-1

RANKING THE PREFERRABLE TRANSACTION THROUGH E-BANKING

E-Banking services	Mean score	Rank
Pay the bills	5.61	I
Check account balance	4.5	II
Transfer fund between accounts	3.56	III
Pay rent and so on	3.42	IV
Requesting credit card and credit card transaction	3.32	V
Stock transaction	3.13	VI
Purchase and sale of foreign currency	2.8	VII

Inference:

The above table clearly indicates the E-Banking services used by the respondents. It is observed that 'Pay the bills' ranked first with a mean score of 5.61 followed by 'Check account balance' which ranked as second (4.5), 'Transfer fund between accounts' ranked as third (3.56), 'Pay rent and so on' ranked as fourth (3.42), 'Requesting credit card and credit card transaction' ranked as fifth (3.32), 'Stock transaction' ranked as sixth (3.13),while 'Purchase and sale of foreign currency' was placed at the trail end with a mean score of 2.8.

TABLE-2

RANKING THE REASON FOR USING E-BANKING SERVICES

E-Banking services	**Mean score**	**Rank**
Saves time	4.76	I
24 hours availability	4.39	II
Banking transactions are easy	4.04	III
Transaction cost is cheap	3.92	IV
Prefer banking transaction while travelling/break hours etc	3.67	V
Privacy & security	3.56	VI
Use and be updated in technology	3.19	VII

Inference:

The above table clearly indicates the reason for using E-Banking services by respondents. It is observed that 'Saves time' ranked first with a mean score of 4.76 followed by '24 hours availability' which ranked as second (4.39), 'Banking transactions are easy' ranked as third (4.04), 'Transaction cost is cheap' ranked as fourth (3.92), 'prefer banking transaction while travelling/break hours etc..,' ranked as fifth (3.67), 'Privacy & security' ranked as sixth (3.56),while 'use and be updated in technology' was placed at the trail end with a mean score of 3.19.

TABLE-3

BARRIERS AFFECTING THE USAGE OF E-BANKING SERVICE

Particular	**Mean**	**Rank**
Network problem	5.92	I
Complexity	4.62	II
Security problem	4.22	III
Insufficient guidance	4.05	IV
Trial ability	3.53	V
High cost per transaction	3.32	VI

Inference:

The above table clearly indicates the barriers affecting the usage of E Banking services of the respondents. It is observed that 'Network problem' ranked first with a mean score of 5.92 followed by 'complexity' which ranked as second (4.22), 'security problem' ranked as third (4.22), 'insufficient guidance' ranked as fourth (4.05), 'trial ability' ranked as fifth (3.53), while 'high cost per transaction' was placed at the trail end with a mean score of 3.32.

TABLE -4

χ^2 TEST OF SIGNIFICANCE BETWEEN OCCUPATION AND TYPES OF E-BANKING SERVICES

Null Hypothesis (H_0):

There is no significant relationship between occupation and E-Banking services.

Alternate Hypothesis (H_1):

There is a significant relationship between occupation and E-Banking services.

$\chi^2 = \sum (O-E)^2 / E$

Occupation/Types of E-Banking	**Internet banking**	**Mobile banking**	**ATM**	**Other Banking**	**Total**
Government employee	3	8	5	1	17
Private employee	6	39	3	3	51
Professional	2	5	2	1	10
Business	15	15	10	2	42
Total	26	67	20	7	**120**

Rows & Column	**O**	**E**	**$(O-E)^2$**	**$(O-E)^2/E$**
R1C1	3	3.68	0.46	0.12
R2C1	6	11.05	25.5	2.30
R3C1	2	2.16	0.02	0.01
R4C1	15	9.1	34.81	3.82
R1C2	8	9.49	2.22	0.23
R2C2	39	28.47	110.8	3.89
R3C2	5	5.58	0.33	0.06
R4C2	15	23.45	71.4	3.04
R1C3	5	2.83	4.7	1.66
R2C3	3	8.5	30.25	3.55
R3C3	2	1.66	0.11	0.06
R4C3	10	7	9	1.28
R1C4	1	0.99	0.001	0.0001
R2C4	3	2.97	0.009	0.0003
R3C4	1	0.58	0.17	0.30
R4C4	2	2.45	0.20	0.08
Total				**20.46**

The Chi-Square Calculated value = 20.46

Degree of freedom (df) = (c-1) (r-1)

= (4-1) (4-1)

= (3) (3)

df = 9

Calculated value=20.46

Table value: $\chi^2_{0.05}$=16.919

INFERENCE:

The table value for 9 degrees of freedom at 5% level of significance is 16.919. It is found that the calculated value i.e., 20.46 is greater than the table value. Therefore, the Null Hypothesis (H_0) is rejected. Hence it is concluded that there is a significant relationship between occupation and type of E-Banking preferred by a respondents.

FINDINGS

- An examination of preferable transaction on using the E-Banking services like pay the bills, check account balance, transfer fund between accounts, pay rent and so on, requesting credit card and credit transactions, stock transaction purchase and sale of foreign currency, based on highest mean score, it is found that 'pay the bills" is ranked first with a mean score of 5.61.
- An analysis of the reasons for using E- Banking like saves time, 24 hours availability, banking transactions are easy, transaction cost is cheap, able to perform banking transactions while travelling/ break hours etc., privacy & security and use and be updated in technology, based on highest mean score, it is found that 'saves time" is ranked first with a mean score of 4.76.
- An analysis of ranking the barriers faced by respondents during the usage of E-Banking like network problem, complexity, security problem, insufficient guidance, trial ability and high cost per transaction based on highest mean score, it is found that 'network problem' was the major barrier faced by respondents
- Chi-square test was analysed between the occupation of the respondent and types of E-Banking preferred. It is concluded that there is a significant relationship between occupation and type of E-Banking preferred.

SUGGESTIONS

- The use of E-Banking delivery channels is still not up to the mark as expected by the banks. This requires awareness building among the customers about the benefits of these services. Customers should be properly educated about the mechanism of using these services.
- Customer awareness programmes are necessary. Practical demonstrations on how to use their cards, mobile phones and authentications while transacting should all be part of the training.
- One of the major problem of customer while using E-Banking service is the network problems. Banks should collaborate with internet service providers which will enable banks to exercise better control and quality of service as well as enhance adopters' accessibility.
- Customer awareness programmes are necessary. Practical demonstrations on how to use their cards, mobile phones and authentications while transacting should all be part of the training.

CONCLUSION

This study on "Customers' Preference and Attitude towards E-Banking" reveals that users of E-Banking delivery channels have strong positive perception towards technology used in banking which is reflected in their adoption and usage of the same. In current situation, Indian commercial banks are providing plenty of E-Banking services for their customers. ATM, Mobile Banking, Internet Banking, Electronic Funds Transfer, Debit and Credit cards and NEFT are the foremost E-Banking channels. Customers are enjoying the time constraints like quick, easy and round clock access of transactions. Based on the empirical evidences this study concludes that E-Banking is a fastest growing banking service

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SAVINGS AND INVESTMENT PATTERN OF WORKING WOMEN IN THOOTHUKUDI

R.Steena and D.Daisy Bai

PG and Research Department of Commerce, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

Savings lead to investment and investment leads to capital formation of the country's economy. In India, household sector occupies the prime place as far as savings is concerned. In olden days, women's income was just an additional income. But nowadays, women's income plays an important role in the family. Women's investment is necessary to meet the uncertain future emergencies in the family. A number of studies have revealed that women and men have different investment behavior. Women hold low risk tolerance and also earn less return from their investments. This research paper was conducted to study the investment behavior of working women. The study examines the awareness level and current investment pattern towards various investment avenues like bank deposit, insurance, postal savings, bonds, debentures, shares, chit fund, real estate, mutual funds and gold. In addition, the study has also made efforts to find out the most influencing factor for making investment decision. Efforts have also been made to study the most preferred investment portfolios by the working women.

KEYWORDS

Savings, investment, working women, savings and investment options

INTRODUCTION

A woman is a girl or an adult female human being. She is the one who possess dynamic characteristics; Women constitute half of the world and Indian population. In olden days women were confined to the four walls of the houses and were involved mostly in non-economic activities. But nowadays there is a shift in their attitude and their participation can be seen in all activities. A woman can also be defined a female member of a workforce, team or female person associated with a particular place, activity, or occupation. Saving is setting aside some money for future or needs. It is the first and foremost step towards leading a financially disciplined life. The primary focus of creating a savings fund should be to meet certain specific goals that future plan to achieve soon. Investment refers to the use of funds

on assets with the most aim of achieving further financial gain, growth in worth or capital appreciation. Investment is the process of sacrificing something today in the anticipation of gaining something in the future.

MATERIALS AND METHODS

(REVIEW OF LITERATURE)

Dr G. Santhiyavalli and M.Usharani avinashilingam institute for home science higher education for women, Coimbatore. Investment behaviour of women investor in Coimbatore city.

Michelin (2019) Women's representation in society: Women's full and equal participation in all facets of society is a fundamental human right. Yet, around the world, from politics to entertainment to the workplace, women and girls are largely under represented. The visualizations takes a closer look at this gender-imbalanced picture over time, revealing just how slow progress is. Rooted in patriarchal norms and traditions, the consequences are far- reaching with detrimental, negative consequences on the personal, economic and future well- being of women and girls, their families and the community at large Building a sustainable future for all, means leaving no one behind. Women and girls are critical to finding solutions to the biggest challenges we face today and must be heard, valued and celebrated throughout society to reflect their perspectives and choices for their future and that of the advancement of humanity. Finally they left question that, how many more generations are needed for women and girls to realize their rights? Joint generation equality to demand equal rights and opportunities or all.

Shreya dutta (2021) The Challenges Faced by Women in The Workplace: Women have been trying to break away from norms and standards set by society. They have been marching for equal rights and fighting for their rightful place in the world. True, that the movement has begun to smash down centuries of patriarchy, but we still have a long way to go. Especially, in corporations, where the adage glass ceiling is still quite prevalent. It is 2019. The world talks about progression and creating an environment where all people are treated equally. But, why does it stop when it comes to women? Why does it happen that women are expected to balance between their careers and home while men are supposed to be the breadwinners of the family? While there are men who have come forward to support women in all their endeavors, why is the word "feminism" branded with so much hatred and contempt? It's time we shatter toxic masculinity and make people understand that feminism's goal is to reduce gender gaps and achieve political, economic, personal, and social gender equality.

STATEMENT OF THE PROBLEM

Nowadays investment and savings is more important, to be protected and reduce the risk on uncertainty. The problem is that in olden days women's income is considered as a additional income within the family. But in present world more importance given to income earned by women. Mainly it is related to the share in the house hold income and it also treated to their control over the expenditure of the total income. Women investment is necessary for the individual to face unpredictable future in order to meet the emergencies in their family. The investment can be done in different ways by making bank deposit, post office, jewellery, shares, insurance etc., one of the best ways of investment is to create a monthly investment plan. This study intends to put on some knowledge with the focus to know the savings and investment pattern of working women.

OBJECTIVES

- To analyse the savings habit of working women.
- To study the behavioral pattern of savings and investment concept of working women in Thoothukudi.
- To identify the various ways to invest the savings of working women.
- To study the awareness level of working women about various investment opportunities.
- To offer valuable suggestions to working women in investment schemes.

RESEARCH METHODOLOGY

This study is about savings and investment pattern of working women. In this study both descriptive and statistical methods have been used to evaluate the working women's savings and investment pattern.

COLLECTION OF DATA:

Data collection is a process of obtaining information from the respondents. In the present study both the primary and secondary data have been used. This study is largely based on primary data. The required primary data have been collected through a well structure questionnaire. Necessary secondary data have been collected from various source like websites and journals

PERIOD OF THE STUDY

The survey was conducted among the working women in Thoothukudi city during a period of 4 months from December 2022 to March 2023.

SAMPLE DESIGN

Keeping the objectives of the study in the mind the researcher constructed the questionnaire to elicit information from savings and investment pattern of working women. The questionnaire was administrated to a sample size of 120 respondents selected at convenience sampling methods.

LIMITATIONS OF THE STUDY

- The study is conducted within a limited time period..
- The area of the study covers only Thoothukudi district.
- Chances of errors or bias which may affect the validity of findings.

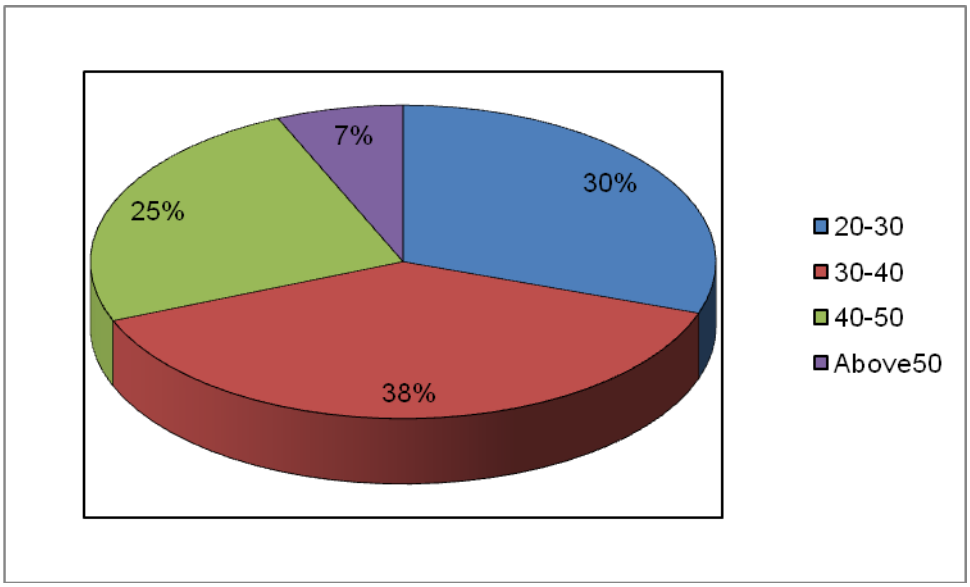
STATISTICAL TOOLS USED

- Percentage analyses
- Likert scale

DATA ANALYSIS AND INTERPRETATION

Classification based on age

Age	No. Of respondents	Percentage
20-30	35	29
31-40	47	39
41-50	30	25
Above50	8	7
Total	120	100

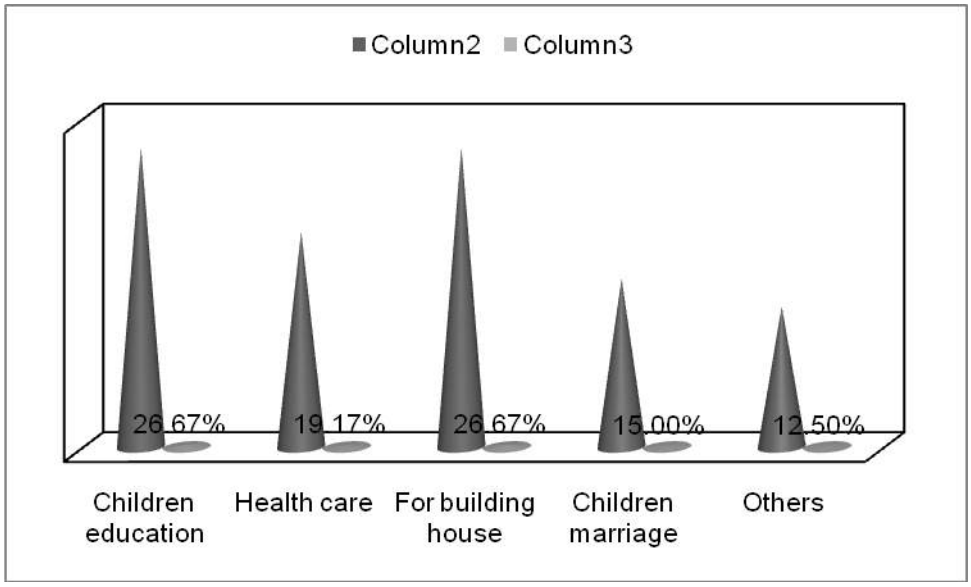


Inference:

The above table shows that, 29% of the respondents are between the age of 20-30 years, 39% of the respondents are between 31-40 years, 25% of the respondents are between the age of 41-50 years, and 7% of the respondents are above 50 years. Thus it is inferred that majority i.e., 39% of the respondents belongs to age group between 31-40 years.

Saving object

Saving object	**No. of respondents**	**Percentage**
Children education	32	27
Health care	23	19
For building house	32	27
Children marriage	18	15
Others	15	12
Total	120	100

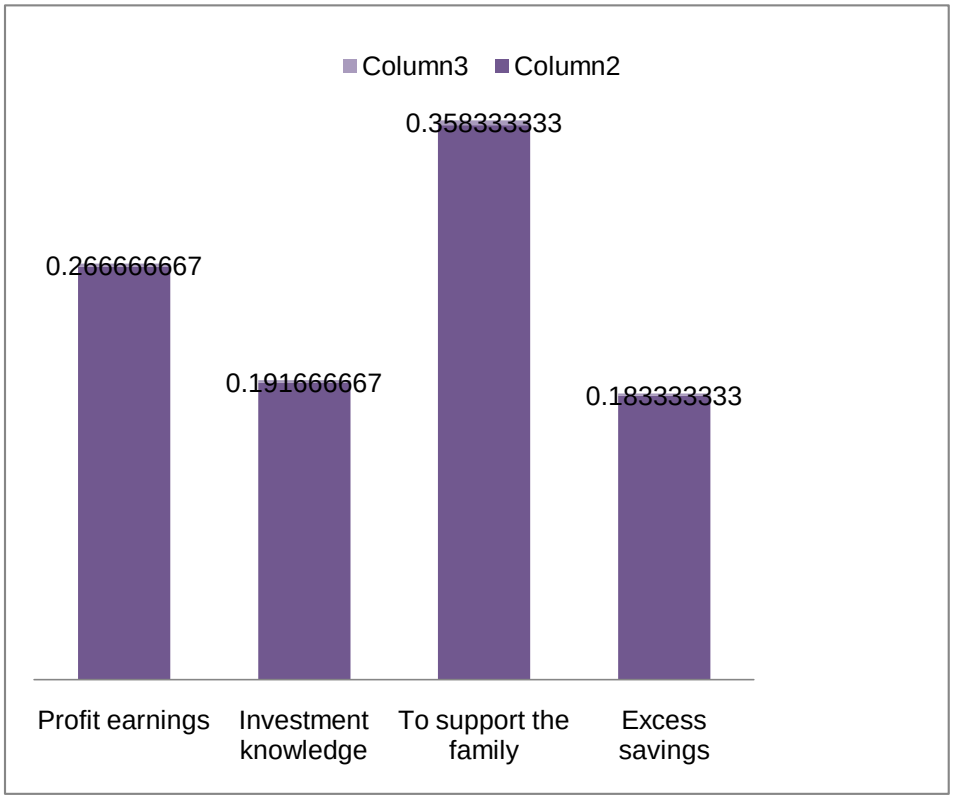


Inference:

The above table shows that, 27% of the working women saved for children education.19% of the working women saved for health care. 27% of the working women saved for building house. 15% of the working women saved for children marriage.12% working women saved for other purpose. Thus it is inferred that, majority 27% of the working women saved for children education and for building house.

Decision on investment

Decision on investment	**No. Of respondents**	**Percentage**
Profit earnings	32	27
Investment knowledge	23	19
To support the family	43	36
Excess savings	22	18
Total	120	100



Inference:

The above table shows that 27% of the working women investment decision is profit earnings, 19% of the working women investment decision is investment knowledge, 36% of the working women investment decision is to support the family, and 18% of the working women investment decision is excess savings. Thus it is inferred that majority 36% of the working women investment decision is to support the family .

Table showing investment option

Inference

Particulars	**Highly satisfied**	**Satisfied**	**neutral**	**Highly dissatisfied**	**Satisfied**	**Total score**	**Mean score**	**Rank**
Shares	200	140	60	30	10	440	3.67	V
Bank deposit	150	220	60	20	5	455	3.79	III
Insurance	175	180	60	20	10	445	3.71	IV
Gold / silver	250	120	60	30	5	465	3.88	II
Real estate	275	140	30	20	5	470	3.92	I

The above Likert's five point scaling table exhibits the investment options of working women. From the table, it is seen that the preferred investment options of the respondents are:

Real estate - Rank I

Gold/silver - Rank II

Bank deposit - Rank III

Insurance - Rank IV

Shares - Rank V

FINDINGS

- Majority of the respondents 38% are from the age group of 31-40 years of age.
- Majority of the working women saving object is children education/ for building house.
- This study indicates that most of the working women prefer to invest in savings account.

SUGGESTIONS

- Working women has to review their investment strategy once or twice a year, and allocate their funds.
- Working women can seek for financial advisor or licensed professionals, for proper guidance in investing their savings.

- Working women do not keep the savings in their pocket, wallet or checking account, where they will spend the money on something else.
- Working women has to know about their earnings, how much they need to spend and should plan a monthly budget Organizing their expenses and observation of it, is mandatory.
- If saving is challenging for working women, then they can start by trying to save a small amount.
- It is essential for working women to be financially literate and take an effective role for her own and her family's financial decisions.

CONCLUSION

This study was mainly conducted to know the investment pattern which women choose while investing their savings. Savings are the funds safeguarded by any person to meet their urgent needs and fulfill their desire either at present or in future. Bank fixed deposit, post office savings, gold/ silver are preferred investment avenues among working women. Working women who have chosen these investment pattern feels that it is convenient, guaranteed return, gives income, and safety over principal though these investment options give less return. The investment options like real estate, bonds, insurance and shares which are risky but gives high return . This study is concentrated in identifying the working women preferred towards various investment avenues based on their level of income. It becomes easy for them to manage their portfolios on their own without their help of their family.

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AN ANTONYMN OF TRAUMA: A STUDY OF ANNE ENRIGHT'S *THE GATHERING*

J. Abinaya

Department of English, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

The paper discusses about the traumatic experience of Veronica. Her favorite brother Liam was sexually abused by the landlord. She reveals the truth to her entire family. Through her writings she came out of trauma. Irish author Anne Enright is well known throughout the world. Irish literary traditions are illustrated in *The Gathering*, her Man Booker Prize winning book, using a mix of fresh and old. Veronica recalls the pastincident; she notices things more deeply and comprehends them with present mature outlook.Childhood trauma elucidates how the condition of being a paranoid and a solitary affects the children, through an explication of the protagonist Veronica. It also examines her road to recovery through the five stages of grief denial and isolation, anger, bargaining, depression and acceptance.

Keywords:trauma, recollections, memory, grief, death.

Trauma or traumatize means a traumatic event which involves a single event or experience; it involves the feelings and emotions. Essentially, past trauma and traumatic memories affect the mind of the characters. Confusion and insecurity cause trauma; typical causes of psychoanalysis trauma are sexual abuse, employment discrimination, police brutality, bullying, domestic violence, and particularly childhood experiences. Significantly, childhood trauma can lead to violent behavior. Psychoanalysis trauma are caused by catastrophic events, war, treachery, betray and sexual abused. Trauma is personal and cannot be ignored or invalidated, leading to increased mental health problems in children and adolescents. It is probable that those who did not verbalize their experience will develop adult psychiatric disorders or carry the trauma with them. Everyone can work towards recovery.

Trauma in early childhood affects a child's development and ability to attach securely, especially when it occurs with a caregiver. Childhood trauma is caused by negative events, such as abuse, assault, neglect, violence, exploitation and bullying. In her book *The Drama of the Gifted Child* Alice Muller pointed out that: "Experience has taught us that we have only one enduring weapon in our struggle against mental illness: the emotional discovery and emotional acceptance of the truth in the individual and unique history of our

childhood" (15). Children may develop a fear of people, withdraw from society, or harm themselves due to negative experiences, which can lead to paranoid and social isolation. The protagonist says that, "Children do not understand pain; or do not know how to feel it, until they are grown" (Enright 129).

Anne Enright's writings are not autobiographical. She has spoken repeatedly about the writers she admires and has learned from. Joyce's words such as "dappled" or "angle poise" frequently feature in her writing and the influence of Dubliners is evident not only in her short fiction but in *The Gathering* as well. She puts it Joyce "did not throw a shadow, he cast a great light in Irish Literature" (2). Enright's fiction has not been shaped only by literature, rather it was shaped by her experiences she got from her education and early career in radio and television. Her narrative strategies often include techniques from the televisual medium, such as fast cutting, rewinds, fast forwards and closeups.

The Gathering focuses on the theme of memories, family secrets, and death. The novel expresses the protagonist's feelings in her childhood and her memories along with her brother. She expresses how she suffered in her childhood and also after her marriage. Her only companion was her brother, Liam. When he died, the narrator felt a lot. The novel revolves around the theme of love and loss. The novel mainly focuses the inner psyche of Veronica, the protagonist of the novel. Even her daughters also were not ready to love her. Her only source of comfort was her brother and his death was the major cause of her mental agony.

The title of the novel explains the gathering of the family members to say goodbye to Liam, the gathering of the Hegarty family with all their imperfections and dishonesty; Veronica who is on the brink of a breakdown, Ernest who is hiding that he no longer priest, or a twin sister that had a surgery to remove the family nose. They all gather around their suffering mother, who, as Veronica realizes, loves some more than others, her being the one who barely notices the discovery of a new Hegarty Liam left behind and on whom all want to clear their consciousness for any misbehavior towards Liam.

Enright also explores how a person's memories affect them in the present. In Veronica's case, she left to wonder if the dark secret she and her brother share is responsible for his suicide. Veronica is tortured by past and she cannot forget it. Veronica does not stir her warm feelings. Her father had been harsh and her mother was weak. In her adult life, relationships fare no better. Veronica is uncomfortable with her relationships with her children.Veronica thinks that the reason for his alcoholism lies in something that happened to him in his grandmother's house, and uncovers uncomfortable truths about her family.

Paranoid people are characterized by mistrust and hostility towards others, a negative point of view, and lack of faith in others. Solitary individuals need more alone time because they are unable to meet the emotional needs of others. *The Gathering* tells the story of persistent childhood trauma and how a character's life is impacted by it, leading to a new identity as an adult. Veronica experiences childhood trauma and develops paranoid due to her closeness to her closest sibling Liam. Liam was sexually abused by a friend, lover and landlord of his grandmother Ada and alcohol was his coping strategy, "I don't forgive her" (Enright 7). He eventually committed suicide by drinking alcohol and drowning in the sea when he was thirty-nine years old.

Veronica is paranoid due to a negative childhood experience, which leads to unforgiving grudges and mistrust of others. She experienced a lack of support and internal conflict due to living in a large family, leading her to be alone and taking care of herself. She holds her mother responsible for the turmoil in their home and blames her for her brother's problems. Her perspective on her mother and way of thinking are both impacted by his grief, "don't tell Mammy, because 'Mammy' would – what? Expire? 'Mammy would worry" (Enright 9). The narrator's family is dysfunctional, with no love or affection, and the children often have a quarrel and accuse others based on their own beliefs and judgment. They develop biases and assert that someone else is to be blamed for negative things. The character is unable to feel secure and comfort in her family due to unfavorable factors and trauma from childhood sexual assault.

Veronica faces lack of communication with her husband and makes assumptions based on her own point of view, leading to internal conflict. She questions her husband's devotion and accuses him of having other women without any proof. She assesses others solely on her own judgment and maintains a safe space from others. *The New Personality Self-Portrait* in the workM. Oldham says that "Individuals with solitary personality style have small need of companionship and comfortable being alone" (5). Veronica was a solitary person as a child, suppressing her emotions and trying to forget her painful memories. This has had a lasting impact on her life, making her feel helpless and shielded from others. Chronic childhood trauma can have a negative impact on people's lives, leading to bad relationships with their partners, family, friends and others. Veronica's process of healing was not a direct one, but she was able to write down her story and have support from her family. She also decided to confide the secret and tell what happened in her grandmother's home to the rest of the family, which indicated that she was slowly healing. Veronica did heal from her childhood trauma by facing her past and writing a traumatic narrative.

Liminal space is the place a person is in during a transitional period, and can be physical, emotional or metaphorical. Kubler Ross's theory examines and defines grief through five stages: isolation, anger, bargaining, depression and acceptance. Veronica Hegarty's journey through grief after her brother committed suicide is explored using the theory of the five stages of grief. Veronica is given a liminal place where she can write a biography of her grandma and use memories to process her grief. The stages of grief and how Veronica encounters her own version of closure are discussed in the following.

Veronica's mother's grief demonstrates the importance of traditional practices during grief. She passes into the second stage of grief, where anger takes over denial. Anger is a necessary stage of grief that helps to cope with other feelings until one is ready to deal with them. Veronica accepts the concept of maternal priority and chooses a particular type of coffin without consulting her family, "because I am the one who loved him most" (Enright 23). She embraces the liminal space provided by the planning of Liam's funeral. She also uses her liminal space to examine the past and write down an account of her grandmother's life, often using the airport road as her destination. This suggests a yearning for escape and leaving the past behind.

Veronica acknowledges Liam's practices of rituals as a symbolic entrance into the third stage of grief of bargaining. Veronica allows the trauma of her brother's death to enter the liminal space of grief through the arrival of Lambert Nugent, who is a menacing presence in her recollections and accounts of her grandmother's death and her present with Liam's death dragging her through grief in different frames due to her responsibilities as an adult. Irish funeral customs include a wake, a removal, a mass, a burial, a post funeral gathering. Each of these rituals mourners through liminal stages while bringing with it its own traditions.

Veronica finally allows herself to cry after considering the details of her brother's death including stones in his pants, a hi-vis jacket, and no underwear or stockings. She requires a liminal place to process her grief at her own pace, causing her sorrow at the moment. She then comes to her senses and realizes she is looking at Liam, reposed in his coffin: The room is almost empty. There is no one here I can talk to about children's lungs or carpet colours, about weaves and seagrass or percentages of wool. Dead or alive. Liam does not care about these things" (Enright 193). She also uses the liminal space provided by the Irish funeral rites and traditions to process her grief, mixing past and present to speed up by her journey. These are the griefs are included in this novel.

The book contains the situation of the families gathering, Veronica's memories, the flashback of Ada and Charlie, the funeral arrangement of Liam and the family secrets. Veronica is creating as much as she is recollecting. The novel is centered on a wake for a man who has died early because of alcohol. The book closes with a wake. It is a powerful scene soaked in anticlimax and bitterness. Enright offers pictures of middle age, marriage and mourning, mistakes and the difficulty to bring back to life the past.Enright uses these characters to illustrate the blessed and cursed bonds of family and how time and its passage affect them. By giving Veronica a woman in the throes of a minor breakdown, the responsibility of exploring the secrets of her family's past, Enright makes a point about the elusive and subjective nature of memory and family relationships.

The main aim of the paper is to study the impact of Liam's death on the protagonist Veronica. Because of that incident she gets into the traumatic stage. She takes liminal space for to recovery from her brother's death. During the liminal space she did not believe anyone. She takes space for her recovery. Enright exposed towards the end of the book that Veronica also experienced traumatic event when she was a child and that Liam was not the only one who took a traumatic incident from his childhood into his adulthood. At the end she accepted that she has gone through traumatic stage and she recognized herself during the liminal stage.

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GOVIND'S QUEST FOR THE MEANING OF LIFE IN CHETANBHAGAT'S *THE THREE MISTAKES OF MY LIFE*

Anamika.M

Department of English, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

ChetanBhagat, a rising star in the contemporary modern Indian literature, is a multitalented personality. He is a novelist, columnist, public speaker and a screenplay writer. Additionally, he received Society Young Achiever' award, Publisher's Recognition award and Film fare Award for Best Screenplay. ChetanBhagat's the third novel *The Three Mistakes of My Life*. The project entitled, Govind's Quest for ChetanBhagat's*The Three Mistake of My Life* shows to the youth icon and aspiration. The Firstfocus on the Indian literature, contemporary author works and the biographical details of ChetanBhagat's and the abstract of the novel *The Three Mistakes **o**f My Life***.** Economic Instability focuses on middle class society young people lack of money and sacrifice the dreams and desire. Class Discrimination talks about the rich and poor people leading the life style. The religion based dominated the people. Technique and Style talks about the author writing style reached to convey easy of readers. **S**ummationsums up all the important aspect of preceding.

Key Words – Economic Instability, class Discrimination, Narrative Technique and styles.

ChetanBhagat is an Indian author, columnist, and screenwriter. His novels are adapted into successful movies and his views are focused on youth and issues based on national development. He quit his banking career in 2009 to bring changes in the society. His novels touch an emotional chord of the third generation, showing their ambition, mixed with fears and tinged with tears. He is also a good columnist and writes many columns for leading newspapers. His columns point out the happenings within our country are triggered even in the parliament.

Bhagat's*The Three Mistakes of My Life* talks about the lower middle class people suffering with Economic instability. The three main characters are Govind, Omi and Ishaan, who are friends and run a cricket shop selling cheap cricket equipment and school stationery. Govind's mother is a Gujarati snacks seller, Omi's father is a priest, and Ishaan's father works in a telephone exchange. The children of the area study in a municipal school with limited facilities. The society and people depicted in the fiction replicate the actual low class Indian society, with people quarrelling over small matters and displacing garbage on the streets.

They are habituated to gossips and keep themselves busy working-out stories from the small incidents of others' life. The parents of the young characters are described as over expecting guardians of their children, with Govind's mother wanting him to do engineering while Govind is interested in doing business. Ishaan's father wanted him to join the Indian Army.

Economic Instability explores the typical mentality of lower middle class people in India. It focuses on Ishaan, Ishaan's sister Vidya, Omi's father, and Ali's father, who all want their children to become successful in life by choosing their career as per their parents' expectations. The novel also highlights the typical mentality of lower middle class youth, such as Govind, Ishaan, Omi, and Vidya. The protagonists in the novel represent the reality of the middle class youth mentality, who have high aspirations but cannot fulfil them due to lack of money, opportunity, motivation, or luck. They are influenced by non-secular and opportunist religious and political forces and cannot understand what to do in life. ChetanBhagat has depicted the lower middle class hardships of contemporary Indian society in the novel.

Govind, Ishaan, and Omi all have limited income resources and have to compromise their aspirations in life due to poverty. Govind expresses his and his friends' family condition as being the poorest of the three, while Ishaan's dad works in the telephone exchange and Omi's dad is the priest of a Swami-bhakti temple. The poverty of lower middle class people is reflected in the novel, with those who have money being respected and given more importance. Govind's expression reveals how people used to treat them when they had no money. He has high aspirations to become a big business man, but has to struggle to save enough money to reach his goal. Ishaan’s father works with a low designation at a telephone exchange, and the economic condition of their parents causes considerable hardship in their children's lives. Ishaan has potential to become a national cricketer, but cannot become one due to his poor family background.

The novel depicts a society in Belrampur, India, where Hindus and Muslims live with conspicuous religious tension. The characters like Bittoo Mama and Parekh-ji represent the prevailing non-secular and dirty, and the society is divided into the Hindu dominated and Muslim dominated areas. This causes communal differences to persist, leading to hellish situations like Godhra sabotage and post Godhra communal riots, where people are stabbed to death or burnt alive in public. ChetanBhagat has written a realistic picture of lower middleclass Indian society in his novel, which reflects the actualities of the lower middleclass sentiments lack of economy and issues. He passed two years in Ahmedabad for his management studies, and his observations are presented in the novel.

The novel talks about economy instability of the middle class people. The protagonist of the novel Govind Patel was very interested to study at IIT Engineering collegebut he could not join. The main reason is lack of money. So, Govind was join in an arts college. The economy status not fulfilled his dream. Another important character Ishan was a cricket player. He was interested to play cricket and he watches all the cricket matches. Due tolack of money he could not participate in national and international matches, Ishan studied in the school which did not give importanceto sports. So Ishancould not develophis ambition. The middle class youths are sacrificing our desire and dreams. His family income not fulfilled his dream.

The Class Discrimination talks about the class discrimination. The class discrimination means the rich people and poor people lived in their society. The rich people attitude of dominated the poor people. This chapter talks about the difference in the rich people are high level in the politics. But the poor people only need for our vote. The rich people house are very big and beautiful ventilation for anytime but poor people house are not big, lacking of fundamental facilities. The religion based are dominating the people. The place of Gujarat more occupied the Hindu peoples. So the majority people are dominated the other religion people.

India is the largest democracy in the world, with people having freedom to express and the right to elect their representatives. Marxism calls into question the social system of living conditions, which is built solely for the maintenance of the status quo and to support the privileged position of the bourgeoisie. Three Mistakes of My Life is a realistic exposition of class difference between two opposite strata of society, with the caste issue being a nefarious design to divide an otherwise united Hindu community and a problem that is internal to it. Class discrimination is a human construction arising from man's lust for power. Money is used to divide people and societies into different classes. Three Mistakes of My Life is an exposition of class discrimination in Indian society and the sub-continent, presenting Govind as the working class hero. The protagonist confesses in the prologue that he is from a poor family from Ahmedabad. The protagonist, Govind and his friends are in low strata of the society, but they are able to watch seasonal cricket matches in their friend's house. This is a pathetic situation of working class people in India.

Whenever the caste issue is raised, it is alleged that it is a nefarious design to divide an otherwise united Hindu community and a problem that is internal to it. How is it a ‘Hindu problem’ when Islam, Christianity and Sikhism in Indian are equally bedevilled by it? (10)

Middle class and rich people frequent seasonal cricket festivals like Indian Premier League and International One-day cricket matches in India but poor boys like Ishaan whose father is a Government employee, Omi whose father is a priest in a Hindu temple and Govind whose mother is working for a daily wages can watch those matches only on televisions. That too, Govind and Omi have to watch in his friend's house as the facility is absent in their house. This is a pathetic situation of working class people in India. Govind says, the match was in Vadodara, just two hours away from Ahmedabad. But we could not go- one because we didn't have money; and two because I had my correspondence examination in two days. (Bhagat, 74)

Bittoo Mama wants all the three friends to meet Parekh-Ji and takes them to him. Parekh-Ji house is the grandest house in Gandhinagar. Parekh-Ji is a symbol of bourgeosis. Bittoo Mama tells "He heads the biggest temple trust in Baroda." India stands 8th on global list of millionaires but there is still poverty that stifles Indian economy. Poverty line is fixed to measure and to alleviate poverty. There are three components in poverty line, food consumption, expenditure for non-food items such as education, conveyance, clothing, and house rent and behaviourally determined expenditure. India is two countries into one, India of Light and India of darkness. It is largely based on the living conditions of people in the country. Parekh-Ji's house is the grandest and luxurious whereas Govind's house is very simple even without proper ventilation. It is seen by all the three when they go for a meeting in Parekh-Ji's residence. It is the grandest:

We reached Parekh-Ji's residence at around eight in the evening. Two armed guards manning the front gate let us in after checking our names. The entrance of the house had an elaborate rangoli, dozens of lamps and fresh Flowers. (Bhagat 40)

It is clear by the conversation between Bittoo Mama and Parekh-ji that the attack on Muslims has political influence. After a thorough analysis, it becomes clear that the political system is riddled with lack of account ability, entry of criminal into politics, the dominant influence of muscle power and money power, the pernicious influence of religion and caste, oppression of marginalized groups. Govind, the working class boy, is disappointed and dejected with his failures though he is talent and determined. He goes for a suicide attempt and saved. Once he clearly understands his position. He says,

Talent is the only way the poor can become rich. Otherwise, in this world the rich would remain rich and the poor would remain poor. This unfair talent actually creates a balance, helps to make the world fair I said. I reflected on my own statement a little. (20)

Any narrative as a technique of delineation has two overlapping aspects, one refers to content, or the assemblage of material and the nature of the connections implied. The other is rhetorical. It is the mode of presenting the narrative to the reader, or audience. As the realm of narrative technique is quite vast and endless, an attempt is made to limit the study to the use of various modes like humour, simile, metaphor, irony, symbolism, personification, hyperbole, repetition etc. as found in the *The Three Mistakes of My Life* of ChetanBhagat. Thus, humour is generally used by all the creative artists to provide a variety to the texture and also to relieve the atmosphere of tension and gloom. It helps the author to intersperse comic relief in an otherwise serious plot. Instances of humour abundantly abound in the novels of ChetanBhagat. Most of them are available in *The Three Mistakes of My Life*. In the novel Bhagat describes how Omi becomes stupid. Govind, Ishaan and Omi are good friends. Govind is more interested in business and Ishaan, in cricket. Omi always stays becomes stupid "because a cricket ball hit him". (Bhagat, 8) Govind also makes a comment on Ishaan who wastes his time in playing and watching cricket. He says, "Ishaan is not ran away from the NDA but he was thrown out of it". (Bhagat, 9) Govind and his friends sometimes eat at Gopi, a vegetarian restaurant. Omi eats too much food. Ishaan says to him, "That is your tenth chapatti". (Bhagat, 13) and warns him that all that food is bad for him. Govind says, "People like Omi are no profit customers, there is no way Gopi could make money of him". (Bhagat, 14) Bittoo mama is a great follower of Parekh-ji. He invites Omi and his friends at Parekh-ji's residence for political meeting. All the guests follow the meeting protocol and dress in white or saffron. Ish looks odd with his skull and crossbones, black Metallica T-shirt. Govind says, "Everyone had either grey hair or no hair. It looked like a marriage party where only the priests were invited" (Bhagat, 40).Vidya, the younger sister of Ishaan is preparing for medical entrance exam. She hates maths most and said to Govind between an electric shock and a maths test, I will choose the former. She is even ready to do anything-difficult thing instead of maths study. She says, "I heard some people have to walk two miles to get water in Rajasthan, I would trade my problems for that walk, everyday". (Bhagat, 45)Ishaan is a cricket freak and wants Ali to play in Indian team. Once these trios go to Ali's house where they tell his father to send Ali regularly for cricket and maths coaching. Ali's father offers them dinner. Govind and Ishaan take its advantage but Omi being priest's son does not eat at Muslim's house. Ali's father feels Omi may like non-veg, so he asks him, "Sorry I can't offer you meat, and this is all we have today". (Bhagat, 65)

But instantly Omi says to him, I don't eat meat, I am a priest's son. These friends open a shop at the premises of Swamibhakti temple where they sell stationery and cricket

materials. Once due to slow time in business they sit outside of the shop. On seeing Bittoo mama, Omi signals Govind to bring tea for him but suddenly mama says, Get something to eat as well. Govind thought about the money required for the snacks. He says, "Who the fuck pays for mama's snacks?". (Bhagat, 76) Simile is a figure of speech that makes a comparison, showing similarities between two different things. The language of a novelist has to be different in order to be attractive and appealing Ishaan is a good player during his school days and plays district level matches. Ali is a Muslim boy who takes admission in the same school where Ishaan learns. Kids tell Ishaan that Ali hits only sixes. Govind remarks on Ali that he looks "like the school has his worthy successor". (Bhagat, 28) The novelist tells Ali's ability of playing cricket just like Ishaan. Omi and his friends attend the religious meeting at Parekh-ji's house. All the guests other than Omi and his friends are priests. They wear white or saffron colour dress; have grey hair or no hair. The party looks like a marriage party where only the priests were invited. Most of them carried some form of accessory like a trishul or rudraksha or a holy book. All these guests divide into two groups of saffron and white "like shoal of fishes". (Bhagat, 30) And sit down in two neat section. At the party, all the guests are in dress code but Ishaan wears T-shirt, which has a picture of skull and crossbones. Govind and Ishaan look like the protagonists of those ugly duckling stories in their mismatched cloths.

Metaphor is a figure of speech, which makes an implicit, implied, or hidden comparison between two things that are unrelated but share some common characteristics. In other words, a resemblance of two contradictory or different objects is made based on a single or some common characteristics. Pandit-ji sells cricket materials to Govind and his friends. He settles in Ahmedabad as he is forced to leave Kashmir. Kashmiri's are fair in color. He starts panting due to the weight of trunk he carries to Govind's shop. Bhagat uses the metaphor "rosy red" for Pandit-ji. He depicts "Pandit-ji's white face a rosy red". (Bhagat, 118)

Irony is a figure of speech in which words are used in such a way that their intended meaning is different from the actual meaning. Irony is a figure of speech in which words are used in such a way that their intended meaning is different from the actual meaning. Personification is a figure of speech in which non-human objects are given human attributes. Parekh-ji is a political leader who uses religion for political purpose, using idols and scripture to change people's minds towards Hinduism. Parekh-ji, Govind, Bhagat, and Govind all use repetition to emphasize their statements. Bhagat argues that Muslim and Hindu should come together after the fight, while Govind suggests that politicians fuel a fire and there is no fire brigade to check it. All Muslims are not bad. Parekh-ji uses religion to change people's minds

towards Hinduism, while Govind uses repetition to make the same claim twice in succession. Bhagat suggests that Muslim and Hindu should come together after the fight.

This paper explore the human beings realise our mistake and realise the real life. The protagonist Govind Patel realise the three mistake and understanding of true love and friendship. Next, talks about the paper is economic problem in their characters and more struggles overcome the society. Another one is class Discrimination of the society in poor and rich people treated the surrounding area.

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ENTRAPMENT AT HOME AND ABROAD IN ANITA DESAI'S *FASTING, FEASTING*

Anisha. B

Department of English, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

Anita Desai is a prominent writer in IndianEnglish literature. She has contributed excessively to Indian English literature. She focuses on Indian literature and has made great contribution to the literary world at national and international level. AnitaDesai focuses on Indian culture, tradition, race, politics and self-identity.Entrapment is the state of being caught in or as in a trap. Anita Desai's *Fasting, Feasting,* asimplied in the title itself, is a novel ofcontrast between two cultures, the one, Indian, known for its pious and longstandingcustoms representing fasting,' and the other, American, a country of opulence andsumptuousness epitomising 'feasting'. The plot unveils through the perceptions of Uma,in India, and of Arun, in America. Both of them are entrapped, irrespective of the cultureand enveloping milieu, by oppressive bonds exercised by their own parents.The external progress in terms of physical, social, economic and political setup hasmade little or no impact on the internal psyche and attitude of the society towards women. Even the so-calledliberated modern woman is often understood to be another form of entrapment. Anita Desai portrays thecomplexities involved in the female psyche and a search for identity in a patriarchal society in *Fasting, Feasting*.This paper deals with the entrapmentand the longing for freedom of the central character.

Keywords:entrapment, loneliness, alienation, longing, freedom, dominance.

Anita Desai**,** originally named as Anita Mazumdar was born on June 24, 1937 in Mussoorie, India. She is well known as Indian English novelist and the author of children's books who excelled in evoking character and mood through visual images. She has written several novels like *Cry the Peacock* (1963), *Voices in the City* (1965), *Bye, Bye Blackbird* (1971),*Where Shall We Go This Summer?* (1975). *Fire on the mountain* (1977) , *In Clear Light OfDay*(1980), *A Village by the Sea* (1982), *In Custody* (1984), *Baumgartner 's Bombay* (1988).*Journey to Ithaca* (1995), *Fasting Feasting* (1999), *The Zigzag Way* (2004), In addition tonovels, she has written books for children, numerous short stories that have been collected intoanthologies, and essays. Desai has received many awards, including the Royal Society ofLiterature Winifred Holtby Prize (1978), the Sahitya Academy of India Award

(1979), theGuardian Award for Children's Fiction (1982), the National Academy of Letters Award, andwas nominated thrice for the Booker Prize.

Fasting, Feasting (1999) is a novel in two parts. The first part is set in India and is focusedon the life of Uma who is the overworked daughter of Mama and Papa. She is put upon by themat every turn, preparing food, running errands. Uma's parentsattempt to marry her off on two occasions. The readers are left with great sympathy for Uma and her simple kindness as shesurvives as best as she can in anunfriendly world.In the second part of the novel, the reader meets Arun, Uma's privileged brother. He is attendingcollege in America and during summer holidays he lives with the Patton's an all American family. Of note is his intense dislike of American food and cooking methods. He is dismayed at thebehavior of Melanie, the daughter who is deeply troubled and suffering from bulimia. Arun spends most of his time alone and isolated. On the contrary, these advantages make the diasporic Indians of the second generation encounter the predicament of dual identities.

The first part of the novel tells us in a flashback as how she became a reluctant victim of entrapment at home. The second part of the novel shows how her brother Arun, who leaves his home for higher studies, feels trapped by the very education that is meant to liberate him. . Accordingly, in the story of Uma, we find her unattractiveness leading to her eventual entrapment. Yet, if we pass a final verdict on this account, we would be proved erroneous since Desai presents the versions of Aruna and Anamica, Uma's appealing sister and charming cousin, respectively. Beauty cannot offer them escape from entrapments; in truth, it is rather their good looks that victimize them. Further, if we think again that it is Uma's lack of education that has led to her entrapped situation, Desai presents us the subversion of Anamica, where foreign scholarship fetches her an equal match but fails to provide her the required escape, it suffocates and kills her literally. In like manner, if as Uma thinks, "A CAREER. Leaving home. Living alone"(Desai 134) would bring in the necessary freedom from entrapment, Desai presents us the story of Arun, who leaves home, lives alone for a career but feels the pangs of entrapment despite it. Uma looks forward towards her marriage to give her the much-needed relief, yet,unfortunately, she returns home frustrated after a deceitful marriage and subsequent divorce. Reduced thus to a baby-sitter at her earlier days and an unpaid servant for her self-centred parents for the rest of her life, Uma finds no escape from her entrapment. Uma experiences, however, a brief repose of happiness and freedom once when she is allowed to accompany her ailing aunt, Mira-Masi, on her pilgrimage.

Aruna's entrapment is different from the rest. She has liberated herself from the customs and dominating home rules that bind the rest of the characters like Uma and Anamica.

While Uma, Anamica, Aruna presents the female versions of entrapment in *Fasting, Feasting,* Arun picturizes the male version of it. Unlike his sisters, right from his birth, Arun desists eating the food of his family which is symbolic of its values. Much to the dismay of his father, he shows his preference for vegetarian food. Simply because it revolutionised the life-style of his father, Arun cannot be forced to eat non-vegetarian food. This, of course, is a cause of disappointment for Papa. Nonetheless, Arun cannot fully come out of the clutches of Papa, especially, in terms of his education. And ironic enough, it is education, which instead of offering the desired autonomy, paves way for Arun's entrapment. However, in the eyes of Aruna, her father's manic determination to get a foreign scholarship for Arun, is actually on account of his unfulfilled dreams, which he tries to impose on his son. That is why, when the letter of acceptance from Massachusetts finally arrives, it stirs no emotions in Arun. The ties, though invisible, are so overwhelming that even in a country that feasts on individuality, Arun fails to manifest his identity as an individual. Caught in the prison house of his own family's food habits, he can neither nourish the alien food nor develop a sense of belonging with Patton's family that shelters him during his vacation. Where Mrs. Patton's daughter, Melanie, bluntly says she finds the food revolting, and refuses to taste it, Arun has to helplessly eat it. Melanie, however, suffers from bulimia—a disorder in which overeating alternates with self-induced vomiting, fasting, etc. Her bulimia, along with her mother's frenzy for buying food items to fill the freezer, signifies the consumerist society that she hails from, where excess becomes the malady. This seen in contrast to Rod, the fitness fanatic, who spends all his time and energy injogging, baffles Arun who wonders that "one can't tell what is more dangerous in this country, the pursuit of health or of sickness"(Desai 208). He apprehends that like Melanie, who eats, vomits and lies on her vomit most of the time, the people of her country too, go through an inexplicable pain and a real hunger. Yet he cannot reconcile his mind to the unanswerable question: "But what hunger a person so sated can feel?"(Desai 227).

The title of the novel iscontradictory highlighting the two characters Uma and Melanie. Both the characters suffer andlong for freedom. Fasting refers to Uma who is deprived of her education, failure in marriage and sacrifices her life for her MamaPapa. Melanie on the other hand is a spoilt child leading a lifeof plentiful. Feasting refers to this character who feasts on food only to bring it out. Her frustration towards life and longing to

get freed is beautifully depicted. Arun is blessed with love, care in abundance but it only chokes him. He longs for freedom and leaves to America only to be got trapped in another hand, from MamaPapa to Mrs. Patton. All the characters in the novel are victim in a way or the other. They feel entrapped eitherat home or abroad. They long for freedom which could be got only from the society. If we consider the male version represented by Arun and the female versions constituted by Uma, Anamika and Aruna as Indian versions, Desai offersAmerican versions to counter them. The novel, thus dangling between two countries and cultures shows through the characters of Uma and Arun, and their counterparts Melanie and Rod, that attempts of escape from entrapments can only be temporary, illusory and self-destructively futile since entrapments through familial knots areubiquitous, all-encompassing and universal. And perhaps the salvation comes when one accepts entrapment of one kind or another envisioned as an inescapable fact of life. One must overcome the obstacles of life by breaking them and evolve as an empowered one.

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RECONSTRUCTING IDENTITY: AKHILA AS A 'NEW WOMAN'IN ANITA NAIR'S*LADIES COUPE*

Bill Tony Lauret. S

Department of English, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

In Indian English literature, Anita Nair is a well-known novelist. She depicts variety of characters in her novels and explains how they are alienated from society and one another. Her major themes are social treatment, human relationship, particularly that of man and woman, their loneliness and lack of communication. *Ladies Coupe* deals with multiple voices of women, where Nair answers few questions that every woman would have faced in their life. *Ladies Coupe* unravels the misinterpretations about the role of women in contemporary post-colonial feminist literature and shows how the protagonist, Akhila's identity constructed with memory, and how she reconstructs herself in the patriarchal society as a 'New Woman'.

Key words: Reconstructing, new woman, patriarchal society, post-colonial feminist.

Indian Women novelists have given a new dimension to the Indian Literature. They are known for their bold views that are reflected in their novels. In India, the woman writers have portrayed the plight of Indian women in their novels.Anita Nair's works reveal the struggle of female autonomy played out against the patriarchal cultural pattern. Her characters are reluctant to face reality and suffer from solitary confinement as a result of their negative self-images and dislike of the domestic life. Her writing is an insecure response to excessive masculinity.

The novel *Ladies Coupe* examines the role of women in contemporary post-colonial India, which suffers from a system of sex-role stereotyping and oppression under patriarchal social organization. The novel questions whether the role of Indian woman, as a representative of other women living under oppressive patriarchal systems, in relation to culture, should be wives and mothers, or if her role is limited to reproduction regardless of her own desires and needs.

The novel follows Akhila's journey of self-discovery and her attempt to re-establish contact with a man in order to gain autonomy and an independent identity. Despite her efforts, the novel's conclusion reassures her that she still remains a part of a society of both

men and women who must interact productively. The ending of the novel complicates a previous passage concerning Hari, suggesting that life might toss forth a second chance and that the second chance, she ultimately desires, is not just happiness or to recuperate her compromised past, but the very specific future and very circumscribed hope to rekindle her romance with Hari. Akhila does not burn up any tracks or forge a new path at all, but simply returns to a significant point in her past, if armed with revelatory self-knowledge and fresh hope to revise a significant chapter of her life.

The other issue that is more often than not highlighted in this novel is oppression towards women. The issue is analyzed through postcolonial feminist theoretical framework. Postcolonial feminism is a form of feminism that developed as a response to the fact that feminism seemed to focus solely on the experiences of women in Western cultures. Postcolonial feminism explores women's lives, work, identity, sexuality, and rights in the light of colonialism and neocolonialism. Mohanty in her influential article *Under Western Eyes: Feminist Scholarship and Colonial Discourses* first published in 1991, criticize Western feminism on the grounds that it is ethnocentric and does not pay attention to the unique experiences of women residing in postcolonial nations, Women in postcolonial nations face simultaneous oppressions; being colonized subjects while at the same time being women oppressed by the patriarchal society they are in. This is clarified by Mohanty when she stated that women suffered double colonization, first as a colonized subject and second as simply being a woman by patriarchy.Moreover, GayatriSpivak in *In Other Worlds* writes,

The matter of fact is that postcolonial women to remain passive and continue to bear male oppressive environments. These women seek to emancipate themselves through education, struggle, and hard work. The postcolonial men re-colonized the bodies and minds of their women in the name of preserving their cultural values….. Postcolonial feminism is primarily concerned with deplorable plight of women in postcolonial environment. (86)

In Nair's novel, the characters face some deplorable state of oppression by the men and their society. Akhila is the only unmarried adult character in this novel. Being an unmarried woman brings a lot of challenges to Akhila as she struggles with her role as the head in the family and also dealing with the continuous negative perception of people regarding her status. She has always sacrifices her needs in order to cater her family, since the father passed away, as seen in this excerpt;"What about you? You've been the head of this family ever since Appa died. Don't you want a husband, children, and a home of your own?

In their minds Akhila had ceased to be a woman and had already metamorphosed into a spinster"(Nair 77).

Akhila is a feminist character who is determined to move through her relatively unchanging world. She finds her own middle path between patriarchy and freedom, choosing certain constraints of society while abandoning others in order to pursue a love relationship. To wrest the reins of her life back, she must return to the railway station. As the train is bound to its tracks, she is part of a controlled and regulated system which continues to delineate her life. Similarly, while the safe space of the coupe was dominated by female voices of strength and support, its passengers have to disembark into a society that regulates and passes judgment. The coupe is limiting as well as liberated, so its solution to women's oppression cannot lie in separatism and the only space in which women can articulate their autonomy and agency or question those traditions which systemically oppress.

Nair's novel explores the intimate feelings of her women characters through vivid descriptions of their Indian lives and the pleasure they take in something as simple as enjoying a forbidden fruit. Akhila, the protagonist, chooses to travel in a ladies coupe to discover herself. She belongs to a conservative Brahmin family and is upset when she sees a signboard at the ticket counter that reads 'ladies handicapped and senior citizens'.Five women of different ages and backgrounds came together in a coupe to share their private moments about their childhood, husbands, sons and lovers.

Nair discusses how women survive the male dominated society by their wits. All the women are winners in their respective spaces. They are given to understand and realize their inner power, using their innate strength; they challenge their male counterparts and emerge as winners. The six women featured in ladies coupe have reached an understanding with their independence.Only the woman who feels particularly impacted by her familial and marital relationships should decide how to permanently get out of such a situation. The painful experiences of these five women and Akhila's eventual realization of her future independence serve to highlight this theme. Each woman's experiences are described, bringing out their unique personalities.This is what Paul Ricoeur in *Oneself as Another* has said as, "The narrative constructs the identity of the character, what can be called his or her narrative identity, in constructing that of the story told. It is the identity of the story that makes the identity of the character" (86).

They are capable of overcoming societal challenges. They believe that a woman is just as capable as a man. The women of the contemporary think differently, and Nair's *Ladies Coupe* illustrates this. She portrays her women as having a lot of strength. They fight for a distinct zone and are conscious of their strength. They persevere through their trials and discover the answer to the fundamental question of why they are alive in a patriarchal society.

Throughout the novel, Akhila is portrayed as anemerging new woman. 'New Woman' is a feminist idea that emerged in the late 19th century and had a profound influence well into the 20th century. In 1894, Irish writer, Sarah Grand used the term 'new woman' in an influential article to refer to independent women seeking radical change. In this novel, Nair shows Akhila, the protagonist, as a person who wants to bring a radical change into the conservative patriarchal society. Because, even though Akhila was considered as a provider but, she was not allowed to take life decision on her own.Nair writes, "So this then is Akhila. Forty-five years old. Sans rose-colored spectacles. Sans husband, children, home and family. Dreaming of escape and space.Hungry for life and experiences. Aching to connect" (Nair 02).

Akhila constantly asks her fellow passengers, who have lived longer and are more familiar with the fundamentals of living with a husband, a child, a home, and a mother-in-law, for the answers to her many questions. Due to her circumstances, Akhila comes to believe that marriage is unnecessary and that women can live independently. The state of individual life suddenly strikes Akhila. She is led to believe that other women are just individual psyche patterns of consciousness as a result.

Eachwoman, in some way, in*Ladies Coup*e denotes a gender in one way or another, each of these women gives Akhila advice on how to defy social norms and learn about herself. All of them were the companions of her journey, both physically and psychologically. In each of the stories, it is clearly seen that all the five women have beenvictimized by the male-dominated society and each of these womenhave struggled, at some point, in their life to establish their own identity.Some failed, some succeeded and some managed to stay 'afloat'.

It is not sure if Akhila found the answers to all the questionsthat have haunted her for so long, but one thing is sure that by making aneffort to find her answers, Akhila found a lot more than what she wassearching for. But this novel is good in answering the question 'Is a woman vulnerable?' rather than 'Can a woman stay single and livehappily?'Nair narrates

stories of six women who are very muchdifferent in their age, social status etc., but all being Indian women.

*Ladies Coupe*focuses on the inner strength every human being possesses. It is the story of a woman's search for strength and independence. These women's life stories give an insight into the experiences ofmarried Indian women, of the choices they make and the choices made for them. The coupe becomes a metaphor for a Utopian world that is liberated from patriarchy, one that is not characterized by false binaries. Hence, the conscious action taken by Akhila at the end of the novel, anaction that aims to overcome the contradictions that are characteristic of the 'traditional' world and it's essential determinant: that is, alienation. The repressive forces are varied in their manifestations, leading them torevolt against the social norms and male - dominant society. The finaloutcome of this process of an awareness of repression and a sense ofrevolt leads the characters on the certain resolutions that are bold andlead them to happiness. The whole process finally leads one to anexploration of the dilemma of the new women who is caught betweentraditionalism and modernity.

Women in post-colonial India, boldly defy such delimiting roles and assert self-dignity and personal freedom. They are to pen their basic physical and emotional needs and acts un-inhabiting to satisfy them. The train journey in fact symbolizes a journey away from family and responsibilities, a journey that will ultimately make them conscious of their self-esteem and dignity. It is a journey towards self-discovery Akhila travels with the question that has been haunting all her adult life.She wanted to live alone and away from the clutches of life which the society has framed. "Of sitting with her back to her world, with her eyes looking ahead. Ofleaving, of running away.Of pulling out, of escaping" (Nair 01).

She meets five women characters in the novel and travels with the same question. This wonderful atmosphere, delicious, warm novel takes reader into the heart of women's life in contemporary India, revealing how the dilemmas that women face in their relationships with husband, mothers, friends, employees and children.

Thus, Anita Nair's *Ladies Coupe* brings into focus, the issues of self-realization and how woman wishes to reconstruct the ethics of society. Though Anita Nair is not a feminist, her stories portray the sensibilities of a woman, how a woman looks at herself and her problems.She has brought Akhila as a character who tries to reconstruct her 'self' as new woman by taking the authority of her life in her hand. As a writer, she shows her existential

inclinations by raising question can a woman live alone without a man's support? And she brings the answer through the narration of other passengers in the train. She recovers the existential concepts of freedom and responsibility in all these characters by giving them freedom to come out of the world of emotional and physical trauma and to live their life which is full of happiness, to realize their own strength and to change.

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BAPSI SIDHWA'S *WATER*: A STUDY ON THE STRUGGLE OFWIDOW'S SURVIVAL IN THE PARTITION ERA

Elna Hedwige J

Department of English, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract:

Bapsi Sidhwa'snovel *Water* aims to explore and highlight the gender disgraceof women in the name of cultural norms and traditions. The novel *Water* depicts the struggle of an eight-year-old girl when pushed to the widow ashram. This paper unmasks the element of cultural hegemony by studying the characters of widowed women in Indian culture as depicted by Sidhwa. The miseries of these lower-class widows, represented by the protagonist Chuyia, are examined.The primary purpose of this paper is to investigate the terrible situations imposed upon women by Indian Patriarchy. The study uncovers the ideological schemes and vivacious cultural tricks employed by the upper classes to imprison the widows residing in the Ashram. The oppressed lives, contentious problems, and the identity of women, especially of lower class are thoroughly evaluated by the Gramsci's cultural hegemony for clearer understanding.

Keywords: Widowhood, Partition, Gender Equality,Hegemony,Culture

Pakistani literature in English has emerged visibly and globally in the last two decades. It is difficult to determine the precise date of its origin: it is thought to have originated in colonial India and has a close association with British colonialism. Pre-Partition and Post-Partition Pakistani English literature can be broadly divided into two eras. Pakistani literature flourished with Pakistan's independence, but it only gained wider attention in the 1980s. Because of the importance of their writings, Pakistani English writers have gained worldwide literary attention. Through this, one can observe multicultural surroundings in Pakistani English literature developed by writers living within Pakistan's geographical borders and by Pakistani Diaspora writers, not only because the writers represent different cultural backgrounds or because there is no other way of reflecting pluralist society like in Pakistan, but also because these writers reach beyond ethnolinguistic, historical, religious, and geographical confines in their works.

In Pakistan, widowhood is a very challenging experience for women. To use a local metaphor, when a woman becomes a widow, it is as if the protective chadar on her head has

been removed and the status of dependence has been thrust upon her. The majority of the survival issues that widows face are linked to poverty, and two-thirds of the poor live in rural areas. Poor women who lack land and productive assets spend the rest of their lives on the periphery of society. Those who do have assets can be taken advantage of by the strong male culture, particularly in rural areas. They are also the victims of prejudice and abuse on social and cultural levels.

Social suffering can also be found in the responses of institutions and programs to problems through intended and unintended consequences. Thousands of women went missing during the 1947 partition. The governments of Pakistan and India agreed to search for such women and return them to their families. Despite the fact that the majority of the abducted women had been abused during the partition process, some of them were treated with compassion. After being abandoned, such women remarried and had children.

Bapsi Sidhwa has carved a niche for herself in the realm of Asian women's writings through her thematic preoccupations,well-constructed plots and memorable characters, narrative techniques, and language. Her novels reveal her affectionate admiration for her own community as well as compassion for her characters, who are physically and psychologically repressed women.Bapsi Sidhwa does not speak about women's liberation from a Western perspective. As a result, Sidhwa connects the liberation of her female characters with that of men in all of her novels. Bapsi Sidhwa has depicted women's plight and exploitation in patriarchal society very realistically. However, as a novelist, Bapsi Sidhwa discusses women's emancipation.

Water, a novel by Bapsi Sidhwa, sheds light on the plight of Hindu widows who are forced to live in squalor after their husband's deaths. The plot of the novel sparked much debate and controversy in India. It does deal with society's hypocrisy in viewing them as an object of contempt while exploiting them. Sidhwa rebuked society's double standards, which excluded widows but allowed widowers to remarry.

The novel *Water* depicts the tragic life of a child-widow who is expected to follow religious fundamentalist structures until the end of her life. The irony is that the youngster is completely unaware of the slipknot around her neck. She is the victim of a cruel tradition. Although a few people, such as Narayan, who represent idealists appear to be breathing fresh air, they are unable to make a significant or tangible change in a society riddled with unjust rituals.

In the *Water*, Bapsi Sidhwa has given us an inside look of the lives of women who have left their husbands and are now paying the price because "Outside of marriage the wife

has no recognized existence in our tradition" (Sidhwa15) a tradition-bound society believes that it is because of the woman's ill deeds and sins their husbands die. Sidhwa's novel contains a lovely irony. During the day, from the rising of the sun to its setting, widows can be seen bathing in the holy Ganga, reading holy scriptures, chanting religious songs before the idol of God, and eating simple meals, but at night when the sun withdraws to its abode and darkness spreads all over, these figures in white can be seen crossing the river for the nocturnal calls and have high respectable men of the society with them, considered to be the custodians of religion and traditions.

Sidhwa brings all of this to our attention, as well as the question of what sin is and who is the sinner. A widow relies on prostitution to make ends meet. She is compelled to do so. However, the absence of a highly regarded social figure raises serious concerns. To avoid any immoral deed from the widow's society, numerous rules and regulations were enacted by society. However, men take advantage of this physical advantage. The pain and suffering of these widows cannot be expressed because they are suppressed.

Water focuses partly on the physical agony of females who are denied proper clothing and food, and entirely on the mental agony that they suffer in silence. Nobody wants to suffer, but when there are no other options, a woman must suffer silently. How can we expect Chuyia to protest child marriage when she is only six years old, when it is essentially her parents' responsibility to protect her from the tentacles of social evils? The sole right, religiously preserved for males, is the right to indulge in and enjoy carnal pleasures, whereas women are merely subjugated to man's blind passion.

Water takes place in 1938, when India was still under British colonial rule and children were commonly married to older men. When a man died, his widow was forced to spend the rest of her life in a widow's ashram, an institution for widows to atone for the sins of her previous life that allegedly caused her husband's death. Chuyia is an eightyearold girl who has recently lost her husband. She is placed in an ashram for Hindu widows to spend the rest of her life in renunciation. She befriends Kalyani, who is forced into prostitution to support the ashram, Shakuntala, one of the widows, and Narayan, a young and charming upper-class follower.

Bapsi Sidhwa's *Water*deals about the sufferings of the widows who were outcasted. It shows the internal sufferings of eight-year-old child who is abandoned from family and left alone in the widow ashram. The child yearns for a happy life with her parents but the tradition of their society has deprived her from having a merry life. Being married to an old man where his sudden death brought misery Chuyia's life. Another protagonist of the novel is

Kalyani, who also became a widow in a small age has been a profit maker to the ashram. The head of ashram made to go prostitution and earned money through it for running the ashram needs. She fell in love and plans to elope with him but it will be in vain when the truth revealed to her about her lover's father name. In the very end she takes away her life by falling into the river realizing that she can no more live a peaceful life in this society.

The novel keenly shows the side of good winning over the evil. In this novelthe protagonist is treated as a sex object to make money for the ashram needs where society sees widows as a whore who satisfy the needs of man's pleasure. The evil character in this novel is Madhumati the head of ashram who sent another widow to prostitution in order to get money. The good eye person, Shakuntala tried every means to save her from this situation and to give her a happy life. Shakuntala is a **quiet and reserved type of widow.**She is caught between her hatred of being a widow and her fear of not being a sincere, dedicated widow. Sadananda, a gentlelooking priest in his late forties who recites the scriptures to the pilgrims who throng the ghats of the holy city. Madhumati is a person who dominates the entire woman hood and controls the life of Kalyani by forcing her into prostitution. Being in a class-conscious society, she could not raise out her voice as she is not even considered to be a human in the eyes of other people. This shows how the good one wins against the evil and brings light to the protagonist. It also depicts that goodness also prevails among the evil people.

Cultural hegemony says about the cultural dominance in the society by the ruling class people who manipulate the culture of the society. Their beliefs and explanations, perceptions, values and more has been said that the ruling class will have their own cultural norms. As in the novel *Water*, the ruling class is the Brahmin society who highly dominates the lower-class people. It is mainly the woman who is treated badly. If her husband passes, they blame woman for their death and treat them as an omen. The worst is, when it comes to widow where they are considered to be a whore and they treat them in a very lower level.

According to Bapsi Sidhwa, the terrible consequences of India's partition affected everyone, but women suffered far more than men. Sidhwa draws our attention to the fact that India's partition has a geographical and political background, but men brutally abused women of other religions. Women who were victims of gang rape were rejected by their own families because they were polluted by men of other religions. This group of women is referred to in the society as "fallen women". Because no one was willing to hire them, woman likeMadhumati, whoturned other women for prostitution to satisfy their stomach's hunger. Some women, like Kalyani, committed suicide in order to preserve their family's

reputation. Physical violence during the partition had a significant impact on the mental state of women. Mahatma Gandhi expresses that "Widowhood imposed by religion or custom is an unbearable look and defiles the home by secret vice and degrades religion. He believed that it is better for a widow to remarry openly rather than commit sin secretly"(Ahekar and Poojari,).The story resides in the era of Partition time which expresses therevolutionary impact of Gandhian ideals in hisreformist commitment to widows remarriage and emancipation.Thus, the papergives adeep understanding of how lives of widows are shaped once they are separated from their families.

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A STUDY ON CUSTOMER PERCEPTION OF PRODUCT QUALITYAT RATNA FURNITURE, THOOTHUKUDI

M.Sakthi Saraswathi and Fatima Lucia Sheeba

Department of Human Resource Management, St. Mary's college(Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India

ABSTRACT

The present study investigated on the customer perception on product quality. The wooden manufacturing industry is still in the peak of the market. This report is to identify the product quality in ratna furniture. It is an industry located in Thoothukudi. This study was done to find whether there is any factor affecting the product quality. The sample was focused on the target people of Thoothukudi. There are customers who still go with the wooden products with design and customization in it. Majority of the respondents are satisfied with the product quality of that industry. Finallythere are some suggestion that need to be concerned by the industry for better more customer relationship.

Key words: customer perception on product quality

INTRODUCTION

Customers are the king of the market. A person who buys the product or service is the customer. But a customer cannot be an end user of the product. Customer are the one who decides which product should exists in the market. Customer reference changes accordingly to the development and growth of the economy. Every firm fights to get a customer for their product through their advertisement strategy and attract the people to buy the product by providing according to the experience what people love. Firms also impress the customer by the cost of the products.

A pleasant feeling customers derived or a disappointment that occurs when they compare own expectations to a products perceived outcome was regarded by Kotler and keller as satisfaction. Customer satisfaction occur when the customer perception of received value in a transaction is equivalent with the perceived service quality relative to the client costs of acquisition and price.

Product quality means to incorporate features that have a capacity to meet consumer needs and gives customer satisfaction by altering product to make them free from deficiencies.

Good product are key to market success. The product represents a bundle of expectations of the consumers. The product satisfies the need of the society. A successful product ensures its own promotion if satisfies the needs of consumer, that is the product is

right to the market. A good product should be able to generate extra amount to enthusiasm which is important to market organisations.

Product quality is something to know that whether the product has satisfied the Customer needs or taste. The product should also meet the standard of the firm or industry. Better products will make the customer happier and it increase the revenue.

Anything that possesses utility is described as goods. A product is both what a seller has sell and what a buyer has to buy. Thus, any enterprise that has something to sell, as tangible good or not, is selling a product.

REVIEW OF LITERATURE

Ertekin, Merve (2010): Ertekin, M., & Aydin, B. (2010). The impact of National identity and culture on customer perception of Product Quality. The authors identified an inevitable impact on the product quality perception on customers. The case of mobile phones in Sweden and Turkey. In this study they found the dissimilar norms and values between cultures were defining the quality perception differently.

Yuen EF etal (2010): Yuen, E.F., & Chan, S.S (2010). The effect of retail service quality and product quality on customer loyalty. Journal of Database Marketing & Customer Strategy Management, 17 (3), 222-240. The research is to examine the impact of product and service quality dimension on customer loyalty. They describes the three dimensions- physical aspect, reliability and problem solving to customer loyalty.

OBJECTIVES

- To study about the product quality of Ratna Furniture in Thoothukudi city.
- To identify whether there is any factors affecting the product quality.
- To determine whether the product quality dimension bring the perception towards the buying behaviour of the customer.
- To give a suggestion towards the level of satisfaction regarding the product quality.

STATEMENT OF THE PROBLEM

- To know about the taste and preference of the customer towards this firm.
- To know whether the customer are been changing to modern furniture or still in wood
- furniture.
- Want to know whether this firm provide the best quality to their customer.
- To know about the customer perception towards their product quality

CONSTRUCTION OF TOOLS:

The researcher had a discussion with a good students. Based on the discussion. The researcher constructed a questionnaire. Then it was circulated to respondents, 50 samples were distributed among respondents.

SAMPLING DESIGN

The data collected are original in nature. The sampling technique used in the study was convenience sampling.

TABLE 1.1

TABLE SHOWING CUSTOMER LOYALTY TOWARDS THE RATNA PRODUCTS

S.NO	Particulars	No. of. respondents	Percentage
1	Yes always. I stick to the same product	37	74%
2	Never. I keep experimenting with new product	13	26%
Total		**50**	**100%**

Source: Primary Data

INFERENCE:

From the above chart it is inferred that 74% of respondents stick to the same

and 26% of respondent never.

TABLE 1.2

ANOVA- AGE AND PRODUCT QUALITY

ANOVA					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.405	3	.468	.413	.745
Within Groups	52.215	46	1.135		
Total	53.620	49			

Source: Primary data

INTERPRETATION:

The customer satisfaction level of the product quality is not accepted with an age which is implied by inferential testing in the significance value is 0.745 that is statistically not accepted value at five percentage level of significance. Hence the hypothesis is accepted

TABLE 1.3

HYPOTHESIS ASSOCIATION BETWEEN AGE AND CUSTOMER'S PURCHASE BEHAVIOUR

HO: There is no significant association between customer's purchase behaviour in ratna furniture.

H1: There is significant association between customer's purchase behaviour in ratna furniture.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.295[a]	3	.514
Likelihood Ratio	2.314	3	.510
Linear-by-Linear Association	1.192	1	.275
N of Valid Cases	50		
Source: Primary data.			

INTERPRETATION:

The customer purchase behaviour in ratna furniture is moderately associated with marital status which is implied by inferential testing and t value is 0.514 that is statistically not associated value at five percentage level of significance. Hence hypothesis is accepted.

TABLE 1.4

HYPOTHESIS ASSOCIATION BETWEEN GENDER & CUSTOMERS BRANDAWARENESS

HO: There is no significant association between customer brand awareness and educational qualification.

H1: There is significant association between customer brand awareness and educational qualification.

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7.077[a]	6	.314
Likelihood Ratio	7.267	6	.297
Linear-by-Linear Association	.199	1	.656
N of Valid Cases	50		

Source: Primary data

INTERPRETATION:

The customer brand awareness is highly associated with educational qualification which isimplied by inferential testing and t value 0.314 that is statistically not associated value at five percentage level of significance. Hence the hypothesis is accepted.

TABLE 1.5

ANOVA- EDUCATIONAL QUALIFICATION AND CUSTOMER'S COMPLAINTS

ANOVA					
Whether actions are taken regarding the complaints?					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	10.298	3	3.433	1.957	.134
Within Groups	80.682	46	1.754		
Total	90.980	49			

Source: primary data

INTERPRETATION:

The reaction of company towards customer complaints is moderately accepted with an education qualification which is implied by inferential testing and f value is 0.134 that is

statistically moderately accepted value at five percent level of significance. Hence the hypothesis is accepted.

TABLE 1.6

TABLE SHOWING CUSTOMER'S PREFERENCE TOWARDS TYPE OF FURNITURE IN LAST 5 YEARS

S.NO	Particulars	No. of. respondent	Percentage
1	Synthetic furniture	19	38%
2	Furniture made from natural wood	22	44%
3	Both synthetic and natural wood furniture	9	18%
Total		**50**	**100%**

Source: Primary Data

INFERENCE:

From the above chart it is inferred that 44% of respondents prefer furniture made from natural wood only prefer 18% of respondents both synthetic and natural wood furniture.

TABLE 1.7

TABLE SHOWING SATISFACTORY LEVEL ON ASPECTS OF THE PRODUCT

S.NO	Particulars	No. of. respondents	Percentage
1	Price	29	58%
2	Purchase experience	14	28%
3	Quality	7	14%
Total		**50**	**100%**

Source: primary data

INFERENCE:

From the above chart it is inferred that 58% of respondent are satisfied of the product

price and 14% of respondent not satisfied of the product quality.

TABLE 1.8

TABLE SHOWING EXPENSIVE IS THE BRAND COMPARED TO SIMILAR BRAND

S.NO	Particulars	No. of. Respondents	Percentage
1	A lot more expensive	10	20%
2	Slightly more expensive	10	20%
3	About the same	11	22%
4	Slightly cheaper	9	18%
5	A lot cheaper	10	20%
Total		50	100%

Source:Primary Data

INFERENCE:

From the above chart it is inferred that 22% of respondents felt that cost of all the furniture is same and 18% of respondents felt that Ratna furniture is slightly cheaper.

FINDINGS

- The study reveals 52% of respondents like to run an own business.
- Most of the customer 42% of respondents like the colour and design.
- Majority 28% of respondents using ratna furniture for 5 years.
- The customer brand awareness is highly associated with educational qualification which isimplied by inferential testing and t value 0.314 that is statistically not associated value at five percentage level of significance. Hence the hypothesis is accepted

- From the study 50% of respondent's prefer variety of product. The study analysis 44% of respondent purchase in yearly basis.

The customer purchase behaviour in Ratna furniture is moderately associated with marital status which is implied by inferential testing and t value is 0.514 that is statistically not associated value at five percentage level of significance. Hence hypothesis is accepted.

- Majority 90% of respondent's customer expectation are satisfied.
  According to 34% of respondent buy at ratna product.
- It is found that 22% of respondent felt that cost of all the furniture is same.
- It understood 74% of respondent stick to the same product.
- The customer satisfaction level of the product quality is not associated with an age which is implied by inferential testing in the significance value is 0.745 that is statistically not associated value at five percentage level of significance. Hence the hypothesis is accepted.
- It study reveals 94% of respondent satisfied with the product range.

SUGGESTION AND RECOMMENDATIONS

The industry have to promote their business to large extend through social media platform also. They are available in instagram but they are not responding immediately to the customers. This may lead the customer to switch to new brand. They also face stiff competitive environment so they should increase the production and marketing strategy. Customers are expecting more for the customized product which should be unique from others. They should build a relationship with the customers frequently.

CONCLUSION

From this study it was found that customer having positive perception towards Ratna furniture. The inference which I have dawn will change from time to time in order to meet the competition in the market. The firm have a great trust on their customers and this firm is targeting to build a loyal relationship with them. They just don't want to break their bond with any bad reputation. This firm is very careful in all their move in product quality. The study on customer perception of Product Quality have completed successfully.

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A STUDY ON SOCIO ECONOMIC STATUS OF HOUSE MAID WORKERS IN LIONSTOWN AREA OF THOOTHUKUDI DISTRICT

G. Abina

PG Department of Economics, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

Women play a very important role in building a nation, which includes a part of a home maker. Women workers in India constitute one third of the total workforce. In India, majority of the women are engaged in the unorganized sector such as agriculture, construction, domestic service etc., Domestic work is largely considered as a female work and it has been in great demand. The women who are doing the homemaker service in the others house are known as domestic servant, workers and maids. Generally women do these types of works for their own and familial livelihood. The work expected from them may be part time or full time or around the clock. Since domestic work is not a skilled job it is an avenue of employment of poor, largely illiterate and semi illiterate women and they continue to persist in domestic work even without substantial rights and benefits.

Keywords:

Women workers, domestic work, housekeeper, household activities, Servant, illiterate women, cleaning activities.

Introduction

A housekeeper performs regular cleaning activities to maintain a sanitary and organized environment in public and private buildings. These professionals use a variety of supplies to perform these tasks, including chemical cleaning products and disinfectants. They may also use cleaning equipment, such as mops, vacuums, brooms, irons, laundry machines and dishwashers.

These individuals work in various settings, including private homes, residential facilities and commercial buildings. As a result, their cleaning responsibilities can vary based on their environment and employer. For example, housekeepers working in healthcare or hospitality settings may have to adhere to stricter cleaning and sanitation standards than those that work for families in private homes. Some housekeepers who work in private homes may also

perform other household activities, such as running errands or taking care of pets and children.

Typical tasks when working as a housekeeper

Housekeepers are primarily responsible for maintaining a clean environment. Some of their general tasks include:

- Using cleaning supplies to clean and disinfect areas
- Vacuuming, sweeping and mopping floors
- Dusting and disinfecting surfaces
- Polishing furniture
- Cleaning lighting fixtures
- Cleaning and changing bed and bath linens
- Cleaning and polishing interior windows
- Disposing of garbage and recycling materials

Servants:

"Servant" is a term that has been used very loosely. In England in the seventeenth and early eighteenth centuries the term covered all servants in husbandry—that is, both farm servants and domestic servants. Although now the distinction between live-in servants and day labourers who lived in their own homes and worked only part-time for an employer is clear, in earlier periods people did not distinguish between the two (Hill). Apprentices were frequently referred to as "servants," as were under tenants in the seventeenth century.

Servants have been largely invisible to historians of medieval and early modern art. Ignored in most art historical publications, erased from the titles of artworks, they have even been transformed into elite figures by conservators. Still, those who are only interested in the rich and the powerful cannot – or at least should not – ignore servants, as they play a critical role in constructing the ‘elite’.

Primary housekeeper duties

Housekeeping duties lists often include maintaining the cleanliness of places, such as houses, hotels, offices and commercial buildings. Housekeepers are often hired by agencies that are in charge of maintaining properties and assets, or they can be hired directly by individuals or hotels.

Housekeepers may also be called room cleaners, house cleaners or room attendants. They can begin working for companies as experienced cleaners, or their employer can train them in the tasks involved to ensure a high level of cleaning is consistently maintained. Housekeepers are typically responsible for the following tasks:

- Changing bed linen, washing used linen and making beds
- Emptying rubbish and recycling bins
- Vacuuming floors and carpets
- Sweeping and mopping floors
- Dusting, wiping and cleaning surfaces such as kitchen benches, cupboards, desks and sinks
- Cleaning and dusting lighting fixtures in bedrooms, living rooms and other areas
- Changing bath towels and linen, washing towels and neatly arranging towels, washcloths and bath mats
- Washing dishes, cleaning stovetops, fridges, ovens, coffee pots and restocking kitchen supplies.
- Restocking supplies such as toilet paper, body wash, bar fridges, tissues and shampoos.

Where can housekeepers work?

Housekeepers can work in various residential and commercial settings. The residential environments that employ housekeepers include private homes, senior living facilities, rehabilitation facilities and apartment buildings. They can also find employment at hotels, office buildings and hospitals. Housekeepers work directly for residential or commercial facilities or find jobs through cleaning agencies. These professionals may also consider working independently as freelancers or starting their own housekeeping businesses.

Housekeeper responsibilities

Because housekeepers can work in various environments, their job duties may differ depending on their place of employment. For example, some of the specific responsibilities of housekeepers working in private residences include:

- Maintaining general cleanliness of the home
- Changing and making beds

- Washing dishes and cleaning kitchen surfaces and appliances
- Washing, folding and ironing clothes
- Running errands for homeowners
- Caring for and walking pets as needed

Work environment for housekeepers

Much like their responsibilities, the work environment for housekeepers can differ depending on their place of employment. Housekeepers may find opportunities to work part-time or full-time schedules, with full-time requiring around 40 hours per week. Those that work in private homes often have regular weekday schedules. On the other hand, housekeepers working in commercial buildings may come in after typical work hours to clean office spaces. Housekeepers in the hospitality industry may work during the day, along with nights, weekends and holidays, to meet the demands of their employers.

Because housekeepers often use chemical cleaners, they follow specific rules to protect the safety of themselves and others. These activities may also require them to wear gloves and other protective clothing. Housekeepers may also spend part of their days travelling from one private residence to another or moving across different areas of a hotel or campus.

Training

Most of the training required for housekeepers is received on the job as each facility has individual objectives and needs to maintain a consistent standard. Hotels usually want to maintain a brand image by dictating precise details about the order and management of each room, so guests have an equal experience.

Objectives of the study

- To study the issues and problems of the sample respondents
- To study the working conditions of the house maid
- To know the socio-Economic of the sample respondents
- To know the monetary benefits of the sample respondents
- To know the responsibilities of the sample respondents
- To study about the cleaning activities
- To know the punctual of the sample respondents

Methodology

This is a survey study that makes use of the descriptive survey design. Respondents in this study were 120, who are working in Lionstone area in Thoothukudi district in order to access their socio – economic status. As the researcher herself desires to go personally to ascertain the problems of maid servants through a questionnaire which is specifically prepared for the study to elicit the intervention.

The data collected in the study were both quantitative and qualitative in nature. The data were analyzed using frequency and percentage distribution. Secondary data was collected from literature related the study, books, journals, websites etc. To explore this issue, computed a set of stable matches that would be predicted to arise from the observed in the set of information collected.

Limitation of the study Area

- For the study purpose only maid servants of lionstown area of Thoothukudi district.
- The research survey completely based on the opinion of the household owners.
- The study majority considers the primary data

Signification of the study

A domestic worker not only provides the service to the needy persons of the society but also uplifts their family in all grounds. Domestic servants are proved to be a necessity for non working house wives. For the illiterate and women of poor educational status the domestic work or the house maid work is among the most convenient and comfortable job for the women society. In urban areas the people appoint the domestic workers for carrying out their household work. But at the same time the problem faced by these maid servants often remains hidden and gets ignored.

These were some of the underlying concerns that gave birth to the idea for this study. Hence the study mainly focuses to the socio economic status and the problems faced by domestic servants**.**

Results and discussion

S. No	Items	Particulars	Numbers	Percentage
1	**Age**	20-25	25	21
		26-30	45	38
		31-35	22	18
		40 above	28	23
2	**Sex**	Male	25	21
		Female	95	79
3	**Marital Status**	Married	85	70.83
		Unmarried	5	4.16
		Single Parents	30	25
4	**Education Qualification**	Illiterate	50	41.6
		Primary	44	36.6
		High school	26	21.6
5	**Working area of the specialization**	Mopping and sweeping	20	17
		Washing cloths	30	25
		Cleaning and dusting	20	17
		Cooking	10	8
		All	40	33
6	**Working Time**	Full time	20	16.7
		Part time	40	33.3
		Neutral	60	50
7	**Number of working house**	Single house	50	41.7
		Double house	40	33.3
		More than two houses	30	25

8	**Per day working hours**	2hrs	37	30.8
		3hrs	55	45.8
		4 hrs	28	23.3
9	**Income**	Below 2000	38	31.6
		3000	35	29.1
		5000	27	22.5
		Above 6000	20	16.6
10	**Holidays (Per Month)**	1day	58	49
		2 days	34	28
		3 days	28	23
11	**Festivals Bonus**	Yes	85	66.7
		No	45	33.3
12	**Sufficient income**	Yes	50	42
		No	70	58
13	**Frequency payment**	Daily	65	54
		Weekly	30	25
		monthly	15	13
		As their wish	10	8
14	**Monetary benefit**	Saree/cloth	65	55
		Grocery	30	25
		Old things	15	12
		Food left over's	10	8
15	**Irritating work**	Special occasion	60	50
		Festival time	40	33
		Guest on the house	20	17
16	**Living status**	Own house	60	50

		Rent house	40	33
		Least house	20	17
17	**Primary Reason for the work**	Supporting to the family	60	50
		Children's educations	20	17
		Future demand	40	33

Findings, suggestion and conclusion

Findings

- Majority of the sample respondents are belong to the age group of 26 to 30.
- Majority 79% of the respondents are female.
- 70.83% of the respondents are married.
- Majority 41.6% of the respondents are illiterate.
- 60.8% of the respondents are Hindu.
- Majority 33% of the respondents working in all the categories (Mopping and sweeping, washing clothes, cleaning and dusting, cooking).
- 50% of the respondents working in as their wish.
- 41.7% of the respondents working in single house.
- Majority of the respondents are working in 3hrs per day.
- Out of 120 sample respondents majority of 31.6% of the respondents. getting income below Rs. 2000 per month.
- Majority 49% of the respondents maximum getting leave only one per month
- 66.7% of the respondents getting Bonus
- Majority 65% of the respondents getting receiving their payment weekly ones
- 55% of the respondents getting monetary benefits
- Majority 50% of the respondents working period (same house) above 6 years continuously
- 50% of the respondents getting work pressure on the special occasion time
- The maximum number of the respondents living in their own house

- Maximum 50% of the respondents given primary reason for this work for supporting family
- Majority 58% of the respondents not getting enough hours this work

Suggestions:

- To improve the working conditions and quality of life of the workers in the unorganized sector in general and house maid workers in particulars, the minimum wages policy should be implemented strictly in all segments of the unorganized sector including house maid labors so that income security is maintained.
- The majority of the workers in the unorganized sector including domestic workers do not receive social security benefits.
- The government should initiate to provide for social security benefits to these workers.
- Salary for the holidays should be paid to the domestic workers.
- During festivals, the domestic worker should be helped financially and with various gifts that will benefit their family.
- The domestic workers should be treating fairly and given the same respect as we enjoy in the society.
- Domestic help is an important aspect in today's busy life- Central Social Welfare Board should strictly implement some regulations to safeguard their right and resolve their critical problems.
- It is difficult to find and retain good domestic helpers- organize proper skill development programs for domestic workers.
- Apart from the various challenges that a domestic worker faces, uniformed absenteeism, irregular timings, expectation of payment during leaves are also some of the problems faced by domestic workers.
- Domestic workers experience exploitative wages and poor working conditions, and are more vulnerable than employees in conventional workplaces.
- As the domestic workers are an unorganized lot, it is recommended to bring them under one roof and request the Government to pass laws to protect their rights and dignity.

Conclusion

In view of the above and the entire research, it is important to consider domestic workers as an important part and parcel of our everyday lives. Hence they should be treated with a sense of humanity and their dignity should be preserved by all the owners. As they are meted out with an unfair treatment, I strongly recommend a fair law and act will help the society to look at them with solidarity and then only the dream of being one will ever come into reality. The demand of maid labors among middle and upper class people in Thoothukudi district has been drastically increased because of scarcity of time and lack physical fitness among house wives. The most of the migrant women from lower socio economic background work as domestic laborers. Maid servants in lion stone area have very poor educational status.

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A STUDY ON CONSUMER SATISFACTION ON SWIGGY WITH SPECIAL REFERENCE TO PON SUBBAIYA NAGAR OF THOOTHUKUDI DISTRICT

S. Abinaya Sumathi

PG Department of Economics, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

Customer satisfaction is a term frequently used in marketing. It is a measure of how products and services supplied by a company meet or surpass customer expectation. Customer satisfaction is defined as 'the number of customers, or percentage of total customers, whose reported experience with a firm, its products, and its services exceeds specified satisfaction goals. In researching satisfaction, firms generally ask customer whether their product or service has met or exceeded expectations. Thus expectations are a key factor behind satisfaction. When customers have high expectations and the reality falls short they will be disappointed and will likely rate their experience as less than satisfying. The online ordering system can be defined as a simple and convenient way for customers to purchase food online, without having to go to the restaurant. The system is enabled by the internet that connects the restaurants or the food company on one hand, and the customer on other hand. Therefore as per this system the customer visits the restaurant's app or website, browses through the various food items, combos and cuisines available there and those ahead and selects and purchases the items he or she needs. These items will be then be delivered to the customer at his or her doorstep at the time they choose by a delivery person. Payments for such online orders can be made through debit cards, credit cards, cash or card on delivery or even through digital wallets.

Keywords

Customer satisfaction, debit cards, credit cards, digital wallets, Restaurant, mobile, advertisement, marketing strategies, application.

Introduction:

Swiggy is one of the India's most valuable and largest online food delivery platforms. Swiggy was founded and established in Bangalore in 2014 and since then it has been growing and expanding its business throughout the nation. In 2019 it has further expanded its business into general products also under the name Swiggy stores. Presently Swiggy is operating in

almost 100 cities all over the nation. September 2019, Swiggy further decided to expand and launched the idea of quick pickup and dropout service under the brand name Swiggy Go. Under Swiggy go the company was dealing in picking and dropping variety of items like laundry, parcel or documents to various customers and business clients. Swiggy has started its business with only 25 partner restaurants and 6 delivery executives. Now Swiggy has almost covered all major cities including Mumbai, Delhi, Pune, Hyderabad, Bangalore, Kolkata and Chennai. Today they have 12000 partner restaurants and 13000 delivery executives. India is young developing country and has lot of potential which is yet untapped. Food business is one of them. Covering that gap Swiggy and is growing day by day and expanding business to large scales.

Swiggy is a food delivery app in India

Yet another popular and credible food delivery app in India is Swiggy and also offers on-demand delivery of groceries. This initiative of Swiggy is under the name Instamatic and is quite useful for getting fresh supply of household products. They also offer instant package delivery service and is known as Swiggy Genie.

Swiggy was founded in 2014 and has its headquarters in Bangalore. Currently, Swiggy operates only in India and serves in over 300 cities across the nation. Restaurant partners have to pay 18 to 23 percent of their sales revenue to Swiggy for being a part of their system.

Technology has played a key role not only in transforming the food delivery services but also has made its contribution in changing the customer's preference. Dependency on technology has motivated all the customers to carry out online transactions. Be it online shopping, online banking, or even online food ordering with the advancement in technology, food ordering and delivery service online portals are becoming popular day by day. Today food ordering service can be easily carried out with the help of smartphones. In present scenario, the business of food delivery services is considered to be one of the fastest growing segments of E-Commerce.

The communication between seller and the end customer now can be easily made with the help of such apps. The modern technology, convenience time saving, quick home delivery are some of the features which made todays customer to order even the food online. To match up with the expectations of the consumers, apps from google play store can be

installed and used in smartphones. Apps have provided the new facilities and services to the customers. The interest has been a great medium in changing the customers preference.

At present, technology has moved the today's customer to do everything on the internet. Ordering cooked meals to be doorstep of customers is the best example with a few click on the installed app in a mobile phone, customer can make any order from any place. The convenience feature and easy accessibility of app is the biggest determinant to the consumers to order food online. Even the time taken for the food to be delivered serves as a good reason for consumers to order food at their doorsteps.

Swiggy Revenue Model

Swiggy generates revenue through a number of ways. Let's take a look at each of the methods one-be-one:

1) Commissions

A restaurant has to pay a commission for every order that it receives through the Swiggy app. Roughly 20%-25% of the total order value is charged as commission from the restaurants.

2) Delivery Fee

A nominal delivery fee (including distance fee) is also applied on every order. This, too, fetches decent revenue to the food delivery company. Furthermore, these charges are higher during the times of "high demand" and "challenging weather" conditions.

3) Paid Promotions

You must have seen many promoted restaurants while browsing inside the app. These restaurants pay a fee to appear ahead of their competitors. These paid advertisements contribute a lot to Swiggy's revenue.

4) Instamart

SwiggyInstamart is a fast grocery-delivery system. It came into picture in the year 2020, a few months after the outbreak of the COVID-19 pandemic – a great business move at a time when people were hesitant to go out to buy groceries. The company claims to deliver

groceries within 15 minutes in 15+ cities where this service is available. Swiggy reportedly makes over a million instamart sales every week.

6) Swiggy One

In March of 2021, Swiggy revamped its Swiggy Super subscription service by breaking it into 3 parts – Binge, Bite and Bit. The benefits vary across the three programs as per the subscription plans. With Swiggy One, however, all the existing Swiggy Super Members will be automatically upgraded to the new program for the remainder of their subscription. Now, patrons can enjoy unlimited free deliveries, better discounts and other benefits. These subscriptions generate a good amount of revenue for the company.

Swiggy Marketing Strategies

Swiggy makes great use of digital marketing, especially social media marketing, email marketing and paid ads.

A) Social Media Marketing

Swiggy is very active on all social media platforms. Swiggy has come up with many interesting hashtags in the past, for example

1. Earn Your CheatMeal

2 .No Order Too Small

3 .Eat Your Veggies.

They also share humorous posts in which they spin-off the current trends into something that promotes the company's services and vision.

B) Email Marketing

Customers receive emails from Swiggy on a regular basis. The use amazing graphics, catchy slogans and jaw-dropping deals to garner consumer interest. These emails start getting particularly interesting during major events such as IPL, World Cup, Olympics, etc.

C) PPC Advertisement

The online food ordering and delivery company runs Google text ads and display ads to offer amazing cuisines to people searching for food on Google search. Then, Swiggy also

actively promotes mouth-watering dishes and restaurants to try through social media advertising on platforms such as Facebook and Instagram.

Swiggy Acquisitions

Swiggy has acquired many start-ups so far, here's a list of a few notable acquisitions made by Swiggy over the years:

1) The first acquisition that Swiggy made came in the year 2017 when it acquired Bengaluru-based Asian food startup, 48East.

2) Later that year, Swiggy acquired Mumbai-based Scootsy Logistics – a startup in the field of food and fashion delivery that was struggling to make a mark. It was, however, closed soon.

3) The company purchased milk delivery startup named SuprDaily in an all cash deal

Honours & Awards Received

- Swiggy became a member of the Unicorn club – Start-ups with a valuation of $1 billion – in just 4 years since it was founded
- Awarded with the Outlook Social Media Award in the year 2016
- Honoured with "Start-up" Award by Economic Times in 2017

Swiggy Top Competitor

Swiggy faces direct competition from one very strong rival and that is none other than, of course, Zomato. The latter has a very strong market hold in some cities, for instance, Chandigarh. According to a report in DNA, Swiggy receives a daily order volume of 1.5 million, compared to Zomato's 1.2 million. After acquiring UberEats, Zomato has expanded its business to 556 cities and towns. So the battle between these two food-delivery giants is getting fierce with each passing day.

Delivery Charges From Customer

What made Swiggy so popular is there is no minimum order policy. You can even place an order of less than Rs 100. However, you may feel that Swiggy is hurting its revenue doing so. But, no, they apply delivery charges. The delivery charges are nominal between Rs.10 to 20 if the order is less than Rs. 250

Swiggy often increases their delivery charges during the peak hours of the day, special occasions, rains, or midnight delivery. The customers love placing small orders, and Swiggygets delivery charges, so it's a clear win-win situation for both. So, money through delivery charges is one of the most crucial income streams for Swiggy.

Objective of the study

1. To know the consumer preference towards the usage of food delivery services.
2. To identify the factors which influences the consumer to order food online through mobile app.
3. To analyse the service competitive edge between zomato and swiggy.
4. To find out the most preferred online food delivery app.
5. To understand consumer rating towards the services provided by online food ordering apps.

Methodology

Nature of the study:

The study is descriptive as well as analytical in nature.

Nature of data:

Both primary and secondary data were used for the study.

Source of data:

Primary data are those collected for the first time and thus are original in character. Primary data was collected through well- structured questionnaire already taken from people of ponsubbaiya Nagar at Thoothukudi district.

Secondary data were collected from various websites, journal, books, etc.

Method of sampling:

Sample Random sampling was the method of sampling used.

Size of the samples:

The size of sample used for collecting the data is 125 respondents of the study area.

Tool for Analysis:

1. Sample percentage analysis.
2. Table, Charts and diagrams.

Result and Discussion

S. No	Items	Particulars	Numbers	Percentage
1	Age	Below-30	50	40
		30-40	25	20
		40-50	22	17.6
		Above-50	28	22.4
2	Sex	Female	42	33.6
		Male	58	46.4

		Others	25	20
3	Income	3000 – 6000	61	48.8
		6000 – 9000	28	22.4
		9000 – 12000	17	13.6
		12000 – 15000	10	8
		Above 15000	9	7.2
4	Expenditure	3000 - 6000	54	43.2
		6000 – 9000	24	19.2
		9000- 12000	28	22.4
		12000 – 15000	13	10.4
		Above 15000	6	4.8
5	Education Qualification	Primary level	26	20.8
		Secondary level	54	43.2
		Graduate	25	20
		Uneducated	20	16
6	Using food delivery app	Zomoto	60	48
		Swiggy	65	52
7	Experience level and their satisfaction (Feedback)	Extremely	60	48
		Good	35	28
		Bad	20	16
		Not at all well	10	8
8	Order for online food	Daily	25	20
		Weekly	75	60
		Fortnight	10	8
		Months in a once	15	12
9	Type of ordered	Biryani	40	32

	food			
		Fried Rice	30	24
		Meals	25	20
		Idle / Dosa/ Chappathi	10	8
		Snacks	20	16
10	Spending money per order	Less than 150	25	20
		Less than 250	65	52
		Less than 500	12	9.6
		More than 500	23	18.4
11	Rating of online food delivery	Faster Delivery	55	44
		Convenient	40	32
		Be on time	20	16
		Much better	10	8
12	Payment Method	Cash on delivery	45	36
		Online Payment (G- Pay, Phone Pay , Google Pay)	80	64
13	Facing Problems during ordering food	Delivery delay	41	32.8
		Service charges	32	25.6
		Lack of variety	29	23.2
		Change in orders	23	18.4

CORRELATIONS BETWEEN THE INCOME AND EXPENDITURE

Hypothesis:

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Chi-square formula is a statistical formula to compare two or more statistical data sets. The researcher had taken monthly income and expenditure of the sample respondents. The chi-square value in SPSS table value (22.281) is in significant as its P value .008 is less than 0.05. Thus the null hypothesis, there is no significant relationship between income and monthly expenditure of the respondents. By the respondents it is rejected at 5% significant level. Soitis concluded that there is no significant relationship between income and monthly expenditure of the respondents.

FINDINGS SUGGESTIONS AND CONCLUSION

Findings:

1. Majority 40% of the respondents are belong to the age group of below 30.
2. 46% of the respondents are males and 33.6% of the respondents are female and 20% of the respondents are others.
3. The maximum number of the respondent 48.8% monthly income is Rs. 3000-6000
4. Majority 43.2% of the respondents monthly expenditure is Rs. 3000-6000
5. 43.2% of the respondents are completed their secondary level of education.
6. Majority 52% of the respondents are using swiggy app.
7. 48% of the respondents according their feedback level about swiggy very extremely.
8. Majority 60% of the respondents
9. 32% of the respondents mostly ordering Biryani
10. 52% of the respondents per ordering amount is less than Rs.250.
11. Maximum 44% of the respondents give their feedback according to swiggy give faster delivery to the customer's food.
12. 64 % of the respondents using online payment mood method.
13. Majority 32.8% of the respondents facing the problem is delivery dela

Suggestions

- These food aggregator services are only popular in few cities, they need to expand into other markets and explore the unexplored cities
- Understand the needs and wants of customers.
- Understand the choice, taste, and preference of customers.
- Provide proper quality and efficient training to staff.
- Takeover or acquire other food delivery aggregators who are not doing well in the market.
- Attract customers by providing new offers, promotions and schemes.
- Conduct research and development on regular basis to see which yields benefits.
- Be aware of the competitors
- Come up with ways to retain the existing customers.
- Company should try to reach to people of other age groups.
- Company should take necessary steps to stimulate customers in repurchasing on a frequent basis.
- Swiggy should focus more on other promotional activities such as television advertisements.
- The company should focus on giving better quality product as most customers were very brand loyal and were generally satisfied with the product.
- The company should try to be competitive than other companies and try to establish a strong position in the market.

Conclusion

To better their delivery model Swiggy used technology in a creative way to power its delivery services. They first introduced their app from which customers could have thousands of different choices of food from different restaurants. They also integrate the Google Maps application program interface which lets the customers track their orders. All this user friendly interface and use of modern technology attracts more and more customers for the company and by this, Swiggy also lets the customers know that they keep on updating according to the times. An alternative solution is to expand their business model because of which the company image will also grow and it can be done by following some necessary steps like using a good customer management system, researching the competition etc.

From the case study, we can learn that Swiggy establishes itself in the market through various strategies using technology. Through these strategies they were able to grab the attention of the customers and looking through the customers perspective, it was an ease of access for them, since they got different varieties of food from different hotels. Swiggy managed to find the challenges and opportunities in the market when they just started their business. They understood the business environment and seized whatever opportunity that came their way and gradually started expanding their business. By this way, Swiggy's delivery model was a success in the market.

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SYNTHESIS AND CHARACTERIZATION OF NOVEL MORTIA-BAYLIS HILLMAN COMPLEXES AND IT'S APPLICATION

M. Agnes Mary and R. Pratheeba

PG Department of Chemistry, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

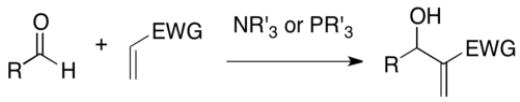
ABSTRACT

Novel Mortia-Bayllis Hillman adduct has been synthesized. The Baylis– Hillman adducts and their derivatives have been extensively utilized for the generation of heterocyclic and other cyclic frameworks. The most common catalysts in synthetic use are DABCO(1, 4diazabicyclo [2.2. 2] octane), quinuclidine, and cinchona-derived alkaloids, all of which have a tertiary amine nucleophile.We chose the MBH reaction between benzaldehyde derivatives and methyl acrylate derivatives using DABCO as catalyst. The synthesized compound were characterized by mass spectroscopy , functional group present in it by IR spectroscopy, further UV and fluorescence spectra support the formation of complexes with metal ions. The prepared MBH adduct forms complex with Zinc and Mercury ions. The formation of metal complexes extend its application as antibacterial compound in the biological field.

Keywords: Mortia-Baylis Hillman Adduct, Metal Complexes, Antibacterial Activity

1. Introduction

The **Baylis–Hillman reaction** is a carbon-carbon bond forming reaction between the α-position of an activated alkene and a carbon electrophile such as an aldehyde. Employing a nucleophilic catalyst, such as a tertiary amine and phosphine, this reaction provides a densely functionalized product (e.g. functionalized allyl alcohol in the case of aldehyde as the electrophile) [1] [2]. It is named for Anthony B. Baylis and Melville E. D. Hillman, two of the chemists who developed this reaction while working at Celanese. This reaction is also known as the **Morita–Baylis–Hillman reaction** or **MBH reaction**, as K. Morita had published earlier work [3] on it.

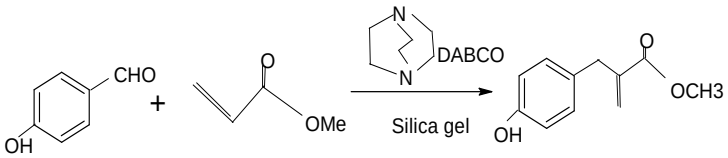


Due to the presence of -OH group it acts as sensor of certain metal ions. Also, most of the Morita Baylishillmann adduct act as antimicrobial or antibacterial agent by simple one pot synthesis. DABCO is one of the most frequently used tertiary amine catalysts for this reaction. In addition, nucleophilic amines such as DMAP and DBU as well as phosphines have been found to successfully catalyze this reaction.DABCO (1,4-diazabicyclo[2.2.2]octane), is a bicyclic organic compound with the formula $N_2(C_2H_4)_3$. This colourless solid is a highly nucleophilic tertiary amine base, which is used as a catalyst and reagent in polymerization and organic synthesis.[4]DABCO is used as a base-catalyst for-Formation of polyurethane from alcohol and isocyanate functionalized monomers and pre-polymers [5]. Baylis-hillmann adduct of aldehydes and unsaturated ketones and aldehydes.[6]

DABCO has more advantages than other organic catalysts because it is an inexpensive, nontoxic base, an ecofriendly and a highly reactive catalyst for building of organic frameworks, which produce the desired products in excellent yields with high selectivity. In chemical and biological defense, activated carbon is impregnated with DABCO for use in filters for collective protection system. [7]

2. SYNTHESIS OF COMPOUNDS

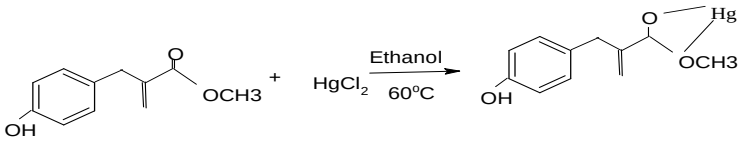
For the synthesis of MBH adduct, 5ml of methyl acrylate in presence of 2g of DABCO and stirred in magnetic stirrer for 30 minutes. Along with silica gel 5g of p-hydroxybenzaldehyde is added and slightly heated at 50℃ for about 30 minutes. The product was filtered to remove silica gel. The white precipitate is then recrystallized with ethanol, results in yield of 80%



PREPARATION OF COMPLEX USING MBH ADDUCT

Preparation of MBH-Hg^{2+}complex

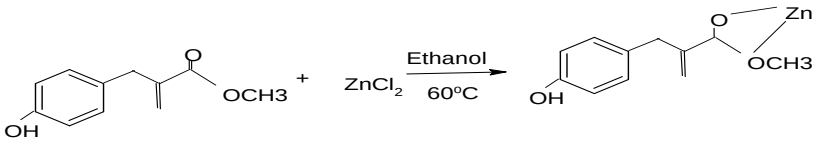
The recrystallized MBH adduct is reacted with $HgCl_2$, the ratio of 1:1 mole using ethanol as solvent and refluxed for about 1hour at 60^{o}C forms MBH-Hg^{2+} complex. The white precipitate obtained was recrystallized using ethanol.



Based on the stoichiometric ratio, the assumed structure of the complex is represented by the above equation, which is proved by fluorescence spectra and its calculations

Preparation of MBH-Zn^{2+}complex

The recrystallized MBH adduct is reacted with $ZnCl_2$, the ratio of 1:1 mole using ethanol as solvent and refluxed for about 1hour at 60°C forms MBH- Zn $^{2+}$ complex. The white precipitate obtained was recrystallized using ethanol.



Based on the stoichiometric ratio, the assumed structure of the zinc complex is represented by the above equation, which is proved by fluorescence spectra and its calculations.

3. Results and discussion

Mass spectra

The Electron spray Ionisation Mass Spectrometry (EMI-MS) was recorded in HP Agilent 5973, Chennai and the ESI-MS was performed in negative ion mode. The relative amount of each component of each compound was LC- MS chromatogram, using the area normalization method. The mass spectra of the MBH adduct are recorded in CH_3CN shown in Fig 3.1. The mass spectra reveal that the peak with m/z values corresponds to the fragmentation of receptors. [12]

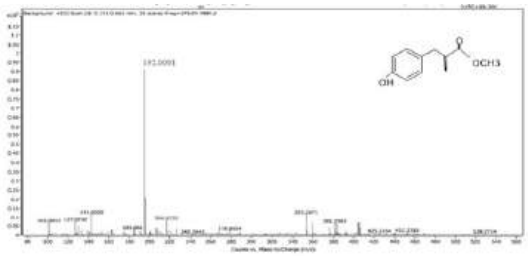


Fig 3.1 Mass spectrum of MBH

The mass spectra of the MBH was recorded in negative mode and the mass values were similar to that of the formula weight and are presented in the table 3.1 as given below. Thus, it is experimentally conformed the prepared sample is MBH adduct.

Receptors	**Molecular weight calculated**	**ESI-MS (found)**
MBH adduct	192	192.0091

Table 3.1 Mass spectral data for receptors

FOURIER TRANSFORM INFRARED SPECTROSCOPY (FT – IR)

The FT-IR spectra of MBH complex with Hg^{2+} and MBH Zn^{2+} as shown in Fig. 5.2. The data on the important infrared spectra bands of the MBH adduct, complexes such as MBH-$Hg^{2+}$and Zn^{2+}

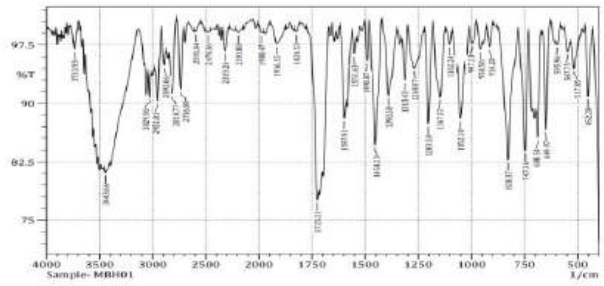


Fig 3.2 FT-IR spectrum of MBH

The characteristic band situated at 3029.96 cm^{-1} can be ascribed to the =C-H vibrations of the aromatics. The characteristic peak at 1597.91 cm^{-1} is assigned to the v(C=O) stretching mode. The bands in the region 1250-1000 cm^{-1} is due to carbon-carbon stretching vibrations in the aromatic ring. [13]

FT - IR spectrum of MBH- Hg^{2+} complex

The FT-IR spectrum of MBH complexes in Hg^{2+} is shown in Fig.5.3. The characteristic band situated at 3154.51 cm^{-1} can be ascribed to the =C-H vibrations of the aromatics. The characteristic at 1609.19 cm^{-1} is assigned to the v(C=O) stretching mode. The band in the region 1250-1000 cm^{-1}corresponds to carbon – carbon stretching vibrations in the aromatic ring. The band at 500.43cm^{-1} represent metal presence in our complexes.

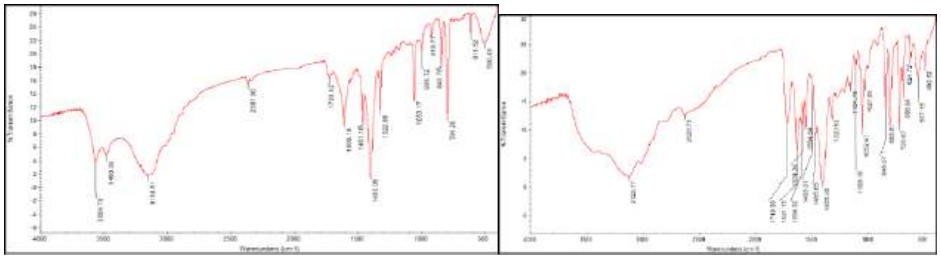


Fig 3.3 FT-IR spectrum of MBH-Hg^{2+} complex Fig 3.4 FT-IR spectrum of MBH – Zn^{2+} Complex

FT - IR spectrum of MBH- Zn^{2+} complex

The characteristic band situated at 3123.77 cm^{-1} can be ascribed to the =C-H vibrations of the aromatics. The characteristic at 1631.15 cm^{-1} is assigned to the v(C=O) stretching mode. The

band in the region 1250-1000 cm^{-1} indicates carbon – carbon stretching vibrations in the aromatic ring. The band 492.62 cm^{-1} corresponds to Zn^{2+} complexes with MBH adduct.

Receptor	**v(C=O) cm^{-1}**	**v(C-C) cm^{-1}**	**V(O-M) cm^{-1}**
MBH adduct	1597.91	1250-1000	-
Hg^{2+}	1609.19	1250-1000	500.43
Zn^{2+}	1631.15	1250-1000	492.62

Table 3.2 FT-IR spectral data for complex

UV spectra

The UV-vis absorption spectrum of the MBH is shown in the Fig.5.5 which reveals that the spectrum region 230-240 nm corresponds to the π-π* transition of C=C in aromatic chromophore and the intense absorption band is observed around 292-410 nm can be attributed to the π-π* transition resulting from the extended conjugation between the aromatic ring. [14]The UV-Vis data of MBH shows peak at 237,252,275,292nm

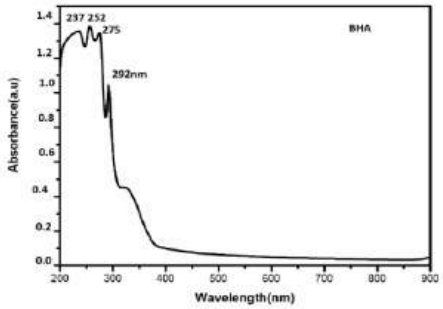
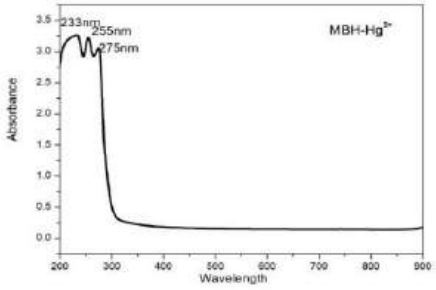


Fig 3.5UV-visible spectra of MBH adduct

UV spectrum of MBH- Hg^{2+} complex

The UV-Vis absoption spectrum of the MBH-Hg^{2+} is shown in the Fig 5.6 . After the complex formation of complex MBH –Hg^{2+} , the UV-Visable spectrum obtained a bathochromic shift due to the lone pair of electron present in the oxygen atom get bonded With Hg^{2+} ions.



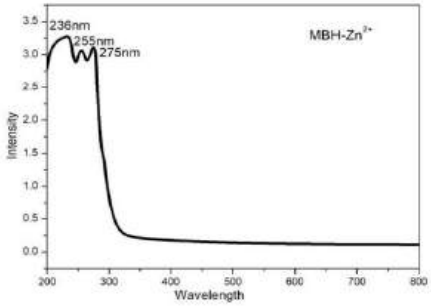


Fig 3.6UV-Visible spectrum of MBH – Hg^{2+} **Fig 3.7 UV-Visible spectrum of MBH- Zn^{2+}**

UV spectrum of MBH- Zn^{2+} complex

The UV-Vis absorption spectrum of the MBH-Zn^{2+} is shown in the Fig 5.7 which reveals that the spectral region 230-280 nm corresponds to the n-π* transition of carbonyl atom present in the aromatic ing. After the complex formation of complex MBH –Zn^{2+} , the UV-Visable spectrum obtained a bathochromic shift due to the lone pair of electron present in the oxygen atom get bonded with Zn^{2+} ions.

Receptor	**λmax**
MBH adduct	237,252,275,292
MBH-Hg^{2+}	233,255,275
MBH-Zn^{2+}	232,256,275

Table 3.3UV-Vis data of MBH complex

Stack UV- Visible spectrum of MBH, MBH-Hg^{2+} and MBH-Zn^{2+}

The comparison of UV-Visable spectrum of MBH adduct with MBH – Hg^{2+} and MBH-Zn^{2+} clearly shows the shift occurs after the complex formation.

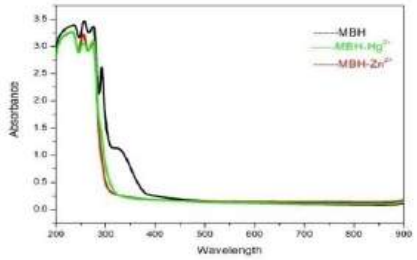
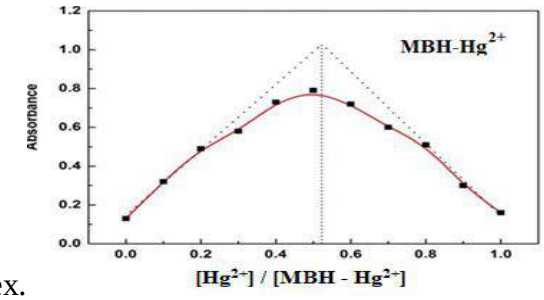


Fig 3.8 UV-Vis spectrum of MBH complexes for stack graph

Job's plot for complex formation

For 2.5 milli Mole(mM) of MBH and Hg^{2+}, Zn^{2+}ions from ($HgCl_2$, $ZnCl_2$), it forms a complex MBH- $Hg^{2+}$and MBH- Zn^{2+} in the ratio 1: 1 which is proved by Job's plot (Absorbance Vs Mole fraction of MBH – $Hg^{2+}$and MBH- Zn^{2+} complex). A value of 0.5 mole fraction from jobs plot indicates 1:1 ratio of ligand and metal complex.



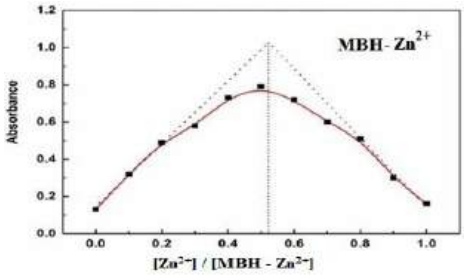


Fig 3.9 Job's plot for MBH – Hg^{2+}Fig 3.10Job's plot for MBH- Zn^{2+} complexcomplex

Fluorescence Spectrum

The cations binding behaviour of the MBH was also investigated by using fluorescence emission spectral studies. There was a strong emission band centered at range of 475 nm, when excited at λ_{ex} = 320 nm. By the addition of various cations, there was a significant increase in the emission intensity of MBH. This fluorescence enhancement could be ascribed to the increased photoinduced electron transfer (PET) process between the MBH moiety and the binding site [15].

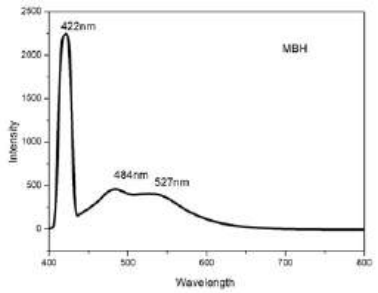
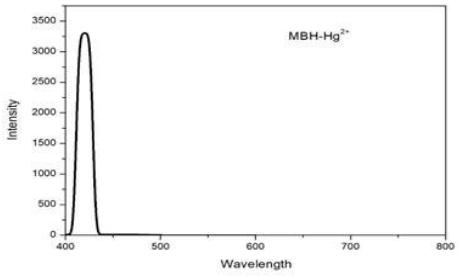


Fig 3.11 Fluorescence spectrum of MBH adduct

Fluorescence spectrum of MBH- Hg^{2+} complex

Fluorescence spectrum shows peak at 420 nm and a hump at 484 nm, 527 nm when excited at 320 nm, which indicates the emission occurs at 422 nm and a broad spectrum around 484nm



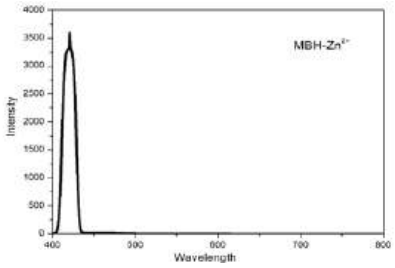


Fig 3.12 Fluorescence spectrum of MBH complex for Hg^{2+}

Fig 3.13 Fluorescence spectrum of MBH complex for Zn^{2+}

Fluorescence spectrum of MBH – Hg^{2+} complex

Once the Hg^{2+} ions forms a complex with MBH adduct, when excited at 320 nm, gives a emission spectrum with increased intensity 2250 to 3250 due to photoinduced electron transfer process. And the absence of hump at 484 nm, which indicates the complex formation of oxygen (lone pair of electrons) with Hg^{2+} ions.

Fluorescence spectrum of MBH complex for Zn^{2+}

Once the Zn^{2+} ions forms a complex with MBH adduct, when excited at 320 nm, gives a emission spectrum with increased intensity 2250 to 3250 due to photoinduced electron transfer process. And the absence of hump at 484 nm, which indicates the complex formation of oxygen (lone pair of electrons) with Zn^{2+} ions.

Stack Fluorescence spectrum of MBH, MBH-Hg^{2+} and MBH-Zn^{2+}

Comparative fluorescence spectrum of MBH, MBH-Hg^{2+} and MBH-Zn^{2+} indicates an increased emission intensity of complexes than MBH adduct. Also, the fluorescence nature of compound get enhanced after complex formation.

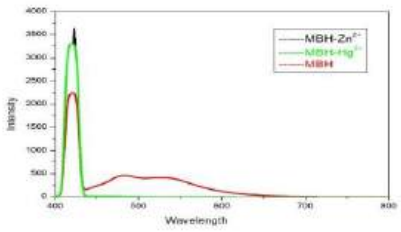


Fig 3.14 Fluorescence spectrum of MBH complex in stack graph

Antibacterial activity

The compound generated during the study gave satisfactory results against the susceptible Gram positive and the Gram negative bacteria including *E.coli, Staphylococcus aureus, Bacillus subtilis, Bacillus cereus, Pseudomonas aeruginosa*. The antibacterial activity of the two synthesised MBH complexes were evaluated using disc diffusion method and the

antibacterial efficacy was judged based on the zone of inhibition around the wells using Ampicillin as reference antibiotics.[16,17]

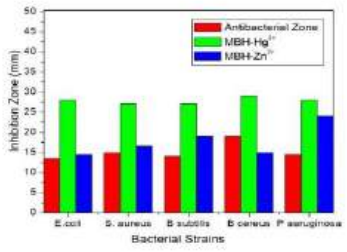


Fig 3.15 Comparative antibacterial activity of reference (Ampicillin) and MBH- Hg^{2+}, MBH – Zn^{2+}

Conclusion

The Hg^{2+} and Zn^{2+} complex was synthesied using Morita baylishillmann adduct. The prepared MBH complexes were characterized using several techniques such as UV-Visible, FT-IR, Mass Spectroscopy, and Fluorescence Spectroscopy. The prepared MBH complexes has excellent antibacterial activity.

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THE MOLECULAR DOCKING ANALYSIS OF ANTIHYPERTENSION DIURETIC

K. Ashmitha and C. Zozimus Divya Lobo

PG Department of Chemistry, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

Diuretics was a medication prefered in management and treatment of oedema,water retension, fluid retension, dropsy, swelling edematous and other non-edematous disease conditions. Diuretics are a class of drugs. This activity shows about the indications, action, and symptoms for diuretics as a valuable agent in treating heart failure, hypertension, abdominal dropsy, etc. Diuretics are used in the treatment of patients with heart failure and related conditions.Diuretic medication can help the person who are all suffering from high blood pressure, heart failure, renal failure, pulmonary edema,nephritic syndrome etc. In the current study, it was determined if isolated phytochemicals could bind to the desired protein. To do this, the ability of isolated phytochemicals to bind to the desired protein was assessed using the current investigation's 3D structure. For this, the target protein's (3-dimensional) structure was replicated using PYROX . The 3D model was then assessed and validated using the Ramachandra plot. Using the PyRx programme and reference compounds, the molecular docking of 23 phytochemicals classified as -blockers inhibitors was done in order to anticipate the binding processes of these drug-like molecules. They exhibited striking interactions with the target protein's active site residues and exhibited similarities to reference ligands, according to the results. In conclusion, the current work provided a computational foundation for the tested -blocker inhibitors. This knowledge should aid in the identification of novel pharmaceutical substances for the treatment of should be aided by this information. QSAR studies was not taken in this project.

Key words : Diuretics, Moleculardocking, Protein, Ligand, Heart disease, PyRx.

INTRODUCTION

Diuretics was a medication prefered in management and treatment of oedema,water retension, fluidretension, dropsy, swelling edematous and other non-edematous disease conditions. Diuretics are a class of drugs [1].This activity shows about the indications, action, and symptoms for diuretics as a valuable agent in treating heart failure, hypertension, abdominal dropsy, etc

Modern drug discovery involves the identification of screening hits, medicinal chemistry and optimization of those hits to increase the affinity, selectivity , efficacy/potency, metabolic stability and oral bioavailability[2]. Once a compound that fulfills all of these requirements has been identified, the process of drug development can continue. If successful, clinical trials are developed [3].

Using natural phytochemical compound diuretic protein can be combine using the molecular docking and the binding energy is obtained.Higher binding energy compound can be further taken for the study [4]

MATERIALS AND METHODS

TARGET SELECTION

The X-ray crystal structure of 1Z9X was retrieved from Protein Data Bank. The protein energy was analysed through Ramachandra Plot and conjugate by using SMILES of Swiss PDB Viewer and final energy minimized model was used for further docking studies.

PROTEIN PREPARATION

Load the protein and apply the force field. For docking studies, the protein 1Z9X loads from RCSB protein data bank (www.rcsb.org/pdb) and apply the force field. Field refers to the functional form parameter sets which are used to find out potential energy of a system.

Preparation of the Ligands

The chemically synthesized individual ligand compounds were sketched using ACD/ChemSketch (12.0) software and saved in (.mol) file format. The saved ligand compounds were later imported in PyRx and go to Minimization studies using minimize. After minimized ligands go to ligand preparation, then go for docking studies with ligand fit.

VIRTUAL SCREENING

The 3D structures of all the selected twenty threephytochemical compounds were virtually screened to reveal their binding efficiencies through docking in the predicted binding site usingPyRx-Python Prescription (version 0.8)

DOCKING INTERACTION

The docking interactions revealing H-bond and Vanderwaals forces among the

phytochemical compounds and the amino acid residues of were analyzed by PyRx-Python Prescription (PyRx).

RESULT AND DISCUSSION

TARGET SELECTION

The X- ray crystal structure of 1Z9X was retrieved from Protein Data Bank .The protein energy was analysed through Ramachandra Plot.The protein energy minimized through SWISS PDB minimizer and used for further docking studies.

LIGAND SELECTION

The SMILES notation of phytochemical compounds including alkaloids and flavonoids from various medicinal plants were obtained by drawing their 2D structures in ACD-Chemsketch (version 12.01). The 3D structures of these compounds were generated and converted into SDFformatby using Open Babel convertor and structure file generator server.

A Phytochemical Compounds from different Plant Sources

COMPOUND NAME	CID NO.	PLANT SOURCE
Niazirinin	10426197	*Moringa oleifera*
Sterol	1107	*Abutilon indicum*
Xanthines	1188	*Camellia sinesis*
Lactucopicrin	102242110	*Lagenaria siceraria*
Avenasterol	12795736	*Centratherum punctatum*
Niazirin	129556	*Moringa oleifera*
Hentriacontane	12410	*Iopomoea aquatica*
Allantoin	204	*Zeamays*
Beta-Sistosterol	222284	*Zeamays*
Coumarin	323	*Lagenaria siceraria*
Gallic acid	370	*Abutilon indicum*
Glycoprotein	439212	*Zeamays*
Lactucin	442266	*Lagenaria siceraria*
Quercetin	5280343	*Camellia sinesis*
Luteolin	5280445	*Cuscutareflexa*

BINDING SITE PREDICTION

The amino acid residues in binding site of 1Z9X protein are defined by using the reference ligand complexed in the retrieved PDB file. The amino acid residue within 6 Å radius ofference ligand was included in the predicted binding site by using PyRx-Python Prescription (version 0.8).

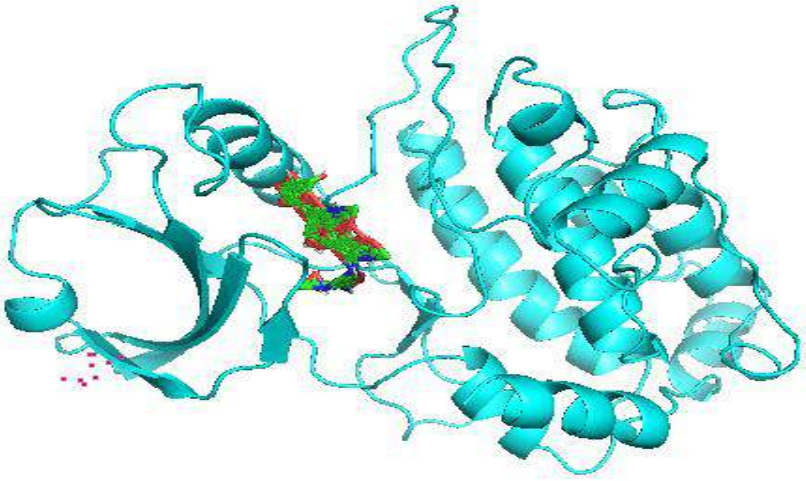
VIRTUAL SCREENING

The 3D structures of all the selected phytochemical compounds were virtually screened to reveal their binding efficiencies through docking in the predicted binding site using PyRx Python Prescription. Docking values for maximum number of solutions per interaction and also per fragmentations. The binding affinities with their docking scores are given in table.

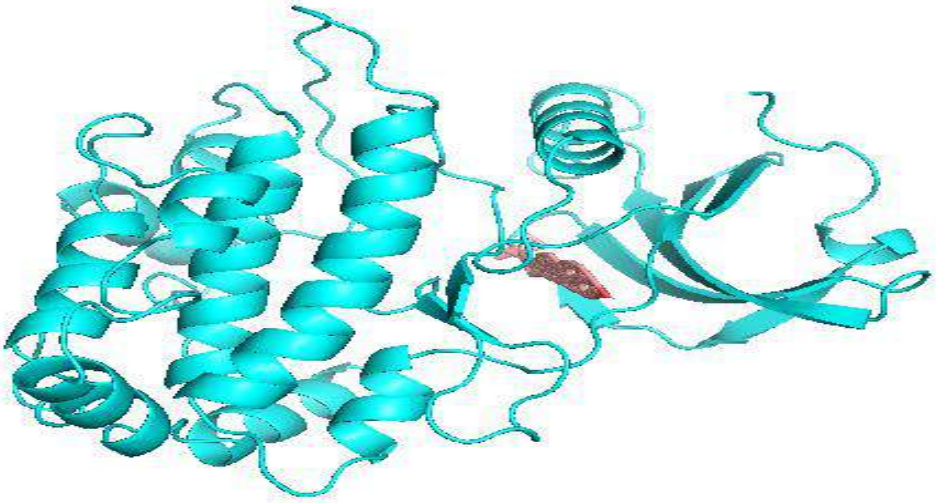
BINDING AFFINITIY OF PHYTOCHEMICAL BY USING PyRX

LIGAND	BINDING ENERGY (Kcal/mol)
Niazirinin	-9
Sterol	-10.9
Xanthines	-5.6
Lactucopicrin	-1.1
Avenasterol	-12
Niazirin	-8.6
Hentriacontane	-6.6
Allantoin	-5.4
Beta-Sistosterol	-12
Coumarin	-6.8
Gallic acid	-5.9
Glycoprotein	-12.1
Lactucin	-9.4
Quercetin	-9.2
Luteolin	-9.4

Docking Complex and interaction of Glycoprotein (CID 439212)



Docking complex and interaction of Avenasterol (CID12795736)



CONCLUSION

The 1Z9X a part of insulin that significantly controls sugars serves as a drug target for diuretics. Insulin receptor kinase complexed with an inhibitor 1Z9X was used explore the diuretic activity of 23 phytochemical compounds. In the present molecular modeling study results clearly demonstrated that Glycoprotein (-12.1kcal/mol), Avenasterol(-12kcal/mol),

Sterol (-10.9 kcal/mol) have similar binding sites and interaction with 1Z9X taken for the study and prove that dietary phytochemical compounds may possess properties of diuretic regulation.

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SYNTHESIS AND CHARACTERIZATION OF BIOPLASTICS FROM *ORYZA SATIVA L.INDICA* AND *SETARIA ITALICA*

P. Jemima and J. Antony Rajam

PG Department of Chemistry, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

Bioplastics are plastics that can be used just like conventional plastics but will disintegrate by the activity of microorganisms into water and carbon dioxide. Starch is a natural polymer material that can be used for bioplastic production. Due to the bio-degradability and renewability of biopolymers, petroleum-based plastics can be replaced with bio-based polymers in order to minimize the environmental risks. Bioplastics are biodegradable and biocompatible with humans and non-toxic to marine organisms. In this article, bioplastic were synthesized from Black rice (*Oryza Sativa*) and Foxtail millet (*Setaria Italica*) using vinegar and glycerol. This work focuses on the performance analysis of synthesized bioplastics by using solubility test in water and various solvents, swelling test, elongation test, degradability test in the natural soil and in the marine environment. Further characterization was done by using UV-visible spectroscopy, FT-IR, XRD and TGA analysis.

Keywords: Bioplastic, degradation, bio polymer, marine environment, swelling ratio, starch, elongation, solubility.

1. INTRODUCTION

The environmental problems caused by discarded synthetic plastics have paved the way for the search for substitutes. Bioplastics, which are both functionally similar to synthetic plastics and environmentally sustainable, are touted as promising new materials to address these problems [1]. Bioplastics are the term used to refer to plastics that are biodegradable, such as PCL or PBS; or may or may not be degradable but are produced from biological materials or renewable feedstock such as starch, cellulose, vegetable oils, and vegetable fat [2]. Like any other polymeric material, the degradability of bioplastics is also a factor of their composition, degree of crystallinity and environmental factors, leading to degradation times ranging from several days to several years. For these reasons, the development of biodegradable bioplastics has gained attention in recent years. Based on degradation mechanisms, there are two main categories of biodegradable bioplastics, namely oxo-biodegradable and hydro

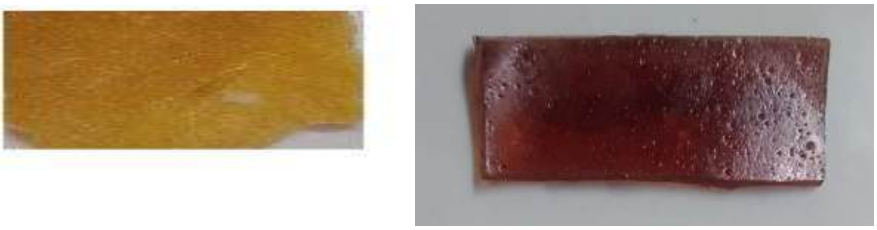
biodegradable [3]. Oxo-biodegradable plastics are made of petroleum-based polymers mixed with a pro-degrading additive that catalyzes the plastic's degradation process. The additive is a metal salt (manganese or iron salts), which enhances the abiotic degradation process of the oxo-biodegradable plastic in the presence of oxygen. Presently, oxo biodegradable plastics are mainly produced from naphtha, a by-product of oil or natural gas. Interestingly, the time taken by biodegradable oxo products to degrade can be programmed at manufacture, like the methane or nitrous oxide industrial processes [4]. The degradation of oxo-biodegradable plastics usually takes months to years. On the other hand, hydro-biodegradable plastics decompose hydrolytically at a rate faster than oxo-degradable plastics. These plastics can be converted to synthetic fertilizers. Examples include bioplastics produced from plant sources (such as starch), and polylactic acid (PLA). Auther summarize the most recent literature on different types of bioplastics that have been or are currently being developed [5].

2. METHODOLOGY

Preparation of bioplastic

3.5 g of black rice starch was dissolved in 10 mL of distilled water in a 50 mL beaker. To this, 5 mL of vinegar was added and stirred well. The beaker was then heated to 40°C in a hot plate. To this mixture, 4 mL of the plasticizer, glycerol was added and the mixture was heated in a hot plate for about 3-4 hours. The heating process was stopped when the mixture becomes thick paste. It was immediately poured and spread over the aluminum sheet, when it was hot. The care was taken to make the sheet with uniform thickness and exposed to sunlight for 2 days, so that it was dried completely. Finally the bioplastic films thus formed were peeled off from the aluminum sheet.

The similar procedure was also adapted for the preparation of bioplastic from foxtail millet. The prepared bioplastics was named as BRB and FMB from Black rice and foxtail millet respectively.



Bioplastics of black rice and Foxtail millet.

3. Characterization

The synthesized BRB and FMB were characterized using various methods like, water solubility test, solubility test in various solvents, swelling ratio test, degradation in soil degradation in marine soil and several techniques such as UV-VIS, FT-IR, XRD and TGA.

4. RESULT AND DISCUSSION

4.1.Solubility test in various solvents

The solubility of BRB and FMB in various solvents like water, Benzene, HCl, Toluene, Ethanol and Acetone was tested every 4 hours.

Table .4.1 Solubility % of BRB and FMB in various solvents

S. No.	**Name of the Solvents**	**Solubility %**	
		BRB	**FMB**
1	Water	68	70
2	Benzene	35	29
3	HCl	49	44
4	Toluene	26	20
5	Ethanol	1.25	1
6	Acetone	13	10.2

After taking the initial weight of the samples BRB and FMB were immersed in the various solvents. The solubility of the sample was calculated by using the formula and tabulated.

Solubility % = $[(W_o-Wf)/W_o] \times 100$

4.2. Elongation test

The elongation test was conducted for five samplesof same length of BRB and FMB .From the average of the measurements, the elongation at break of BRB and FMB was calculated.

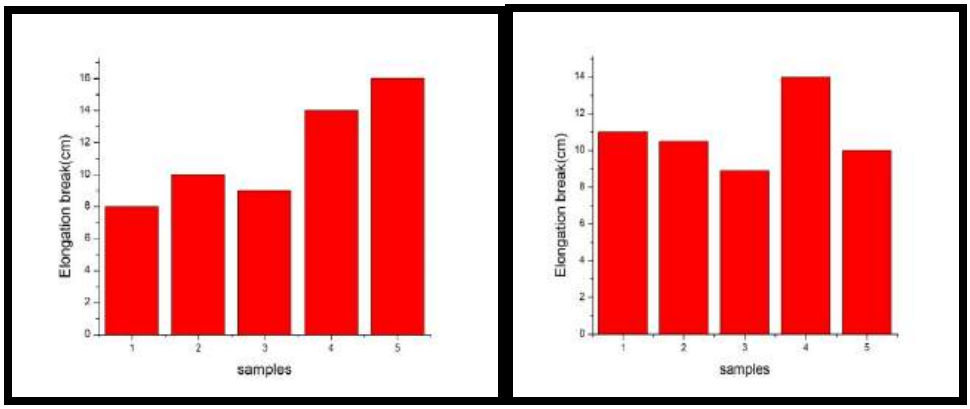


Fig.4.2.1 Elongation at break of BRB**Fig.4.2.2**Elongation at break of FMB

Hence the elongation at break of BRB was found to be 15.6 cm and FMB was found to be 13.8 cm.

4.3. Biodegradability test

Biodegradability of BRP and FMB in soil

The biodegradability in the soil was determined after 30 days.

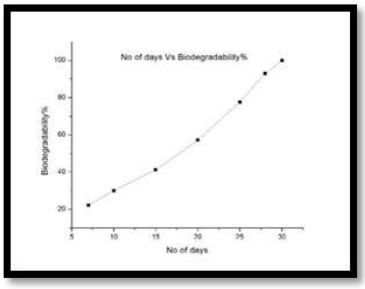
Biodegradability of BRB and FMB in soil

Table. 4.3.1. Biodegradability of BRP and FMB in soil

S. No.	Number of days	Biodegradability %	
		BRB	FMB
1	7	24	22.2
2	10	31.7	30.15
3	15	42.8	41.2
4	20	55.5	57.14
5	25	76.19	77.7
6	28	92.06	93
7	30	100	100

The weight loss of BRB and FMB in soil in different number of days. The initial weight of BRB and FMB was 0.63 g and it was reduced to 0.03 g on day 28 .On day 28 the biodegradability % for BRB was 92.06% and for FMB was 93%. The BRB and FMB completely decomposed after 30 days.

Hence the BMB and FMB have high degradability nature under the natural soil as well as marine soil, within a month.



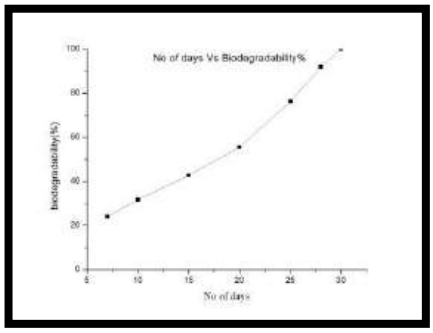
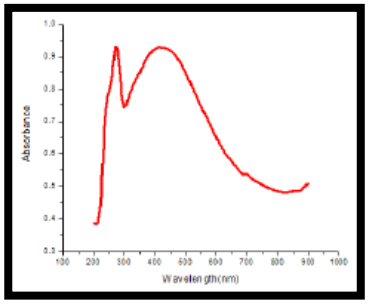


Fig.4.3.1 Biodegradability of BRB in the soil **Fig.4.3.2**Biodegradability of FMB in soil

From this we concluded that the BRB and FMB are good biodegradability behavior in the soil.

4.4. UV-Visible spectroscopy

The UV-Visible spectra of BRB and FMB were shown in Fig.4.4.1 & 2the spectrum was recorded in the range 200-900 nm. For BRB sample the maximum absorbance obtained at 560 mm and the FMB sample the maximum absorbance obtained at 414 nm this is similar to the UV absorption of starch based bioplastics. This indicates that the bioplastic has absorbance UV light especially in the UV-A region.



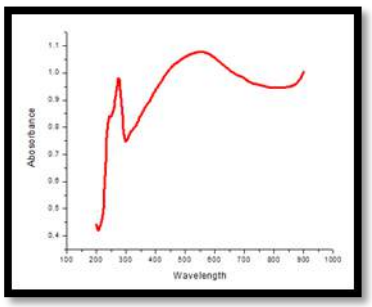


Fig.4.4.1 UV Visible spectrum of FMB Fig.4.4.2UV Visible spectrum of BRB

4.5. FT-IR BRB and FMB spectroscopy

The FT-IR spectra of BRB and FMB were shown in the figures 4.5.1 & 2in the spectrum of BRB, the sharp bands occur at 1033.85 cm-1 and 1018.41 cm-1 corresponding to the stretching vibration of C-O bond. The bands around at 3294.42 cm-1 and 3302.13 cm-1 are due to O-H stretching vibration of carbohydrate protein and polyphenols. The bands around 2939.52cm-1 and 2931.80 cm-1 can be referred to the C-H stretching vibration in the presence of alkane.

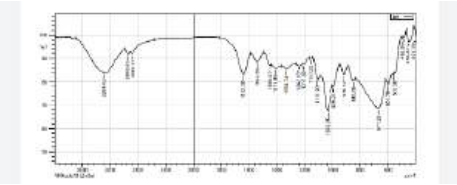


Fig.4.5.1 FT-IR Spectrum of BRB

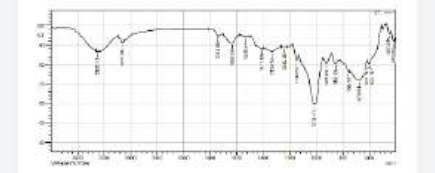


Fig.4.5.2 FT-IR Spectrum of FMB

4.6. Thermo gravimetric analysis

TGA is a precise method for examining the decomposition pattern and thermal stability of bioplastic.In BRB the first stage of weight loss is 35.1% at 30–300 °C and the second stage of weight lossis 43.9% at 300°C and 650 °C. For the initial phase of FMB weight loss with a significantly average rate of weight loss and a total weight reduction of about 36.5%, the second stage of weight loss occurs between 10 to 270°C. The main cause of first-stage weight loss is the evaporation of some of the free water included in sample BRB and FMB. Thus the BRB and FMB possess good thermal stability.

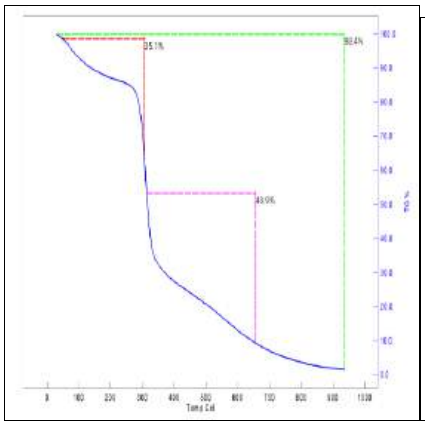


Fig.4.6.1TGA of BRB curve

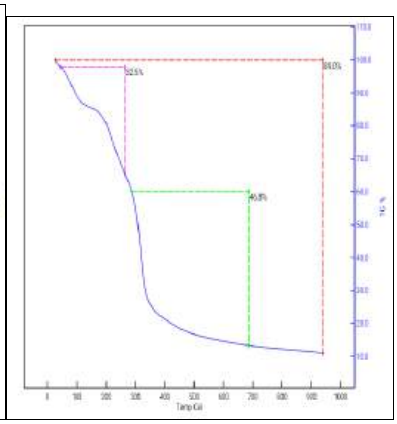
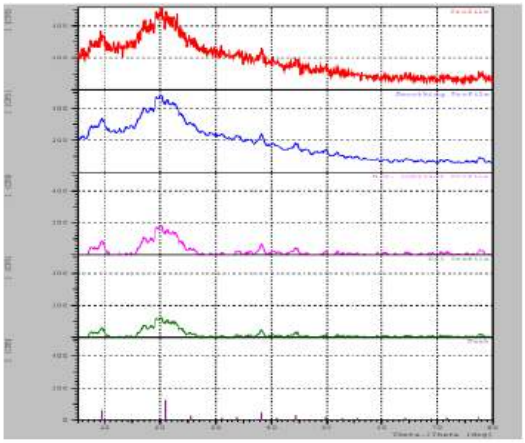


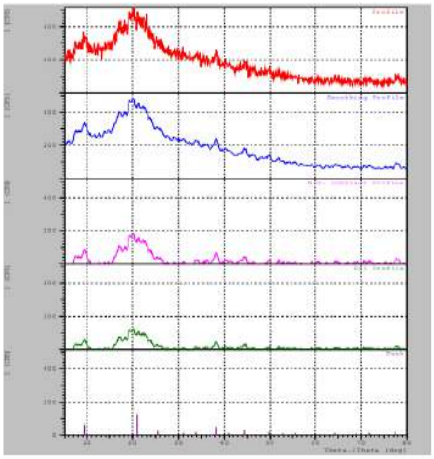
Fig.4.6.2 TGA of FMB curve

4.7.X-Ray diffraction

X-ray diffraction (XRD). This test was performed to information about the crystallinity by using Shimadzu 7000 X-ray diffractometer with CuKα radiation (λ = 1.5405 Å) was recorded between 15° ≤ 2θ ≤ 60°, operates at 30 kV and 10 mA. There are two components in sago starch namely amylose which has a linear chain structure and amylopectin which has a branch chain structure. The strongest peak of BRB was 20.5750, 16.2000 and 44.1000 are evident and FMB was 20.9363, 9.3250, 38.2800 are evident.



4.7.1 XRD for BRB



4.7.2XRD for FMB

5. Conclusion

BRB and FMB were successfully synthesized from Black rice and foxtail millet by using vinegar and glycerol. The quality of normal BRB and FMB, solubility test in various solvents, swelling ratio test, degradation test in natural and in marine soil and also they were characterized by using several techniques such as UV-VIS, FT-IR, ,TGA.

- Solubility test in various solvents was BRB has high solubility value of 68 % in water and very low solubility % of 1.25% in ethanol. Similarly FMB has high solubility value of 70% in water and very low solubility value of 1% in ethanol.
- Elongation at break of BRB was 15.6 cm and FMB was 13.8cm.
- The biodegradability test in the soil shows that the BRB and FMB completely decomposed after 30days.

- ❖ BRB and FMB successfully characterization studies of UV-VIS, FT-IR, TGA and XRD.

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ACUTE TOXICITY ANALYSIS AND ANTIDIABETES ACTIVITY OF *CISSUS QUADRANGULARIS*

Selzia.R and Joys Selva Mary Albert

Department of Microbiology, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT:

The present study was carried out to evaluate the safety of combined ethanolic extract of stem of *Cissus quadrangularis* by determining its acute toxicity administration in albino rats. Study on acute toxicity of extract found to be safe at the doses 2000mg/kg body weight. There were no significant changes in the characteristic or activity of the model. Lacrimation, salivation, piloeretion, stimulants, depression, paw-licking and convulsion were not observed in the study. It suggests that does not produce significant toxicity. Thereforethe extracts can consumed as traditional medicine, there is a wide margin of safety. Hyperglycaemia mediate oxidative stress plays a major role in the progression of diabetic complications. The study involved repeated administration of the drugs for 28 day, a serum glucose level estimated at 0,7,14 and 28 days. Glyburide time after glucose administration in minutes 0,1,2, and 4 hour. In subacute study, repeated administration (once a day for 28 days) of the Alloxanmonohydrate(150mg/kg) and glibenclamids(10 mg/kg) caused a significant reduction in the serum glucose level . In can be Concluded that ethanolic extract of *C. quadrangularis*has Acute toxicity and Antidiabetic.

Key Words: Aegle marmelos, *Cissus quadrangularis,* Traditional Medicine haematological, alloxan, glidenclamids, Wistar rats.

INTRODUCTION

The fundamental study of poisons is toxicity. Acute toxicity was defined by the Organization for Economic Cooperation and Development (OECD) as the adverse effect that develops shortly after oral administration of a single dosage of a chemical or repeated doses given within a 24-hour period. Poison phytochemical interactions cause harm to or death to living tissues Like to science, toxicology is both an art and a science. It comprises collecting and using observational data to forecast how exposure would affect people and animals. Some plants were classified by prehistoric humans as danThe strength of secondary metabolites, the amount consumed, the duration of exposure, the plant's various parts (root, oil, leaves, stem bark, and seeds), a person's body chemistry, the climate and soil, and genetic variations within the species have all been shown to affect a given plant's toxicity (Tülay, 2012). This

implies that medicinal plants should be handled carefully and toxicity research should be carried out to improve the population's awareness of the plant or plant preparation.Gerous and others as safe.To evaluate the toxicity of medicinal plants, in-vitro and in-vivo models are available. Moreover, histological or genetic alterations are the most pertinent markers for chronic or sub-chronic toxicity.Adverse responses to synthetic medications account for about 8% of all hospital admissions in the US. A minimum of 100,000 people every year pass away due to these toxins. Therefore, the toxicity of herbal remedies must be considered in its wider perspective (Haq I. 2004). For instance, steroid anti-inflammatory medications are typically used to treat serum arthritic, but these medications have numerous unsettling side effects. The use of plants to treat these disorders facilitates excretion through the kidneys, liver, and biliary systems; modifies food metabolism; moistens dry synovia; and stimulates blood flow in the affected areas, among other effects (Philomena *et al*.,2011). there must be a range of drug concentration that falls between these two extremes and provides a graded effect. (Gokhale *et al*.,2002). Another common side effect of ingesting plant materials is neurotoxicity.

Diabetes is a metabolic disease that affected 9.3% of adults worldwide in 2019. Its co-occurrence is suspected to increase mortality from COVID-19. The treatment of diabetes is mainly based on the long-term use of pharmacological agents, often expensive and causing unpleasant side effects (Prezor,*et al.*,2022). The disease is classified into type 1 and type 2 which occurs due to production of insufficient insulin or destruction of βcells.It is one of the common metabolic syndrome since three are 200 million diabetic individuals due to deficiency or abnormalities in insulin action (Dheepak Jha,*et a*l., 2018). The blood glucose level in normal rats is in the range of 85-132 mg/dl. Fruit powder of *C. quadrangularis* showed anti diabetic effect and hypolipedemic effect.The treatment was given for 15 days, after treatment a significant reduction was observed in fasting blood glucose level in diabetic treated but no hypolipidemic activity in normal rats.

MATERIALS AND METHODS:

CHEMICAL:

a) Alloxanmonohydrate Alloxan monohydrate was used as aqueous solution and given in the dose of 150mg/kg of body weight intraperitonially to induce diabetes.

b) Glibenclamide: Glibenclamide is an oral hypoglycemic agent and was obtained as gift sample from Alkem Laboratory, Mumbai. Suspension in distilled water was

prepared and administered in the dose of 10 mg/kg of body weight, orally, for standard comparison.

c) Diagnostic instrument Glucometer One Touch, Horizon, LIFESCAN, Johnson and Johnson Ltd. was used to determine the blood glucose level.

ANIMALS USED:

MaleAlbino rats weighing 190-210g were used in the experiments. They were maintained in standard environmental conditions of temperature (25±2ºC), relative humidity (55±10%) and 12 hrs dark/light cycle. They were fed with standard diet and water *ad libitum*

SAMPLE COLLECTION

The plant species namely *Cissus quadrangularis* stem were collected from Nagercoil, Kanyakumari district, Tamil Nadu.

PREPARATION OF PLANT

The plant werewashed thoroughly with water for 2-3 times to avoid unwanted debris. Theit was air dried in shade away from sunlight for 20-30 days. It was the ground to fine powder using electric mixer and stored in air tight container until further

EXTRACT OF PREPARATION:

Dried powder of the stem of *Cissus quadrangularis* was weight and it was subjected to Soxhlet extraction with ethanol (99.9%) used as solvent for up to 8hrs the extraction process was continued. The extract was air dried solvent was evaporated at room temperature in a flat tray for 24- 48 hrs. After evaporation the crude extract was collected and store at 4℃ for further analysis.

ACUTE TOXICITY:

Albino mice were divided into 14thday . The mice were fasted for 1hr and access only water ad lactimation before experiments study. 1 hr received only vechicle (distilled water). 2hr,3hr,4hr,24hr,8th day,14th day animals received with different dose of respectively. All the dose and vehicle were adminstered orally. The mice were observed continously for 2 hr for behavioral , neurological and autonomic profiles for any lethality or death for the next 8$^{th\ Day}$(Ravichandran *et al*.,2007)

INDUCTION OF EXPERIMENTAL DIABETES:

Albino rats were divided into five groups each containing five rats and were placed in separate metabolic cages. Except control group, the animals of remaining four groups were fasted for 24 hrs.

Diabetes was then induced by alloxan monohydrate (150mg/kg intraperitonially). It takes about 48hrs and after 48hours of diabetes induction the treatment was given. Group I served as control which received normal saline solution through oral route.

Group II served as diabetic control. Group III received Glibenclamide (10 mg/kg) and served as reference. Group IV animals received sample I aqueous extract orally at a dose of 400 mg/kg; Blood samples were with-drawn at 0hr, 1hr, 2hrs, 3hrs, 4hrs and 24hrs, after treatment, from retro orbital plexus and were analyzed for the blood glucose level, using glucometer. This study was continued for 21 days by taking readings randomly. Blood glucose level was read from digital display of glucometer with its customized test strips. A drop of blood obtained through retro orbital plexus was placed on inserted gluco strips on glucometer. The method is widely used in clinical practice and appears to be sensitive and accurate.

RESULTS AND DISCUSSION:

ACUTE TOXICITY STUDY

TABLE 6.1 Result of acute toxicity of ethanolic extract *Cissus quadrangularis* stem

Parameter	1hr	2hr	3hr	4hr	24hr	8th day	14th day
Appearance	N	N	N	N	N	N	N
Activity	P	P	P	P	P	P	P
Gait	N	N	N	N	N	N	N
Reaction to stimulus a) Sound b) Touch c) Light	 ++ ++ ++	 ++ ++ ++	 ++ ++ ++	 ++ ++ ++	 ++ ++ ++	 ++ ++ ++	 ++ ++ ++
Lacrimation	A	A	A	A	A	A	A
Salivation	A	A	A	A	A	A	A
Piloerection	A	A	A	A	A	A	A
Stimulant	A	A	A	A	A	A	A
Depressant	A	A	A	A	A	A	A
Licking of paw	A	A	A	A	A	A	A
Convulsions	A	A	A	A	A	A	A

N- Normal; A- Absent; P- Present; +=Present Minimum; ++= Present medium

Further research is absolutely necessary to determine the effectiveness and side effects of these treatments. The same is true for the combined ethanol extract of the stem bark of Cissus quadrangularis and the fruit pulp of Aegle marmelos. Because choosing which medicinal plants to utilise in the healthcare system should be based mostly on safety (Obici S *et al.*, 2008). Toxicological screening is done mostly on animal model in this study albino rats. Although the haematopoietic system is one of the most susceptible targets for hazardous substances and a crucial indicator of physiological and pathological condition in humans and animals, hematopoiesis and leucopoiesis were also unaffected (Harper HA, 1973), The level of dosage was increased from 50-2000mg/kg of body weight. There were no significant changes in the characteristic or activity of the model.The reaction to stimulation was positive with both extract up to 14 days. Lacrimation, salivation, Piloerection, stimulants, depression, paw-licking, and convulsions were not observed in the study. Futher analysis on concentration and dosage of the compounds present in this species can be evaluated.

ANTIDIABETIC STUDY:

Table 7.1: Effect of single dose treatment of Ethanolic extract

GROUP	**TREATMENT**	**DOSE**	**SERUM GLUCOSE (mg/dL)**			
			Time after glucose administration in minutes			
			0 hour	**1 hour**	**2 hour**	**4 hour**
I	Normal control	10ml/kg	95±0.48	95±0.48	95±0.48	95±0.48
II	Control	10ml/kg	234±0.85	234±0.85	234±0.85	234±0.85
III	Standard	10mg/Kg	204±0.85	204±0.85	204±0.85	204±0.85
IV	Ethanolic extract	400mg/Kg	280±1.18	285±1.18	282±1.12	275±1.08

Value are the mean of 3 observations ±SEM

Table 7. 2: Effect of repeated dose treatment of Ethanolic extract on glucose level in alloxaninduced diabetic rats

GROUP	TREATMENT	DOSE	SERUM GLUCOSE (mg/dL)			
			TIME AFTER GLUCOSE ADMINISTRATION IN MINUTES			
			0th day	7th day	14th day	21st day
I	Normal control	10ml/kg	95±0.48	95±0.48	95±0.48	95±0.48
II	Control	10ml/kg	234±0.85	234±0.85	234±0.85	234±0.85
III	Standard	10mg/Kg	204±0.85	154±0.16	130±1.02	92±1.08
IV	Ethanolic extract	400mg/Kg	280±1.18	270±1.16	200±1.12	180±1.08

Value are the mean of 3 observations ±SEM

Treatment with alloxan has the blood glucose level to a range of 250-270mg/dl after 5 days single dose of administration of extracts at 400mg/kg showed Significantly reduced blood glucose level at the 1st 2nd and 4nd hour after single dose administration in diabetes induced rats. Repeated dose administration with*Cissus quadrangularis*stemethanolic extract has progressively showed to reduce the level of glucose level contingent on time over a period of 3 weeks when compared to standard the glucose range of the *Cissus quadrangularis* compared to the standard found some inhibition from 7 to 21 days.

When comparing the standard Gibenclamideshowed 204±0.85% The ethanolic extract showed 275±1.80% respectively. The ethanolic extract showed activity less equal to standard in comparative manner.

CONCLUSION:

Swiss albino mice were used in the acute toxicity testing of *C. quadrangularis* at doses of 50–2000 mg/kg extract orally. The *C. quadrangularis* was exposed once via oral inhalation of an aqueous slurry, with water serving as the vehicle for the exposure. According to the study's findings, animals in all dose groups consumed the same amount of food and water and did not experience any changes in body weight. Even at the highest dose level of 2000 mg/kg for the extract of *C. quadrangularis stem*, there was no mortality noted. Reports were made regarding changes in body weight, food and water intake, and cage side observations. There is no indication of any toxicity. There was no mortality recorded even at highest dose level of plant material. The ethanolic extract of *Cissus quadrangularis stem* exhibits potent antidiabetic properties with further invivo and invitro studies the plants extract can be formulated into a potent antidiabetic drug.

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EVALUATION OF WOUND HEALING AND BLOOD CLOTTING POTENTIAL OF SPIDER WEB

MuhsinaThahira. M. A and Siluvai Kirubagari Aneeshia. C

Department of Microbiology, St.Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT:

Spider web has been used as bandages and gauzes to promote wound healing and stop bleeding since ancient times. The ointment made from spider web was tested for its wound healing activity in excision and incision wound models. A significant reduction in the wound area was observed in comparison to control. The tensile strength was measured by constant water flow technique and it was observed that the strength was higher for spider web treated incision wound than standard treated model. The wound healing may be due to the presence of proteins in the web. The blood clotting potential was tested with human blood and as it was observed that the web treated blood clotted faster than the untreated blood. The blood clotting activity may be due to the presence of vitamin K and its fine sized fibre.

KEY WORDS: Spider web, Excision wound model, Incision wound model, Blood clotting, Wound healing

INTRODUCTION:

Spider silk is made of fibre protein which is spun by spiders. Silk is usually made by spiders to make spider webs which act as a sticky net to catch prey or for other purposes. Some spiders do not spin web at all. The spider silk is said to be 5 to 6 times stronger than steel by weight, also stronger and more elastic than any known natural or synthetic fibre on earth [1]. Spider silk is secreted from the special abdominal glands of spiders. The silk quickly hardens (polymerizes) as it is spun. Spider silk is thin and soft. The protein present in spider silk is non-toxic [2].

Spider silk possess a variety of medicinal properties such as wound healing and so on. Due to its bio compatible, biodegradable, strong nature they can be used to make artificial tendons and ligaments, tissue repair materials, sutures. They doesn't cause any strong immune, inflammatory and allergic responses. This property is useful in curing slow healing wounds such as diabetic ulcers.

Wound healing is a physiological process which is multi factorial and complicated. Treatment strategies for wound healing include wound dressings, compression bandaging, debridement, negative pressure wound therapy, ultrasound, electrical stimulation, phototherapy, skin substitutes and so on. For this, natural bio materials of plant and animal origin can be used which own good medicinal properties [3]. Though wound repair is a spontaneous and self-sustaining response to damaged tissue, when the tissue has been damaged so severely that it cannot heal on its own naturally, there is a need for an appropriate material to augment the wound healing process [4].

Spider webs are thought to have great clotting potential due to its fine sized fibre along with bactericidal property [5]. The blood clotting potential of the silk may attribute to the rich vitamin k content of it [6]. It was observed that in and around Bokaro, Jharkhand, India people were applying spider web on small cuts to stop bleeding and healing of wounds [7]. The webs were also used as gauze pads to stop an injured person's bleeding hundreds of years ago [8]. Hence the use of spider silk as a natural biomaterial to heal wounds would be of great value.

In this study, *Crossoprizalyoni* that has adapted well in the human habitats was selected because of the high availability of spider silk which can be obtained from the environment.

MATERIALS AND METHODS:

Sample collection:

Spider webs were collected in the presence of the spider using sterile pipette to spool up the web around Thoothukudi in order to avoid sampling the wrong web for other closely related species.

Sample processing:

The collected spider webs were thoroughly washed and soaked in distilled water overnight, allowed to air dry and stored in an air tight container.

Wound healing activity:

The spider web was mixed with 0.1% NaOH and the high alkalinity of this was brought to pH 5.4 using acetic acid.Cream was formulated by using 10% extract (10g of sample was incorporated in 100g of cream base). A control ointment base was formulated without any drug content. The standard drug for screening the wound healing activity is Povidone iodine ointment (5%w/w) which was bought commercially.

Albino rats (150-250 g) of either sex were procured from the animal house, which were used for the present study. The Albino rats were divided into three groups of six rats. Group I rats were treated with simple ointment base (control). Group II rats were treated with a reference standard Povidone iodine ointment. Group III rats were treated with 10% sample ointment respectively.

a)Excision wound model:

The excision wound healing activity was studied by the method described by Farahpour and Habibi[9]. The skin area on the dorsal thoracic region of the mice was removed by using a suitable depilatory (Anne French hair removing cream) one day prior to the experiment. Alcohol (70%) was used as antiseptic for the shaved region before making the wound. The surgical procedures were carried out under sterile conditions. The experimental animals were anesthetized with anesthetic ether. After successful anesthesia mice were fixed in a dorsal posture on a surgery table. Circular, full thickness surgical wounds with diameters of 5mm, 1 cm away from the backbone were made using 5mm biopsy punch. Using this excision wound method, the epidermal, dermal, hypo-dermal and panniculuscarnosus layers were removed completely. After making surgical wounds, all mice were randomly marked using a non-toxic color. The animals were divided into the following three groups of six animals each (both male and female) and were treated as given below:-

Group I - Normal control group received petroleum jelly

Group II - Standard group received Povidone iodine ointment

Group III - Drug treated group received 10% w/w of Sample.

The drugs were topically applied daily until the formation of complete epithelial layer, starting from the first day of wound excision. All the animals were monitored daily and observed for any wound fluid, evidence of infection and any other abnormalities. The diameters of the wound were measured immediately by using verniercaliper.

The wound area of each animal was measured from the first day of wounding to the days (8^{th} and 16^{th}) until the healing was complete. The wound closure was measured at regular intervals of time to see the percentage of wound closure and epithelialization time that indicates the formation of new epithelial tissue to cover the wound.

The percentage of wound contraction was determined using the following formula:

Percentage of Wound

$$\text{Contraction} = \frac{\text{Initial day wound size} - \text{Specific day wound size} \times 100}{\text{Initial day wound size.}}$$

The number of days required for falling of the scar without any residual of the raw wound gave the period of epithelialization.

b) Incision wound model:

Animals were anaesthetized and para vertebral incisions (2.5-3.0 cm long) were made through the entire length of skin. After the incision was made, the parted skin was kept together and stitched with nylon thread at 0.5 cm apart with curved needle (No. 11). The test formulation, cream base and povidone iodine ointment were applied on wound once daily for 7 days. The sutures were removed on day 8 and wound tensile strength was measured on day 10 by using constant water flow technique.And the results for excision and incision wound model was tabulated.

Blood clotting activity:

About 0.005g of washed and dried spider web was taken in a clean test tube. Another tube was kept as control without adding any agent or sample. 1ml of human blood sample was added to each test tube immediately after taking it from the donor. The blood in the control as well as test sample was observed for clot formation every minute for five minutes.

RESULT AND DISCUSSION:

Wound healing activity:

Wound healing activity of the spider web sample was evaluated for excision and incision wound on wistar albino rats. The albino rats were divided into three groups of six animals,

Group I - Normal control group received petroleum jelly

Group II - Standard group received Povidone iodine ointment

Group III - Drug treated group received 10% w/w of Sample.

a)Excision wound healing:

For excision wound healing activity, the wound area of Group I, Group II, Group III albino rats was measured on the first day, 8th day, and 16th day. Percentage of the wound contraction was calculated using the formula

Percentage of Wound

$$\text{Contraction} = \frac{\text{Initial day wound size} - \text{Specific day wound size} \times 100}{\text{Initial day wound size.}}$$

And the results were tabulated. The results were expressed as mean ±SEM.

Table 1: Effect of topical application of sample on excision wound model

(Wound area mm^2)

Treatment	**% wound contraction in excision wound model**		
	0 day	**8th day**	**16th day**
Group I Control (simple ointment)	387.04±2.08	335.24±2.20 (13. 38%)	176.35±2.28 (54.43%)
Group II (Standard)	398.06±2.22	306.09±2.00 (23.10%)	38.14±0.65 (90.41%)
Group III (Sample 10%)	324.12±2.12	246.16±2.06 (24.05%)	112.18±0.85 (65.38%)

The wound area was 387.04±2.08 for group I, 398.06±2.22 for group II, and 324.13±2.12 for group III on the 0thday. The wound area was then measured on the 8thday. The spider web ointment showed significant reduction in the wound area. The percentage of wound contraction on the 8th day was 24.05% which was higher than that of the standard povidone iodine ointment which was 23.10%. The control group showed 13.38% activity. On the 16thday, the percentage of wound healing for group III was 65.38%. Though it is lesser than that of the standard which is 90.41%, the spider web sample does show excision wound healing activity.

b) Incision wound healing:

The tensile strength of the incision wound was measured on the 10th day for the three groups of albino rats by constant water flow technique. And the results were tabulated.

Table 2: Effect of topical application of sample on incision wound model

Treatment	**Tensile strength (g)**
Group I Control (simple ointment)	138.82±0.24
Group II (Standard)	108.22±0.26
Group III (Sample 10%)	122.24±0.16

The tensile strength of the incision wound of group III was 122.24±0.16g which is higher than that of the standard which is 108.22±0.26. But it was lesser than that of the control group, which is 138.82±0.24g.

Blood clotting potential:

The blood clotting potential of the spider web was investigated by adding 1ml of freshly collected human blood sample to a test tube containing spider web sample and 1ml of blood was added to empty tube which was kept as control. The blood in both tubes were observed for clot formation every one minute.

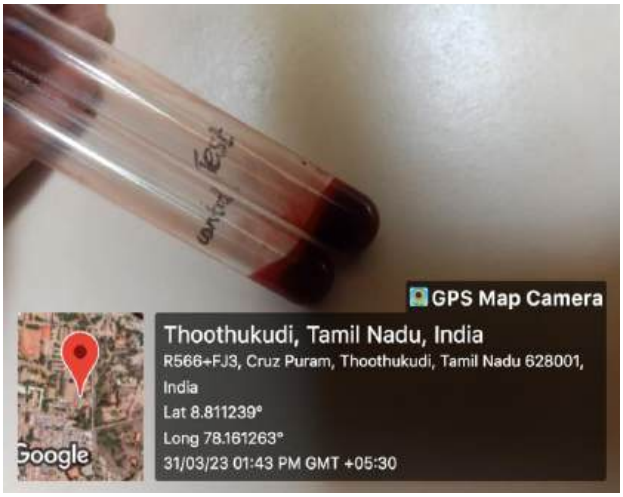

Figure 1: Test and control blood sample (duration: 4 minutes)

The blood to which the spider web was added clotted within three minutes, whereas control blood took around five minutes to clot. No clots were observed in both tubes in the first two minutes. Test blood showed slight clotting in the 3rd minute. In the 4th minute, the test blood clotted completely. The control blood clotted completely in the 5th minute, slight clots were observed in the 4th minute for control.

CONCLUSION:

Spider web possess a lot of potentials which will be very much helpful for humans in many aspects. This study revealed some of the medical applications of spider web. From the results, it can be concluded that the spider web exhibit good wound healing activity in excision wound model and the tensile strength was higher than that of the standard for incision wound model. The present study also concludes that the spider web possess blood clotting activity.This study paves the way for further attention and research to identify the bioactive compounds which are responsible for the medicinal properties of the spider web.

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BIOCONVERSION OF POMEGRANATE PEELS USING THE ISOLATED FERULIC ACID DEGRADING BACTERIA

Ajmal Rizwana A S and A. Maria Heartina Adlin Vaz

Department of Microbiology, St.Mary's College (Autonomous), Thoothukudi
Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract:

Vanillin is a phenolic aromatic aldehyde, naturally derived from the pods of *Vanilla plantifolia* which is a secondary metabolite of plants and the major organoleptic aroma component of natural vanilla. The intent of the current work was to exploit soil bacterial isolates to produce vanillin using solid-state fermentation (SSF), with pomegranate peel as the substrate because it contains a lot of ferulic acid. Following the initial screening of the bacterial isolates, a unique strain that produces a considerable amount of vanillin is added together with the pomegranate peels to the bioconversion medium. Using paper chromatography, a qualitative evaluation was conducted. This creates an alternative method for the production of this significant culinary flavor of food industry, which has the potential to become economically competitive in the foreseeable future. The microbial conversion of ferulic acid rich pomegranate peels to bio-vanillin offers a cost effective approach for the industrial production of bio-vanillin.

Keywords: bio-vanillin, ferulic acid, pomegranate peels, bioconversion, ferulic acid degrading bacteria.

Introduction:

Vanilla is an orchid that belongs to the Orchidaceae family which has its origin in Mexico [1]. The fragrance and the flavor profile of vanilla extract consist of more than 200 components, and the critical component is vanillin, which constitutes 1.0–2.0% *w*/*w* of dry weight in cured vanilla pods [2]. Vanillin, which is regarded as a secondary plant metabolite, is a crucial organoleptic component of the vanilla flavour. [3-5]. Natural vanilla is produced in roughly 2000 tonnes annually, however due to the expanding global market and growing popularity of natural flavours, the supply cannot keep up with demand. Just 1% of vanilla flavour is derived from a natural source the balance is made synthetically. However, due to the flavour's intricacy, only its primary component, vanillin, is made [6]. It is a simple

phenolic molecule and is classified chemically as an aromatic aldehyde (3-methoxy-4hydroxybenzaldehyde). Aldehyde, ether, and phenol are some of its structurally functional groups, and its chemical formula is $C_8H_8O_3$[7]. Vanilla is most often used in the food and beverage industry to flavour things like chocolate, ice cream, and coffee. It is also frequently utilised in the perfume and cosmetics sectors. Vanillin, the primary ingredient in vanilla flavour, is also utilised in the pharmaceutical sector to create medications including L-DOPA, dopamine, and papaverine. It is also employed as a food preservative because of its antibacterial and antioxidant properties [8].

Vanillin is naturally produced from the vanilla pods (*Vanilla planifolia*, *Vanilla pompona*, and *Vanilla tahitensis*), however the amount taken from the pods is insufficient for industrial use less than 0.5%. According to the literature, 12,000 tonnes of vanilla are consumed annually around the world, but only 50 tonnes of that is natural vanillin, which is extracted from vanilla pods since it is more expensive (1200-4000 $Kg) than chemically produced vanillin (15 $Kg).Several factors contribute to the high cost of natural vanillin, including the scarcity of vanillin pods, climatic variations, demanding cultivation and harvesting practices, manual pollination, pod maturation, and political and economic decisions [7,9].Nowadays, lignin and guaiacol are employed in chemical synthesis to make vanillin, which results in a lower-cost but cheaper product. The procedure is not only harmful to the environment, but it also reduces production because it lacks substrate selectivity [10]. Vanillin that has been chemically created has health risks, which has increased customer desire for natural vanillin production. So, according to U.S. and European legislation, biotechnology methods are deemed natural [11].

Bio-vanillin is defined as vanillin that has been obtained through a biotechnology process using natural precursors such as eugenol, isoeugenol, guaiacol, ferulic acid (FA), phenolic stilbenes, aromatic amino acids, creosol, sugars, vanillic acid, vanillyl amine, and waste residues that have been used to biotransform it by microorganisms or by isolated enzymes. Because it has a structural resemblance to vanillin, ferulic acid is an excellent precursor for the generation of bio-vanillin [12-14].Ferulic acid is a naturally occurring aromatic substance in plants, and it is also a component of the cell walls of many agricultural crops, making it possible to value agricultural waste, while avoiding the high expense of commercial ferulic acid [15].Ferulic acid can be found in a variety of foods, including fruits, vegetables, grains, leaves, and other agricultural products like beans, corn hulls, wheat, rice, and coffee seeds. Examples of foods that include ferulic acid include coffee, which contains

9.1–14.3 mg/0.1 kg, oranges, which contain 9.2-9.9 mg/0.1 kg, bananas, which contain 5.4 mg/0.1 kg, carrots, which contain 1.2–2.8 mg/0.1 kg, peanuts, which contain 8.7 mg/0.1 kg, and popcorn, which has 313 mg/0.1 kg [16,17]. It is released when treated with alkali or by using enzymes such as ferulic acid esterases and cinnamoyl esterase used in conjunction with glycosyl hydrolases present in the plant cell wall [18]. In order to get ferulic acid, several fruit by-products including pomegranate peels, banana peels, and orange peels were investigated. The reported amounts of ferulic acid were 1.55 mg/g [19], 0.61 mg/g, and 0.07 mg/g [20], respectively.The fruit and juice processing sector discards numerous fruit wastes, such as peels, seeds, and fruit leftovers [19]. An important environmental issue is how to dispose of these wastes.

In order to add value, the current study was created to make use of these fruit peel wastes. Ferulic acid rich substrate, *Punicagranatum* (pomegranate) was used to produce bio-vanillin using a novel strain isolated from the soil of banana plantation. Because the high cost of ferulic acid is a significant barrier to producing vanillin via a microbial process, fruit peels high in ferulic acid were used in this study.

Materials and Methods:

a)Collection of Soil

Two soil samples were collected at the region of banana tree plantation in Agastheeswaram, Kanyakumari and another from local areas in Thoothukudi in a sterilepolythene bag.

b) Collection of Substrates

Fruit peels of *Punicagranatum*(pomegranate) was collected. The fruit peels were rinsed, cut into smaller pieces, and oven-dried at 60◦C for 48 h. Then, divide it into two equal amounts and one half were grounded into a powder form by using an electrical grinder and another half remains as a peel that act as a source of ferulic acid.

c) Enrichment Culture

For the isolation of ferulic acid degrading bacteria, enrichment culture was prepared using the soil sample which was collected in a sterile bag. Then Ten gm of each wet soil sample was suspended in 90 ml of sterile distilled water and this soil suspension was used as inoculum for enrichment cultures. Prepare sterile nutrient broth (NB) 200ml (100 ml in a flask) and then each soil suspension was added separately in 100ml of nutrient broth (NB)

medium containing 0.3 g beef extract, 0.5 g peptone and 0.5% Nacl. Ferulic acid (1%) was added to the medium. Then the flasks were incubated at 30°C at 150rpm for 24hr.

d) Isolation of Ferulic acid degrading bacteria from Enrichment Culture

Prepare sterile nutrient agar plates and hundred µl of enrichment culture was spread on prepared nutrient agar plates using sterile L-rod and again incubated at 30°C for 24 h. After incubation the obtained visible colonies (CFUs) were streaked on a fresh agar plate to obtain pure colonies. From these plates three isolates were chosen for the next primary screening process.

e) Primary Screening for transforming strain

Prepare sterile modified M9 medium about 150ml (50 ml per flask). For primary screening, the isolated bacterial strains were separately inoculated and grown till growth phase in 50 ml of modified M9 medium (MM9), containing Glucose (0.25 g), $(NH_4)_2SO4$ (0.1 g), $CaCl_2.6H_2O$ (0.016 g), $MgSO_4.7H_2O$ (0.25), KH_2PO_4 (0.015 g), and $Na_2HPO_4.12H_2O$ (0.75 g) for 24 h at 30°C, and then 1% (1 ml) ferulic acid was added. A loop full of isolated bacterial strains approximately having 100-120 CFUs/ml was inoculated in each of the MM9 media with pH 7. Simultaneously, a control experiment was carried out with 1% (v/v) ferulic acid. After an additional 48 hr of incubation at 30°C, potential biotransformation products were separated by acidifying with 10 N H_2SO_4 and extracted with equal volumes of ethyl acetate. After centrifugation (3,000 rpm for 1 min) organic layer was separated and then used for paper chromatography analysis.

f) Biochemical and morphological identification of the isolated strain

After screening, the chosen strain undergone the identification process. The isolate 2 was morphologically and biochemically characterized (Gram test, Motility test, color and colony shape, IMVIC test, oxidase. Catalase, starch, gelatin, urease).

g) Bioconversion of ferulic acid

Two sets of basal medium about 200 ml (100 ml per flask) was prepared and ten ml growth culture of screened strain was inoculated into 250 ml flask containing 100 ml basal medium. The composition of the basal medium was (g/L) 20 g glucose, 8 g yeast extract, 0.2 g K_2HPO_4, 0.5 g $MgSO_4$, 1.3 mg $CaCl_2$.The pH of the media was adjusted to 6.5. and the bacterial strain along with the medium was incubated at 130 rpm at 30˚C for 24 h. After

incubation for the growth of organism, substrate was added to the medium. One was added with the pomegranate peel powder about 20g and another was added with the dried pomegranate peel substrate, and the substrate water ratio was set at 1:3 *w/v* using sterilized basal media. After addition of ferulic acid rich fraction to the medium the flasks were incubated for another 48 hr at 130 rpm at 30˚C for bioconversion of ferulic acid into vanillin.

h) Extraction of Bio-vanillin

The bioconversion medium was centrifuged at 10,000 rpm for 10 min to remove the biomass. Collect the supernatant and acidify it to pH 2 by using 6 N HCL. Then, phenolic compounds were extracted by adding 3 volumes of ethyl acetate to the acidified supernatant. After extraction process the sample was undergone the analytic methods.

i) Analytical methods

Qualitative analysis of vanillin production was done. For qualitative analysis of vanillin, paper chromatography method was used. Using sterile forceps, Whatmann filter paper was taken off and it was handled while putting on gloves. The chromatographic paper was then infused with 50 µl of vanillin samples (Whatmann). The butanol, acetic acid, and water (4:1:5 v/v) solvent system was used to fill the chromatographic tank and the paper was vertically placed in the tank until the solvent passed through a predetermined limit on the filter paper. The paper was then dried, and patterns were created by spraying diazotized para nitro aniline on it. In these circumstances, vanillin manifested.

Results and Discussion

Screening of Vanillin Producers

In the recent work, the aim was to isolate bacteria capable of converting ferulic acid to vanillin. To isolate significant vanillin producer, an enrichment culture was used.

From this 3 isolates were chosen and undergone primary screening. The colony morphology of the three isolates were depicted (Table 1). In primary screening the isolates were grown in M9 medium and then it was undergone acidification with 10 N H_2SO_4 and extracted with equal volumes of ethyl acetate which was then centrifuged at 3,000 rpm for 1 min to obtain the organic layer which was used for paper chromatographic analysis in which orange yellow spots was obtained which confirmed the production of vanillin by the isolate 2 (figure 1) and the Retardation Factor (R_f) value was calculated. The R_f value was **0.38.**Yataro Obata *et al.,* (1962) detected the phenolic compounds by chromatography using different spraying agents included the diazotized p nitroaniline.

Figure 1: Image of the isolate 2

TABLE 1 - COLONY MORPHOLOGY OF THE ISOLATES

CHARACTERISTICS	**ISOLATE1**	**ISOLATE 2**	**ISOLATE 3**
COLOUR	Powdery White	Glistening White	White
SHAPE	Circular	Circular	Circular
ELEVATION	Slightly raised	Raised	Raised
MARGIN	Entire	Undulate	Entire
SURFACE	Rough	Glossy	Rough
OPTICAL CHARACTERISTICS	Opaque	Translucent	Opaque

Identification of the Isolate

Morphological and Biochemical characterization was done to identify the isolate 2. This bacterium was isolated from the soil sample of banana plantation, Kanyakumari. It is a gram negative rod. Morphological and Biochemical characters of the isolate 2 are given in

Table 2. Based on the morphological and biochemical characterization the isolate 2 may be *Enterobacter*sp.

Bioconversion

Bacterial strain was grown in a 250 ml flask containing 100 ml basal medium (2 sets) at 30º C and after 24 h of incubation pomegranate peel wastes and its powder were added separately in each flasks containing basal medium at ratios of 1:3 w/v and again incubated for another 48 h at 130 rpm at 30˚C for bioconversion of ferulic acid into vanillin. After the incubation period, the fermented medium was centrifuged at 10,000 rpm for 10 mins and the collected supernatant was acidified with 10 N H_2SO_4. Then, phenolic compounds were extracted by adding 3 volumes of ethyl acetate.Tahir *et.al.*,(2022) demonstrated the vanillin production using different ferulic acid rich peels as a substrate which includes the pomegranate peel wastes.

TABLE 2 IDENTIFICATION OF THE ISOLATE

CHARACTERISTICS	**ISOLATE 2**
MORPHOLOGICAL CHARACTERISTICS	
GRAM'S STAINING	GRAM NEGATIVE ROD
MOTILITY TEST	MOTILE
BIOCHEMICAL CHARACTERISTICS	
INDOLE TEST	NEGATIVE
METHYL RED TEST	NEGATIVE
VOGES-PROSKAUER TEST	POSITIVE
CITRATE TEST	POSITIVE
OXIDASE TEST	POSITIVE
CATALASE TEST	POSITIVE
STARCH HYDROLYSIS	NEGATIVE
GELATIN HYDROLYSIS	NEGATIVE
UREASE TEST	NEGATIVE

Paper Chromatographic analysis

For qualitative analysis of vanillin, paper chromatography method was used. Using Butanol: Acetic acid: Water as a solvent system and Diazotized p-nitro aniline as a spraying agent. Orange yellow spot was obtained which confirmed the production of vanillin and the Retardation factor (R_f) value was calculated. The R_f value is about **0.36**.Uk Essays published a report on vanillin physiochemical properties and its production, uses in which the Rf value of vanillin was given as 0.35+/- 0.3.

Figure 2: Paper chromatography for qualitative analysis of vanillin production from the bacterial isolate.

Conclusion:

A novel strain was isolated from a soil sample of banana plantation which transformed ferulic acid rich pomegranate peels to bio-vanillin. Based on the morphological and biochemical characterization the isolate may be *Enterobacter*sp. The production of vanillin was confirmed by the paper chromatography analysis through the occurrence of orange yellow spot on the paper and from the calculation of R_f value the production of bio-vanillin was manifested. Further studies should be undertaken to confirmed the purity of the produced vanillin by HPLC and FTIR analysis. It is therefore concluded that the bio-vanillin can be synthesized at the industrial scale by using the cheap substrates.

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PIPER NIGRUM MEDIATED SILVER OXIDE NANOPARTICLES USING CARDIUM SEASHELL FOR BIO-MEDICAL APPLICATIONS

R.Anjutha and Padmavathi

PG Department of Physics, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

A simple and efficient method of Piper Nigrum mediated Ag_2O nanoparticles using cardium seashell for bio-medical applications was carried out by co-precipitation method .The resultant product was characterized by X-ray diffraction(XRD. X-ray diffraction confirmed the prepared nanostructured as Ag_2O and the grain size of the Ag_2O nanoparticles is 24nm.This co-precipitation method gives a large scale production of Ag_2O nanoparticles easily uniqueness of the research in this report is that nanostructures have been formed without any caping agents or surfactants. Two multidrug-resistant bacterial strains were used to determine antimicrobial activity by the well-diffusion method. Thusthe synthesized Ag_2O NPs were also used as effective microbicidal agents.

Keywords: Silver nanoparticles, Pepper extract,Antibacterial activity.

INTRODUCTION

Increased interest in small clusters of metal nanoparticles results from their exceptional properties due to their high ratio of surface area to size and unresidual surface energies, hence potentially applicable in different areas [1,2]. Silver nanoparticles (AgNPs) are definitely one of most widely used nanomaterials among all, which are used in catalysis, biosensing, antibacterial activity, drug delivery, surface enhanced Raman spectroscopy, optoelctronics, nanodevice fabrication, medicine, and textile fabrics [3–7]. Chemical reduction [8–11], photochemical reduction [12, 13], electrochemical reduction [14, 15] and heat evaporation [16, 17] are used for synthesis of nano inorganic particles, which are not environmentally friendly. Various existing chemical reductions have limited applications (for drug delivery or antimicrobial) due to the use of toxic reducing agents like sodium borohydride or formaldehyde along with stabilizers in harmful organic solvent [18]. Green synthesis of nanoparticles is now established as an emerging area of nanoscience research and development. Synthesis of nanoparticles using microorganisms or plants can potentially eliminate this problem by making the nanoparticles more bio-compatible. Use of plant extract for the synthesis of nanoparticles could be advantageous over other environmentally benign

biological processes by eliminating the elaborate process of maintaining cell cultures. Jose-Yacaman and coworkers first reported the formation of gold and silver nanoparticles by living plants [19, 20]. The above synthetic protocol by plant extract or biomass exemplifies the promising application of the green synthesis of metal nanoparticles. Very recently green silver nanoparticles have been synthesized using various natural products like green tea (Camellia sinensis) [21], neem (Azadirachta indica) leaf broth [22], natural rubber [23], starch [24], aloe vera plant extract [25], lemongrass leaves extract [26, 27], leguminous shrub (Sesbania drummondii) [28], latex of Jatropha curcas [29] etc. It is a well-known fact that silver ions and silverbased compounds are highly toxic to microorganisms which include 16 major species of bacteria [30]. This aspect of silver makes it an excellent choice for multiple roles in the medical field. Silver is generally used in the nitrate form to induce antimicrobial effect, when silver nanoparticles are used, there is a huge increase in the surface area available for the microbe to be exposed to. Though silver nanoparticles find use in many antibacterial applications, the action of this metal on microbes is not fully known. It has been hypothesized that silver nanoparticles can cause cell lysis or inhibit cell transduction. There are various mechanisms involved in cell lysis and growth inhibition [31]. In this present investigation, we reported a green method for the synthesis of silver nanoparticles using aqueous extract of pepper and non-toxic chemicals are used as reducing and stabilizing agent during the synthesis. We have also studied the catalytic and antibacterial activity of silver nanoparticles.

2. EXPERIMENTAL

2.1 PREPARATION OF SEA SHELL POWDER

The seashell was collected near the seashore of Muthu Nagar beach and the collected shells are cleaned under ultrasonicator for 3 hours .The cleaned shells are crushed, grinded, and makes into powdered by muffle furnace under 600℃ for 2 hours.

2.2 PREPARATION OF PIPER NIGRUM

20g of pepper was powdered using mixer .Then the 20g of pepper and 200ml of distilled water was boiled at 100℃, the extract was filtered to obtained pure pepper solution.

2.3 PREPARATION OF SILVER NANOPARTICLES

First the beaker is washed thoroughly with ethanol.25g of seashell powder is dissolved in 125ml of pepper solution. Then the mixture is poured into a beaker and kept on a magnetic stirrer and stirred thoroughly for one and half hour at 70℃ heat is maintained and cooled. Then 21.233g of silver nitrate ($AgNO_3$) was measured in digital balanced and mix it with the beaker containing seashell and pepper extract. The mixture is stirred at 700rpm until the precipitate is obtained. Now the color of the solution changes from light brown to dark brown color. The sample is filtered and heated in hot air oven at 120℃ . The dried sample is placed in muffle furnace at 600℃ . The precipitate thus obtained is finely powered. Thus the Silver nanoparticles are obtained.

3. RESULTS AND DISCUSSION

3.1 Characterization using XRD:

The crystalline structure of the Ag_2O NPs was studied using XRD analysis, as shown in Figure. The crystalline existence and purity of as-prepared Ag_2O NPs were confirmed by studying the XRD pattern. The observed diffraction peaks observed at 2θ of 38.050, 44. 235, 64.395, and 77.332 were indexed to Bragg reflections (111), (200), (220), and (311), respectively. The XRD pattern was obtained as per the standard diffraction (JCPDS) file no: 04-0783 corresponding to the silver metallic nanoparticles of the crystalline face-centered cubic (fcc) planar geometry. The intensity of the peak corresponding to the (111) plane was greater than that of other planes, promoting the idea that Ag_2O NPs predominantly established along the (111) direction. Analysis of the X-ray diffraction (XRD) showed that most of the Ag_2O NPs were spherical. The average estimated crystallite size of the Ag_2O NPs estimated from the FWHM of the diffraction peak using the Scherer equation, $D = K\lambda/\beta\cos\theta$, was found to be 24 nm.

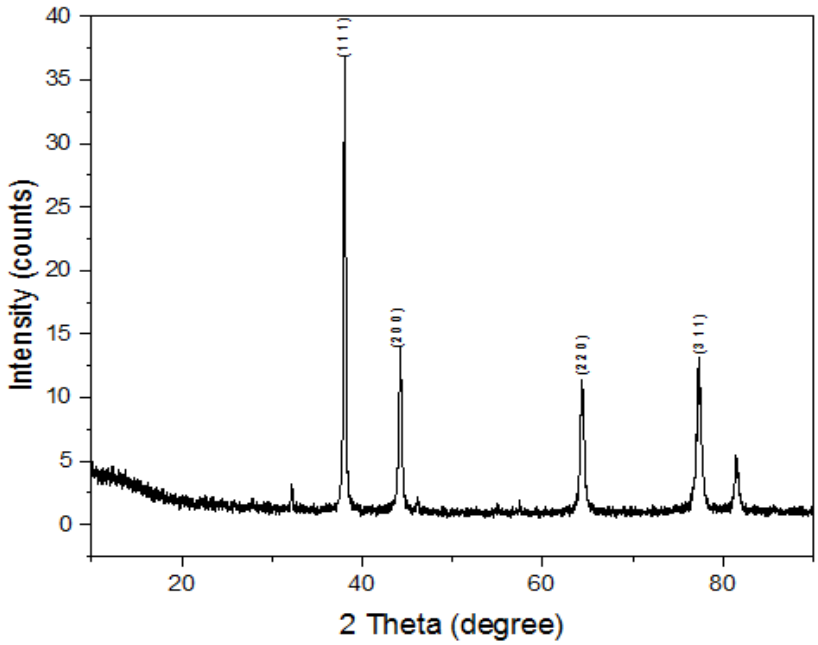


Figure3.1 XRD Pattern with hkl plane values.

3.2 ANTI MICROBIAL TEST(WELL DIFFUSION TEST)

The disk diffusion test which is also known as Kirby–Bauer test or diffusion test is a culture based microbial assay to check the susceptibility of any given sample or drug compound in drug discovery process and diagnostic setup. Agar well diffusion method is an extensively utilized procedure to assess the antimicrobial activity of any synthetic chemical molecule or plants/microbial extracts. The agar plate surface is inoculated by spreading a volume of the microbial inoculums over the entire agar surface. Then, a hole with a diameter of 6 to 8 mm is punched aseptically with a sterile cork borer or a tip, and a volume (20–100 µL) of the antimicrobial agent or extract solution at desired concentration is introduced into the well. Then, agar plates are incubated under suitable conditions depending upon the test microorganism. The antimicrobial agent diffuses in the agar medium and inhibits the growth of the microbial strain tested.

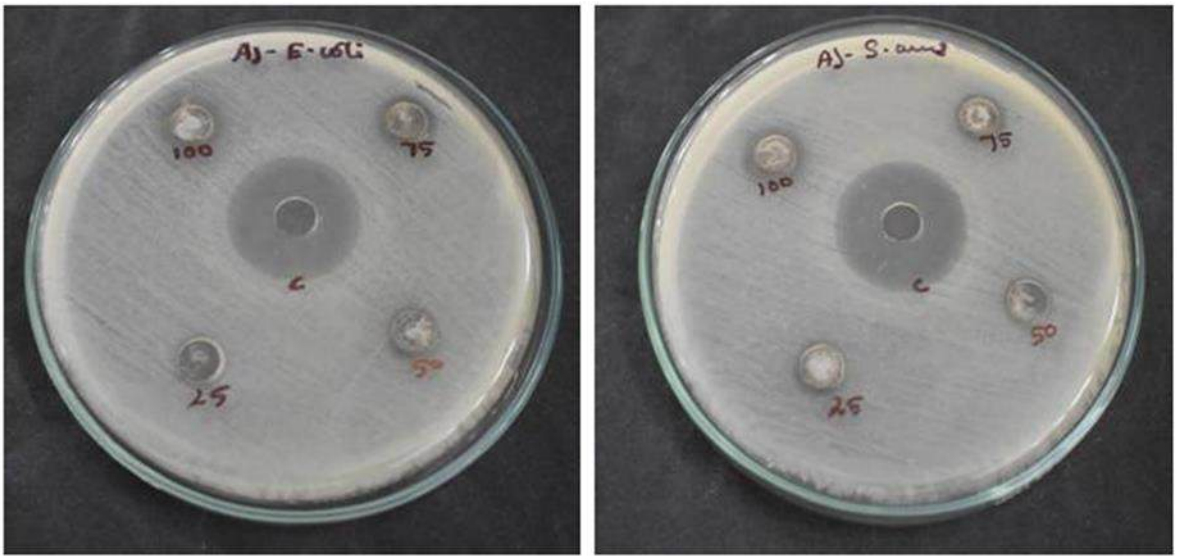
The Nutrient broth media and agar were autoclaved. The sterile media was used to culture the bacterial cells overnight at 37 °C. The autoclaved NB agar were plated on a standard petri dish and let to cool down. Once the agar is solidified, both the*E. coli* (ATCC 10536) and *S. aureus* (ATCC 25923)and were spread plated using a L-rod on to the NB agar plates. Sterile well cutter was used to punch in holes on the agar plate. 100 µl of the dissolved samples at different concentration were spread plated onto the punched in wells. To check the

antimicrobial activity of the given samples and the zone of inhibitions was tabulated below with the plate images. After the incubation period, the zone of inhibition was measured and reported in millimeters (mm). All assays were performed in triplicate. The extracts were dissolved in distilled water and Chloramphenicol was used as control.

Table 3.2 Antibacterial activity of the synthesized Ag_2O NPs

S.No	**Strain**	**Concentration level (µl) Zone of inhibition (mm)**				
		Control	**25**	**50**	**75**	**100**
1.	*E. coli*	20	-	11	13	15
2.	*S. aureus*	22	10	10	12	14

Figure 3.2 Microbicidal potential of synthesized Ag_2O NPs.



4. CONCLUSION

We have developed a green method to synthesize silver nanoparticles using the aqueous extract of pepper. Here pepper extract acts as both reducing and stabilizing agent.Ag_2O is one of the most useful metal oxides, which has many applications in different fields. A very remarkable and effective Silver Oxide nanostructured material is prepared using the simple co- precipitation method without any surfactants.Strong peaks in XRD pattern specify the

preferential crystal plane of the nanostructures. The grain size of the Ag_2O nanoparticles is 24nm.The well diffusion method was used to assess the antibacterial behaviors of the fabricated Ag_2O NPs that were assessed against a group of bacteria. It is a mixed group of various bacterial species and genera such as E.coli and S.Aureus having resistance to variety of antibiotics. Four holes were made in agar plate at four different concentration of Ag_2O NPs of 25 µl, 50 µl, 75 µl, 100 µl .The zone of inhibition was estimated by means of evaluating the diameter of the inhibition zone around Ag_2O NPs. Silver nanoparticles may be used in effluent treatment process for reducing the microbial load, industrial and medical application.

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EFFECT OF DESPOSITION CYCLES OF AS-DEPOSITED ZnO THIN FILMS PREPARED BY SILAR METHOD

M. Mohamed Shifana and A. Nirmala Shirley

PG Department of Physics, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

ABSTRACT

Zinc Oxide (ZnO) is an important material for various applications in electronics, optoelectronics, biomedical and sensing. ZnO thin films were prepared by SILAR Method for various depositioncycles. Zinc Chloride and Distilled Water were used as cationic and anionic precursors for the thin film. ZnO thin films were grown by optimizing the concentration of cationic and anionic precursors of immersion cycle and immersion time. The crystal structure of the films was studied by X-Ray Diffraction. Optical properties were studied by Photoluminescence. Effect of deposition cycles on structural and optical properties were reported.

KEY WORD

ZnO, Thin films, optical properties

1.INTRODUCTION

Being a part of nanotechnology, a thin film is a layer of material ranging from fractions of a nanometer (monolayer) to several micrometer in thickness. Thin refers to the value less than about 1 micron (10,000 Å, 1000nm). Thin films are formed mostly by deposition using either physical or chemical methods. Thin films with both crystalline and amorphous structure, have immense importance in the era of high technology. Thin film materials are the key elements of continued technological advances made in the fields of semiconductor, microelectronic devices, magnetic thin films in recording devices, magnetic sensors, gas sensors, antireflective coatings, photoconductors, IR detectors, interference filters, solar cells, polarizers, superconducting films, anticorrosive, decorative coatings piezoelectric devices, transparent electrodes, solar cells, and photo catalyst .

There are various methods to deposit semiconducting thin films such as chemical bath deposition (CBD) [1], vacuum evaporation [2], electro deposition, chemical vapor deposition [3], molecular beam epitaxy [4], pulsed laser deposition [5], thermal evaporation [6], etc. Among them CBD appears to be very suitable method for a large scale fabrication of the

semiconducting thin films. The main advantages of this method are that it is a low-cost method and do not require any sophisticated instruments, and films can be prepared at low processing temperature [7].

In this project, we deal with the preparation and characterization of ZnO. The ZnO is extremely an attractive replacement material for indium tin oxide due to its good optical and electrical properties coupled with the low cost, non-toxicity and abundance in nature of Zn. In this work, Zinc Oxide thin films were coated by SILAR method and its structural, and optical properties were studied.

2.METHODLOGY

2.1 SYNTHESIS OF ZINC OXIDE THIN FILM.

One of the modern chemical deposition methods is successive ion layer adsorption and reaction (SILAR) method. Generally, this method consisted of two important processes, namely adsorption of ion onto the substrate and reaction of the adsorbed ion layer will be observed.

ZnO thin film were prepared by SILAR method using glass substrates. Before deposition, substrates were cleaned in acetone or ethanol. Later they were rinsed with distilled water**.** For this deposition, cationic precursor was prepared by dissolving 0.1M of Zinc Chloride and 4g of Sodium Hydroxide in 100ml of distilled water. The precursor solution was stirred thoroughly using magnetic stirrer .The anionic precursor was made of 100ml of Hot distilled water maintained at 70-80℃. Well cleaned glass substrates were dipped into solution of Zinc Chloride for 10s. It was then immersed in the hot distilled water for 10s. This formed one SILAR deposition cycle. Films were deposited by repeating SILAR cycles for 40,60 and 80 times.

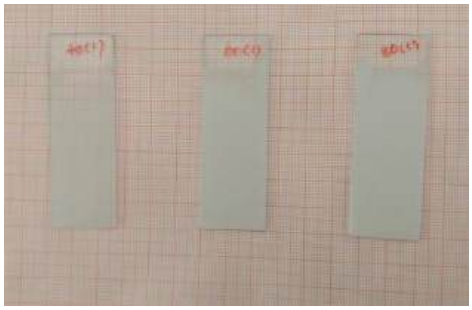

Fig 2.1 ZnO thin film

3. RESULT AND DISCUSSION

3.1 XRD PATTEREN OF ZnO PREPARED BY SILAR METHOD

To study the structural properties of the deposited ZnO thin films X-ray diffraction (XRD) study was carried out. Fig 3.1,3.2,and 3.3 show that XRD pattern of ZnO deposited by SILAR Method for different deposition cycles of 40, 60 and 80 respectively. The observed XRD pattern show the prominent peak (002) plane orientation for all the films prepared by different deposition cycles. However film deposited with 80 cycles show well defined peak with high intensity compared to films prepared at 40 and 60 deposition cycles. All diffraction Peaks of the ZnO thin film correspond to the characteristic hexagonal wurtzite structure of ZnO thin films. The observed 'd' values were compared with standard 'd' values using joint Committee on Powder Diffraction Standards (JCPDS card no 36-1451).

The crystallite size of thin film were calculated from XRD patterns by using Scherrer's formula given below

$$D=k\lambda/\beta \cos\theta$$

Where,

D = Crystallite size

K = Constant

β = Corrected FWHM of the most intense peak

θ = Braggs angle Using these formula grain sizes can be determined.

The dislocation density has been calculated using crystallite size, by the equation

$$\text{Dislocation} = 1/D^2$$

The microstrain has been calculated by the given formula,

$$\text{Microstrain} = \beta \cos\theta/4$$

The lattice parameter calculated for ZnO by the given formula

$$1/D^2 = (4/3)\,[h^2+hk+k^2/a^2] + [l^2/c^2]$$

The lattice parameter has been calculated and reported. The grain size, dislocation density, micro strain and lattice spacing of ZnO thin film for various deposition cycles have been given below.

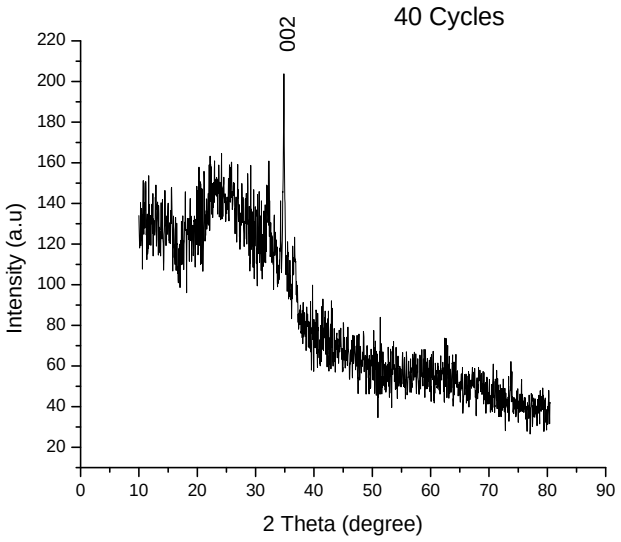

Fig 3.1 XRD pattern of ZnO thin film for 40 deposition cycle

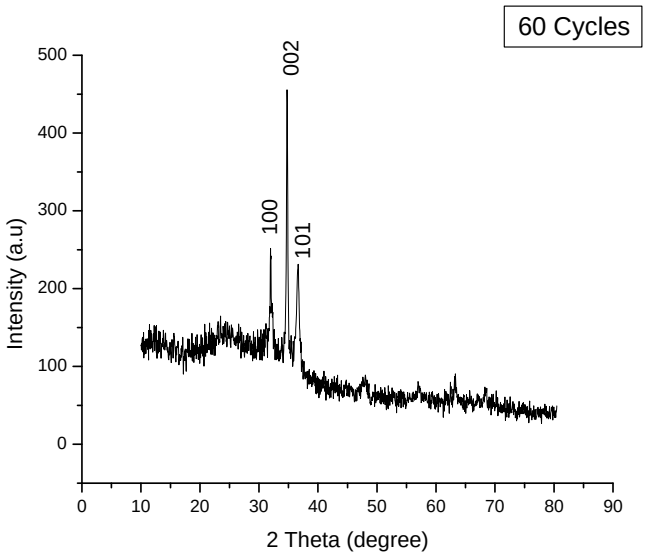

Fig 3.2 XRD pattern of ZnO thin film for 60 deposition cycle

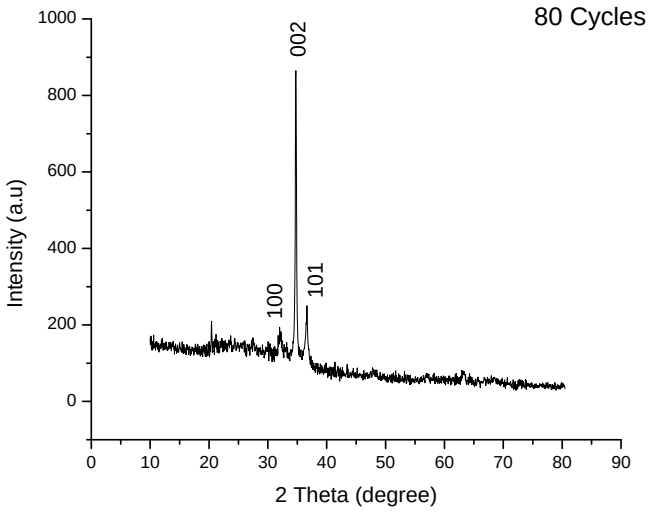

Fig 3.3 XRD pattern of ZnO thin film for 80 deposition cycle

Table 3.1 structural parameter for ZnO for various deposition cycles

Deposition cycle	h k l	2θ degree	Grain size($10^{-9}m$)	Dislocation density (line/m^2)	Micro strain (10^{-4})	Lattice constant
40	0 0 2	34.8439	52.9269	35.6982	6.5494	a= 2.973 c=5.5721
60	1 0 0	31.9868	70.0184	20.3974	4.9506	a= 3.230 c=5.1590
	0 0 2	34.7794	42.3263	55.8186	8.1895	
	1 0 1	36.6321	26.5882	1.4145	0.1303	
80	1 0 0	32.090	17.5119	3.2608	0.1979	a=3.2207 c=5.1622
	0 0 2	34.757	52.9158	35.7132	6,5506	
	1 0 1	36.652	53.2001	35.3322	6.5156	

3.2 RESULT FOR PHOTOLUMINESCENCE.

Since the peak was found prominent in 80 deposition cycle, photoluminescence study was performed for the film deposited at 80 cycles only.

Photoluminescence is one of the important tools to study the structural defects and quality of crystalline structure which has been shown to play crucial role in the development of photocatalytic property. The PL emission spectra were observed in the range of 340-600nm with an excitation wavelength of 320nm. The strong UV emission were observed at 378 nm.

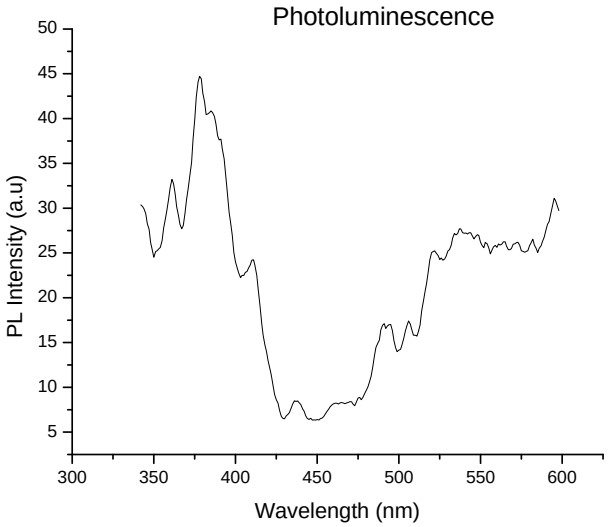

Fig 3.4 photoluminescence of ZnO for 80 deposition cycle

4.SUMMARY AND CONCLUSION

In this work, ZnO thin films were prepared by SILAR method and were subjected to various studies such as XRD, and PL

The synthesized films were characterized by XRD. The grain size of ZnO thin film for various deposition cycles were calculated by De-Scherrer's Formula and the result proves that ZnO thin film is a Hexagonal wurtzite structure.

PL showed strong UV emission at 378 nm.

Thus, the investigated surface properties of ZnO thin films varied with a number of deposition cycles .This film may pave the way for utilizing various optoelectronic application based on surface and electrical studies which will be carried out in future.

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Open and Closed Maps via $\mathcal{M}\alpha$*-sets in Micro Topological Spaces

.P.Anbarasi Rodrigo and J.Charlet Jenisha

PG Department of Mathematics, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

The aim of this paper is to introduce and investigate the notion of $\mathcal{M}\alpha$*-open maps and $\mathcal{M}\alpha$*-closed maps.We also examine some of their properties and relations of other such maps.

Keywords: Micro$\boldsymbol{\alpha}$*-open maps Micro $\boldsymbol{\alpha}$*-closed maps ,Micro $\boldsymbol{\alpha}$*-open sets and Micro $\boldsymbol{\alpha}$*-closed sets.

1.Introduction

The concept of nano topology was introduced by Thivagar et al which is defined in terms of the lower and upper approximation and the boundary region of a subset of an universe. The notion of approximations and boundary region of a set was originally proposed by Pawlak[11] in order to introduce the concept of rough set theory. In 2019, [2]Chandrasekar introduced the concept of micro topology which is a simple extension of nano topology and so studied the concepts of Micro pre-open and Micro semi-open sets.[3]K.Chandrasekar and Swathi introduced Micro α-open in micro topological space.P.Anbarasi Rodrigo [10] introduced $\mathcal{M}\alpha$*-open sets and studied their properties.Jain introduced totally continuous functions in topological spaces.In this paper we introduce $\mathcal{M}\alpha$*-open and $\mathcal{M}$α*closed maps.

2.Preliminaries

Definition:2.1[2]

LetUbeanonemptyfinitesetofobjectscalledtheuniverseandRbeanequivalencerelationon Unamedasthe indiscernibility relation. Then U is divided into disjoint equivalence classes. Elements belonging to the sameequivalence class are said to be indiscernible with one another. The pair (U,R) is said to be the approximationspace.

LetX⊆U

1. The lower approximation of X with respect to R is the set of all objects, which can be for certainclassified as X with respect to R and it is denoted by L_R(X). That is L_R(X) =

$\bigcup_{x\in}\{R(x): R(x) \subseteq X\}$ where R(x)denotesthe equivalence classdeterminedbyx$\in U$.

2. The upper approximation of X with respect to Ris the set of all objects, which can be possiblyclassifiedas Xwith respecttoR andit isdenotedbyU_R(X).ThatisU_R(X)= $\bigcup_{x\in}\{R(x):R(x)\cap X\neq\emptyset\}$.

3. TheboundaryregionofXwithrespectto Risthesetofall objects,whichcanbeclassified neitherasXnor asnot-XwithrespecttoRanditisdenotedbyB_R(X). ThatisB_R(X)=U_R(X)-L_R(X).

Definition:2.2[2]

LetUbe anuniverse,Rbe an equivalence relationonU andτ_R(X) =$\{U,\emptyset,L_R(X),U_R(X),B_R(X)\}$whereX$\subseteq U$satisfiesthefollowingaxioms.

1.U,$\emptyset\in\tau_R$(X)

2. The union oftheelementsofanysubcollectionof (X)isin (X).

3.The intersection of the elements of any finite sub collection of (X) is in (X).Then (X) is calledthe nano topology on U with respect to X. The space (U, (X)) is the nano topological space. The elementsarecallednanoopensets.

Definition:2.3[2]

(U,τ_R(X))isananotopologicalspacehereμ_R (X)=$\{N\cup(N'\cap \mu)\}$⁄N,N'$\in\tau_R$(X)anditiscalledMicrotopologyofτ_R(X)by $\mu$where$\mu\notin\tau_R$(X). The microtopology μ_R(X)satisfiesthe followingaxioms.

1.U,$\emptyset\in\mu_R$(X)

2.Theunion oftheelements ofany subcollection ofμ_R(X)is in μ_R(X).

3.The intersection oftheelementsofanyfinitesubcollectionofτ_R(X)is inμ_R(X).

Then μ_R(X) is called the micro topology on U with respect to X. The triplet (U,τ_R(X),μ_R (X))is called microtopological spaces and the elements of μ_R(X) are called micro open sets and the complement of a micro open setiscalledamicroclosedset.

Example:1

LetU=$\{p,q,r, s,t\}$andU/R=$\{\{p\},\{q, r,s\}, \{t\}\}$andletX=$\{q, r\}\subseteq U$.ThenN$\tau_R$ (X)=$\{U, \phi,\{q,r, s\}\}$and$\mu=\{p\}$.$\mathcal{M}$–open,τ_R(X)=$\{U,\phi,\{p\},\{p,q,r,s\},\{q,r,s\}\}$.

Definition:2.4[2]

ThemicroclosureofasetAisdenotedby$\mathcal{M}$-cl(A)andisdefinedas$\mathcal{M}$ -cl(A)=$\cap\{B:Bismicroclosedand A\subseteq B\}$.

Definition:2.5[2]

ThemicrointeriorofasetAisdenotedby$\mathcal{M}$ -int(A)andisdefinedas$\mathcal{M}$ -int(A)=$\cup\{B:Bismicroopenand A\supseteq B\}$.

Definition 2.6:

Let $(U,X),\mu_R(X))$ be a micro topological space. A set A is called a $\mathcal{M}$ α* open set if A⊆$\mathcal{M}$-int*($\mathcal{M}$-cl($\mathcal{M}$-int*(A)))

Definition:2.7[3]

Let $(U,\tau_R(X),\mu_R(X))$be a micro topological space.A set A is called an $\mathfrak{M}\alpha$−open set if A ⊆ $\mathfrak{M}$-int($\mathfrak{M}$-cl($\mathfrak{M}$-int(A))),The complement of a $\mathfrak{M}\alpha$−open set is called an $\mathfrak{M}\alpha$−closed set.

Definition:2.8[7]

Let $(U,\tau_R(X),\mu_R(X))$ be a micro topological space. A set A is called an $\mathfrak{M}\alpha$*-open set if A ⊆ $\mathfrak{M}$-int*($\mathfrak{M}$-cl($\mathfrak{M}$-int*(A))).

3.1 $\mathcal{M}\alpha$*-open maps

Definition 3.1.1

Let $(U,\tau_R(X),\mu_R(X))$ and $(V,\sigma_R(Y),\mu_R(Y))$ be two topological spaces. A function f :$(U,\tau_R(X),\mu_R(X))\rightarrow (V,\sigma_R(Y),\mu_R(Y))$ is said to be $\mathcal{M}$α*-open map if f(S) is $\mathcal{M}$α*-open in Y for every open set S in $(U,\tau_R(X),\mu_R(X))$.

Example 3.1.2.

Let U = V ={a, b, c} with $\mu_R(X)$ = {φ, {a,c},{b}, U} , $\mu_R(Y)$= {φ, {b,c}, {b},{a,b} ,V} and $\mathcal{M}$α*(Y) = {φ,{a},{b},{a,b},{b,c},V}. Define f :$(U,\tau_R(X),\mu_R(X))$ → $(V,\sigma_R(Y),\mu_R(Y))$ by f(a) = b, f(b) = a, f(c) = c. Then f is $\mathcal{M}$α*-open in $(V,\sigma_R(Y),\mu_R(Y))$.

Theorem 3.1.3.

Let $(U,\tau_R(X),\mu_R(X)),(V,\sigma_R(Y),\mu_R(Y))$ be two topological spaces. A bijective function f :$(U,\tau_R(X),\mu_R(X))\rightarrow (V,\sigma_R(Y),\mu_R(Y))$ is a $\mathcal{M}$α*-open if and only if the image of each $\mathcal{M}$-closed subset of $(U,\tau_R(X),\mu_R(X))$ is $\mathcal{M}$α*-closed in $(V,\sigma_R(Y),\mu_R(Y))$.

Proof.

Assume that f :$(U,\tau_R(X),\mu_R(X))\rightarrow (V,\sigma_R(Y),\mu_R(Y))$ is a $\mathcal{M}$α*-open map. Let V be a closed set in $(U,\tau_R(X),\mu_R(X))$. Then X\V is open in $(U,\tau_R(X),\mu_R(X))$. Therefore, by our assumption, f(X\V) is $\mathcal{M}$α*-open in $(V,\sigma_R(Y),\mu_R(Y))$. This implies, Y \f(V) is $\mathcal{M}$α*-open in $(V,\sigma_R(Y),\mu_R(Y))$. Hence, f(V) is $\mathcal{M}$α*-closed in $(V,\sigma_R(Y),\mu_R(Y))$. Conversely, assume that the image of each closed subset of $(U,\tau_R(X),\mu_R(X))$ is $\mathcal{M}$α*-closed in $(V,\sigma_R(Y),\mu_R(Y))$. Let U be an open set in $(U,\tau_R(X),\mu_R(X))$. Then X\U is closed in $(V,\sigma_R(Y),\mu_R(Y))$. Therefore, by our assumption, f(X\U) is $\mathcal{M}$α*-closed in $(V,\sigma_R(Y),\mu_R(Y))$. This implies, Y

\f(U) is $\mathcal{M}\alpha^*$-closed in $(V,\sigma_R(Y),\mu_R(Y))$. This implies, f(U) is $\mathcal{M}\alpha^*$-open in $(V,\sigma_R(Y),\mu_R(Y))$. Therefore, f is a $\mathcal{M}\alpha^*$-open map.

Theorem 3.1.4

Let $(U,\tau_R(X),\mu_R(X))$,$(V,\sigma_R(Y),\mu_R(Y))$ be two topological spaces. Then every $\mathcal{M}$-open map is $\mathcal{M}\alpha^*$-open.

Proof.

Let f :$(U,\tau_R(X),\mu_R(X)) \rightarrow (V,\sigma_R(Y),\mu_R(Y))$ be an $\mathcal{M}$-open map and A be an open set in $(U,\tau_R(X),\mu_R(X))$. Then f(A) is $\mathcal{M}$-open in $(V,\sigma_R(Y),\mu_R(Y))$. Since every $\mathcal{M}$-open set is $\mathcal{M}\alpha^*$-open set,f(A) is a $\mathcal{M}\alpha^*$-open set. Therefore, f is a $\mathcal{M}\alpha^*$-open map.

Remark 3.1.5

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

Example 3.1.6

Let U = V ={a, b, c} with $\mu_R(X)$ = {φ, {a},{c},{a,c}, U} , $\mu_R(Y)$ = {φ, {b,c}, {a},Y} and $\mathcal{M}\alpha^*$(Y) = {φ,{a},{b},{c},{a,b},{b,c},{a,c},V}. Define f :$(U,\tau_R(X),\mu_R(X)) \rightarrow (V,\sigma_R(Y),\mu_R(Y))$ be an identitiy function. Then f is $\mathcal{M}\alpha^*$-open but not $\mathcal{M}$-open map since f(c)=c is not $\mathcal{M}$ -open in $(V,\sigma_R(Y),\mu_R(Y))$.

Theorem 3.1.7

Let $(U,\tau_R(X),\mu_R(X))$, $(V,\sigma_R(Y),\mu_R(Y))$ be two topological spaces. Then every $\mathcal{M}\alpha$-open map is $\mathcal{M}\alpha^*$-open.

Proof.

Let f :$(U,\tau_R(X),\mu_R(X)) \rightarrow (V,\sigma_R(Y),\mu_R(Y))$ be an $\mathcal{M}\alpha$-open map and A be an open set in $(U,\tau_R(X),\mu_R(X))$. Then f(A) is $\mathcal{M}\alpha$-open in $(V,\sigma_R(Y),\mu_R(Y))$. Since every $\mathcal{M}\alpha$-open set is $\mathcal{M}\alpha^*$-open set,f(A) is a $\mathcal{M}\alpha^*$-open set. Therefore, f is a $\mathcal{M}\alpha^*$-open map.

Remark 3.1.8

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

Example 3.1.9

Let U = V ={a, b, c,d} with $\mu_R(X)$ = {φ, {a},{a,b},{a,c},{a,b,c},U} , $\mu_R(Y)$ = {φ,{b},{c,d},{b,c,d},{a,b},V} ,$\mathcal{M}\alpha$(Y) ={φ,{b},{c,d},{b,c,d},{a,b},V}and

$\mathcal{M}\alpha^*(Y)$={φ,{b},{c},{d},{a,b},{b,c}{b,d},{c,d},{a,b,c},{a,b,d},{b,c,d},V}Define f : $(U,\tau_R(X),\mu_R(X)) \rightarrow (V,\sigma_R(Y),\mu_R(Y))$ by f(a) = d,f(b) = c,f(c) = b,f(d) = a. Then f is $\mathcal{M}\alpha^*$-open but not α-open map since f(a)=d is not $\mathcal{M}\alpha$ -open in $(V,\sigma_R(Y),\mu_R(Y))$.

Theorem 3.1.10

Let $(U,\tau_R(X),\mu_R(X))$, $(V,\sigma_R(Y),\mu_R(Y))$ be two topological spaces. Then every $\mathcal{M}$g-open map is $\mathcal{M}\alpha^*$-open.

Proof.

Let f :$(U,\tau_R(X),\mu_R(X)) \rightarrow (V,\sigma_R(Y),\mu_R(Y))$ be an $\mathcal{M}$g-open map and A be an open set in $(U,\tau_R(X),\mu_R(X))$. Then f(A) is$\mathcal{M}$g-open in $(V,\sigma_R(Y),\mu_R(Y))$. Since every $\mathcal{M}$g-open set is $\mathcal{M}\alpha^*$-open set,f(A) is a $\mathcal{M}\alpha^*$-open set. Therefore, f is a $\mathcal{M}\alpha^*$-open map.

Remark 3.1.11

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

Example 3.1.12

Let U =V={a,b,c,d} with $\mu_R(X)$ = {φ, {b},{c},{b,d},{a,b},{b,c},{a,b,c}, {b,c,d}, {a,b,d}, U} , $\mu_R(Y)$ = {φ,{a,b},{a,b,c},V} $\mathcal{M}$g(Y) ={φ,{a},{b},{c},{ab},{b,c},{a,c},{a,b,c}, V}and $\mathcal{M}\alpha^*(Y)$={φ,{b},{c},{a},{a,b},{b,c},{a,b},{b,d},{c,d},{a,b,c},{a,b,d},{b,c,d}, {a,c,d},V}. Define f :$(U,\tau_R(X),\mu_R(X)) \rightarrow (V,\sigma_R(Y),\mu_R(Y))$ be an identity function. Then f is $\mathcal{M}\alpha^*$-open but not $\mathcal{M}$g-open map since f(a,b,d)= {a,b,d} is not $\mathcal{M}$g -open in $(V,\sigma_R(Y),\mu_R(Y))$.

Theorem 3.1.13

Let $(U,\tau_R(X),\mu_R(X))$,$(V,\sigma_R(Y),\mu_R(Y))$ and $(W,\eta_R(Z),\mu_R(Z))$be microtopological spaces. If f :$(U,\tau_R(X),\mu_R(X)) \rightarrow (V,\sigma_R(Y),\mu_R(Y))$ is an $\mathcal{M}$-open map and g : $(V,\sigma_R(Y),\mu_R(Y)) \rightarrow (W,\eta_R(Z),\mu_R(Z)$ is a $\mathcal{M}\alpha^*$-open map, then g ◦f : $(U,\tau_R(X),\mu_R(X)) \rightarrow (W,\eta_R(Z),\mu_R(Z))$ is $\mathcal{M}\alpha^*$-open map.

Proof.

Let S be an open set in $(U,\tau_R(X),\mu_R(X))$. Since f is an $\mathcal{M}$-open map, f(S) is $\mathcal{M}$-open in $(V,\sigma_R(Y),\mu_R(Y))$. Then g(f(S)) = (g ◦f)(S) is a $\mathcal{M}\alpha$ *-open set in $(W,\eta_R(Z),\mu_R(Z))$. Therefore, g ◦f is a $\mathcal{M}\alpha^*$-open map.

Theorem 3.1.14

Let $(U,\tau_R(X),\mu_R(X))$, $(V,\sigma_R(Y),\mu_R(Y))$ and $(W,\eta_R(Z),\mu_R(Z))$ be micro topological spaces. If $f:(U,\tau_R(X),\mu_R(X)) \rightarrow (V,\sigma_R(Y),\mu_R(Y))$ and $g:(V,\sigma_R(Y),\mu_R(Y)) \rightarrow (W,\eta_R(Z),\mu_R(Z))$ are $\mathcal{M}$-open maps, then $g \circ f:(U,\tau_R(X),\mu_R(X)) \rightarrow (W,\eta_R(Z),\mu_R(Z))$ is a $\mathcal{M}\alpha$ *-open map.

Proof.

Let S be an open set in $(U,\tau_R(X),\mu_R(X))$. Since f is an $\mathcal{M}$-open map, f(S) is $\mathcal{M}$-open in $(V,\sigma_R(Y),\mu_R(Y))$. Also, since g is an $\mathcal{M}$-open map, g(f(S)) is $\mathcal{M}$-open in $(W,\eta_R(Z),\mu_R(Z))$. That is, $(g \circ f)(S)$ is a open set in $(W,\eta_R(Z),\mu_R(Z))$. Then $(g \circ f)(S)$ is a $\mathcal{M}\alpha$*-open set in $(W,\eta_R(Z),\mu_R(Z))$. Therefore, $g \circ f$ is a $\mathcal{M}\alpha$*-open map.

Theorem 3.1.15

Let $(U,\tau_R(X),\mu_R(X))$, $(V,\sigma_R(Y),\mu_R(Y))$.and $(W,\eta_R(Z),\mu_R(Z))$ be topological spaces. If $f:(U,\tau_R(X),\mu_R(X)) \rightarrow (V,\sigma_R(Y),\mu_R(Y))$. is an $\mathcal{M}$open map and $g:(V,\sigma_R(Y),\mu_R(Y)). \rightarrow (W,\eta_R(Z),\mu_R(Z))$ is a $\mathcal{M}$g-open map, then $g \circ f:(U,\tau_R(X),\mu_R(X)) \rightarrow (W,\eta_R(Z),\mu_R(Z))$ is a $\mathcal{M}\alpha$*-open map.

Proof.

Let U be an open set in $(U,\tau_R(X),\mu_R(X))$. Since f is an open map, f(U) is open in $(V,\sigma_R(Y),\mu_R(Y))$.. Then g(f(U)) is a $\mathcal{M}$g-open set in $(W,\eta_R(Z),\mu_R(Z))$. That is, $(g \circ f)(U)$ is a $\mathcal{M}$g-open set in $(W,\eta_R(Z),\mu_R(Z))$. Then $(g \circ f)(U)$ is a $\mathcal{M}\alpha$*-open set in $(W,\eta_R(Z),\mu_R(Z))$. Hence $g \circ f$ is a $\mathcal{M}\alpha$*-open map.

3.2 $\mathcal{M}\alpha$*-closed maps

Definition 3.2.1

Let $(U,\tau_R(X),\mu_R(X))$ and $(V,\sigma_R(Y),\mu_R(Y))$ be two topological spaces. A function $f:(U,\tau_R(X),\mu_R(X)) \rightarrow (V,\sigma_R(Y),\mu_R(Y))$ is said to be $\mathcal{M}\alpha$*-closed map if f(S) is $\mathcal{M}\alpha$*-closed in Y for every closed set S in $(U,\tau_R(X),\mu_R(X))$.

Example 3.2.2

Let U = V={a,b,c} with $\tau_R(X)$={U,φ,{a,c},{a},{c}},Then$\tau_R^c(X)$= {U,φ ,{b,c},{a,b},{b}}, $\sigma_R(Y)$={U,φ,{c},{a},{a,c}}.Then$\mathcal{M}\alpha^{*c}(Y)$={V,φ,{b},{a,b},{b,c}}.
Letf :$(U,\tau_R(X),\mu_R(X)) \rightarrow (V,\sigma_R(Y),\mu_R(Y))$ be an identity map.Hence f is$\mathcal{M}\alpha$*-closed map.

Theorem 3.2.3

Let $(U,\tau_R(X),\mu_R(X)),(V,\sigma_R(Y),\mu_R(Y))$ be two topological spaces. Then every $\mathcal{M}$-closed map is $\mathcal{M}\alpha^*$-closed.

Proof.

Proof is obvious.

Remark 3.2.4

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

Example 3.2.5

Let U = V={a,b,c} with $\tau_R(X)$={U,φ,{a,c},{b}},Then$\tau_R^c(X)$= {U,φ,{a,c},{b}}, $\sigma_R(Y)$={Vφ,{c},{a},{a,c}}.Then$\mathcal{M}\alpha*^c(Y)$={V,φ,{a},{b},{c},{a,b},{a,c},{b,c}}.

Letf :$(U,\tau_R(X),\mu_R(X))\rightarrow(V,\sigma_R(Y),\mu_R(Y))$ be an identity map.Hence f is$\mathcal{M}\alpha^*$-closed map but not $\mathcal{M}$-closed map since f(b)=b is not $\mathcal{M}$-closed in $(V,\sigma_R(Y),\mu_R(Y))$.

Theorem 3.2.6

Let $(U,\tau_R(X),\mu_R(X))$, $(V,\sigma_R(Y),\mu_R(Y))$ be two topological spaces. Then every $\mathcal{M}\alpha$-closed map is $\mathcal{M}\alpha^*$-closed.

Proof.

Proof is obvious

Remark 3.2.7

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

Example 3.2.8

Let U = V={a,b,c,d} with $\tau_R(X)$={U,φ,{a},{c},{a,b},{a,c},{a,d}, {a,b,c},{a,c,d}},Then$\tau_R^c(X)$= {U,φ,{d},{b},{c,d},{b,c},{b,d},{b,c,d},{a,b,d}},$\sigma_R(Y)$={V,φ,{a},{a,b},{a,c},{a,b,c}}.Then $\mathcal{M}\alpha*^c(Y)$={V,φ,{b},{c},{d},{b,c},{b,d},{c,d},{b,c,d},{a,c,d},{a,b,d}}.

$\mathcal{M}\alpha^c(Y)$={V,φ,{b},{c},{d},{c,d},{b,d},{b,c},{b,c,d}}Letf :$(U,\tau_R(X),\mu_R(X))\rightarrow(V,\sigma_R(Y),\mu_R(Y))$be an identity function.Hence f is$\mathcal{M}\alpha^*$-closed map but not $\mathcal{M}\alpha$-closed map since f(a,b,d)={a,b,d} is not $\mathcal{M}\alpha$-closed in $(V,\sigma_R(Y),\mu_R(Y))$.

Theorem 3.2.9

Let $(U,\tau_R(X),\mu_R(X))$, $(V,\sigma_R(Y),\mu_R(Y))$ be two topological spaces. Then every $\mathcal{M}g$-closed map is $\mathcal{M}\alpha^*$-closed.

Proof.

Proof is obvious.

Remark 3.2.10

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

Example 3.2.11

Let U = V={a,b,c,d} with $\tau_R(X)$={U,φ,{a},{c},{d},{c,d},{a,c},{a,d},{a,b,d},{a,c,d}},Thenτ_R^c(X)= {U,φ,{a},{c},{d},{c,d},{a,c},{a,d},{a,b,d},{a,c,d},$\sigma_R(Y)$={V,φ,{a},{a,b},{a,c},{a,b,c}}.The n$\mathcal{M}\alpha*_R^c$ (Y)={V,φ,{b},{c},{d},{b,c},{b,d},{c,d},{b,c,d},{a,c,d}, {a,b,d}}.$\mathcal{M}g^c$(Y) ={V,φ,{d},{a,d},{c,d},{b,d},{a,c,d},{a,b,d},{b,c,d}}Letf :(U,$\tau_R(X), \mu_R(X)$)→(V,$\sigma_R(Y), \mu_R(Y)$)defined by f(a)=b,f(b)=a,f(c)=c,f(d)=d.Hence f is$\mathcal{M}$α*-closed map but not $\mathcal{M}$g-closed map since f(a)={b} is not $\mathcal{M}$g-closed in (V,$\sigma_R(Y), \mu_R(Y)$).

Theorem 3.2.12

Let (U,$\tau_R(X), \mu_R(X)$),(V,$\sigma_R(Y), \mu_R(Y)$) and (W,$\eta_R(Z), \mu_R(Z)$) be micro topological spaces. If f :(U,$\tau_R(X), \mu_R(X)$) →(V,$\sigma_R(Y), \mu_R(Y)$) is an $\mathcal{M}$-closed map and g : (V,$\sigma_R(Y), \mu_R(Y)$) → (W,$\eta_R(Z), \mu_R(Z)$ is a $\mathcal{M}$α*-closed map, then g ◦f : (U,$\tau_R(X), \mu_R(X)$) → (W,$\eta_R(Z), \mu_R(Z)$) is $\mathcal{M}$α*-closed map.

Proof:

Let S be an closed set in (U,$\tau_R(X), \mu_R(X)$) . Since f is an $\mathcal{M}$-closed map, f(S) is $\mathcal{M}$-closed in (V,$\sigma_R(Y), \mu_R(Y)$). Then g(f(S)) = (g ◦f)(S) is a $\mathcal{M}\alpha$ *-closed set in (W,$\eta_R(Z), \mu_R(Z)$). Therefore, g ◦f is a $\mathcal{M}\alpha$ *-closed map.

Theorem 3.2.13

Let (U,$\tau_R(X), \mu_R(X)$), (V,$\sigma_R(Y), \mu_R(Y)$) and (W,$\eta_R(Z), \mu_R(Z)$) be micro topological spaces. If f :(U,$\tau_R(X), \mu_R(X)$) → (V,$\sigma_R(Y), \mu_R(Y)$) and g : (V,$\sigma_R(Y), \mu_R(Y)$) → (W,$\eta_R(Z), \mu_R(Z)$) are$\mathcal{M}$-closed maps, then g ◦f : (U,$\tau_R(X), \mu_R(X)$) → (W,$\eta_R(Z), \mu_R(Z)$) is a $\mathcal{M}\alpha$ *-closed map.

Proof.

Let S be an closed set in (U,$\tau_R(X), \mu_R(X)$) . Since f is an $\mathcal{M}$-closed map, f(S) is $\mathcal{M}$-closed in (V,$\sigma_R(Y), \mu_R(Y)$). Also, since g is an $\mathcal{M}$-closed map, g(f(S)) is $\mathcal{M}$-closed in

(W,$\eta_R(Z), \mu_R(Z)$). That is, (g ◦f)(S) is a closed set in (W,$\eta_R(Z), \mu_R(Z)$). Then (g ◦f)(S) is a $\mathcal{M}\alpha$*-closed set in (W,$\eta_R(Z), \mu_R(Z)$). Therefore, g ◦f is a $\mathcal{M}\alpha$*-closed map.

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Mβg-continuousand$M$βg-irresolutemapinMicrotopologicalspaces

P.AnbarasiRodrigo[1] and A.Virgin[2]

PG Department of Mathematics, St. Mary's College (Autonomous), Thoothukudi

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamil Nadu, India

Abstract

The aim of this paper is to introduce a new class ofMicro βg -continuous fuction andirresolutefunctioninMicrotopologicalspaceandsomeofitspropertiesarediscussed.Furt her,theirinterrelationshipwithalreadyexistingcontinuousfuctionandirresolutefunctionare studied.

KEYWORDS:Mβg-closed,Mβg-continuous,Mβg-irresolute.

Introduction

The concept of nano topology was introduced by Thivagar et al which is defined in terms ofthe lower and upper approximation and the boundary region of a subset of an universe. Thenotion of approximations and boundary region of a set was originally proposed by Pawlakinorder to introduce the concept of rough settheory. In 2019, Chandrasekar introduced theconcept of microtopology which is a simple extension of nano topology andso studied theconcepts of Micro pre-open and Micro semi-open sets.Chandrasekar and SwathiintroducedMicro α-open in micro topological space.Ibrahim defined Micro β -open sets and Micro g-closed sets in Micro topological spaces .In this paper,we intoduce a Mβg -continuous andirresolutefunctionvia Micro Mβg-closedsets.

1.PRELIMINARIES

Definition1.1

Let$U$beanonemptyfinitesetofobjectscalledtheuniverseand$R$beanequivalencerelation on$U$namedastheindiscernibilityrelation.Then$U$isdividedintodisjointequivalenceclasses.Ele mentbelongingtothesameequivalenceclassaresaidtobeindiscerniblewithoneanother.Thepair(U,X)issaidtobe theapproximationspace.LetX
$\leq U$.

1. ThelowerapproximationofXwithrespectto$R$isthesetofallobjects,whichcanbeforcertaincla ssifiedasXwithrespectto$R$anditisdenotedbyL_R(X).Thatis,L_R(X) =U$x\in U\{R(x):R(x)\leq$X},where$L_R(x)$denotes theequivalence class determinedbyx.
2. TheupperapproximationofXwithrespectto$R$isthesetofallobjects,whichcanbepossiblyclas sifiedasXwithrespectto$R$anditisdenotedbyU_R(X).Thatis,U_R(X)= U$x\in U\{R(x):R(x)\cap$XGϕ}.
3. TheboundaryregionofX withrespectto$R$isthesetofallobjects,whichcanbeclassifiedneitherasXnorasnotXwithrespectto$R$a nditisdenotedbyB_R(X).Thatis,B_R(X)=U_R(X) −L_R(X).

Definition1.2

Let$(U,r_R(X),\mu_R(X))$beaMicrotopologicalspaceand$A\subseteq U$.Then$A$issaidtobea

(i) Micropre-open(briefly.$\mathcal{M}$-pre-open) setif$A\subseteq\mathcal{M}$-i($\mathcal{M}$-$cl(A)$).

(ii) Microsemi-open(briefly.$\mathcal{M}$-semi-open)setif$A\subseteq\mathcal{M}$-cl($\mathcal{M}$-$int(A)$).

(iii) Microα-open(briefly.$\mathcal{M}(\alpha)$-open)setif$A\subseteq\mathcal{M}$-int($\mathcal{M}$-cl($\mathcal{M}$-$int(A)$)).

(iv) Microβ-open(briefly.$\mathcal{M}(\beta)$-open)setif$A\subseteq\mathcal{M}$-($\mathcal{M}$-i($\mathcal{M}$-$cl(A)$)).

Thecomplementsoftheabove-mentionedsetsarecalledtheirrespectiveclosedsets.

Result1.3

1. Asubset AisMicro closedsetifandonlyif$A$=$\mathcal{M}$-$cl(A)$.
2. EveryMicroclosedsetisMicroβ-closed.
3. EveryMicrosemi-closedsetis Microβ-closed.
4. EveryMicro α-closedsetisMicroβ-closed.

Definition1.4

Let $(U, r_R(X), \mu_R(X))$ be a micro topological space and A $\subseteq U$. Then, A is called aMicroβ-openset if $A \subseteq Mic-cl(Mic-int(Mic-cl(A)))$. $Mic-\beta O(U, X)$denotes the collection of all Micro β-open sets. A subset B of U is called Micro β-

closedifandonlyifitscomplementisMicroβ-open.Moreover,$Mic-\beta C(U,X)$ denotesthecollectionofallMicro$\beta-$closedsets.

Definition:1.5

ThemicroclosureofasetAisdenotedby$M$-cl(A)andisdefinedas-cl(A)=∩{B: $BismicroclosedandA\subseteq B$}.

Definition:1.6

ThemicrointeriorofasetAisdenotedby$M$-int(A)andisdefinedas$M$-int(A)=∪ {B:$BismicroopenandA\supseteq B$}.

Definition:1.7

Let(U, $r_R(X)$, $\mu_R(X)$) be a micro topological space. A set A is called a M α* open setifA⊆M-int*(M-cl(M-int*(A)))

Definition:1.8

Let (U, $r_R(X)$, $\mu_R(X)$) be a micro topological space.A set A is called an $M\alpha-$open setif A ⊆ M-int(M-cl(M-int(A))),The complement of a $M\alpha-$open set is called an $M\alpha-$closedset.

Definition:1.9

Let(U, $r_R(X)$, $\mu_R(X)$)be a micro topological space. A set A is called an $M\alpha$*-opensetifA⊆M-int*(M-cl(M-int*(A))).

Definition :1.10

Let(U,$r_R(X)$, $\mu_R(X)$)and(V,$\sigma_R(Y)$, $\mu_R(Y)$)betwomicrotopologicalspaces.Afunction f : (U,$r_R(X)$,$\mu_R(X)$)→(V,$\sigma_R(Y)$,$\mu_R(Y)$)is called$M$-continuous if $f^{-1}(H)isMicro$closedinXforeveryMicro-closedinY.

Definition :1.11

Amapf:(U,$r_R(X)$,$\mu_R(X)$)→(V,$\sigma_R(Y)$,$\mu_R(Y)$)iscalled$M$βg-irresoluteif$f^{-1}(V)$ is$M$βg-closedinXforevery$M$βg-closedsetVinY.

2. Mβg-continuousFunction

Definition2.1

Amapf:(U,$r_R(X)$,$\mu_R(X)$)→(V,σ_R(Y),μ_R(Y))issaidtobe$M$βg-continuousiftheinverse imageof every$M$-closed setinYis$M$βg–closedinX.

Theorem2.2

Every$M$-continuousis$M$βg–continuous,butnotconversely.

Proof:

LetVbea$M$-closedsetin(V, σ_R(Y), μ_R(Y)).Thenf^{-1}(V)isa$M$-closedsetin(U, r_R(X),

μ_R(X))as f is a M- continuous .Since every M-closed set is Mβg-closed,wehavef^{-1}(V)is$M$βg-closed.Hencefisa$M$βg–continuous.

Example2.3

LetU=V={a,b,c,d}withtopologiesμ_R(X)={U,ϕ,{a},{b,d},{a,b,d}}andμ_R(Y)={U,ϕ,{a},{b,d},{a,b,d},{c},{a,c},{b,c,d}}.Letf:U→Vbetheidentitymap.Thenfis$M$βg–continuousbut not$M$-continuous.

Theorem2.4

Every$M$g-continuousis$M$-βgcontinuous,butnotconversely.

Proof:

LetVbea$M$g-closedsetin(V,σ_R(Y),μ_R(Y)).Thenf^{-1}(V)is$M$g-closedsetin

$(U, r_R(X), \mu_R(X))$asfis$M$g-continuousmap.Sinceevery$M$g-closedsetis$M$βg–closed,wehave$f^{-1}(V)$is$M$βg-Closed.Hencefisa$M$βg -continuous.

Example2.5

LetU=V={a,b,c}withtopologies$\mu_R(X)$={U,ϕ,{b,c}},$\mu_R(Y)$={U,ϕ,{b,c},{a}}.

Letf:U→V betheidentitymap.Thenfis$M$βg-continuousbutnot$M$g-continuous.

Theorem2.6

Every$M$gs-continuousis$M$βg-continuous,butnotconversely.

Proof:

Let V be a M- closed set in Y.Then $f^{-1}(V)$ is Mgs- closed set in X as f is$M$gs-continuous map .Since every Mgs- closed setis M-βg Closed , we have$f^{-1}(V)$ is Mβg-Closed.wehavef is$M$βg-continuous.

Example2.7

Let U=V={a,b,c,d}withtopologies $\mu_R(X)$={U,ϕ,{a,b},{c}{a,b,c}}and$\mu_R(Y)$={U,ϕ,{a,b},{a,b,c}{c},{a},{a,c}}. Letf:U→V betheidentitymap.Thenfis Mβg-continuous but$M$gs-continuous .

Theorem2.8

Every$M$αg-continuousis$M$βg-continuous,butnotconversely.

Proof:

LetV be a M-closed set in Y.Then $f^{-1}(V)$ is a Mαg-closed set in$(U, r_R(X), \mu_R(X))$asfis$M$αg-continuous.Sinceevery$M$αg-closedset,wehave$f^{-1}(V)$is Mβg-Closed.Hencefisa$M$βg-continuous.

Example2.9

Let U=V={a,b,c,d}withtopologies $\mu_R(X)$ ={U,ϕ,{d},{a,b,c}},$\mu_R(Y)$={U,ϕ,{a,b},{a,b,d}{d},{a},{c},{c,d},{a,b,c}}.Letf:U→V betheidentitymap.Thenfisa Mβg-continuousbutnot$M$αg-continuous.

Remark2.10

Theconceptof$M$βg-continuusmapand$M$pre-continuousmapareindependentofeachother as seen from thefollowing example.

Example2.11

LetU={a,b,c}.Then$\mu_R(X)$={U,ϕ,{a},{b,c}}and$\mu_R(Y)$={U,ϕ,{b,c},{a}}.Letf:U→V

betheidentitymap.Thenfis$M$βg-continuousbut$M$pre-continuous.

Example2.12

LetU=V={ a,b,c,d}withtopologies Thenμ_R(X)={ U,ϕ,{c},{a,c,d}{a,d}}.Then μ_R(Y)={U,ϕ,{c},{a,c,d}{a,d},{a,b},{a},{a,b,c},{a,c}}.Letf:U→ Vbethe identitymap.Thenfispre-continuous.butis$M$βg-continuous

Thereom2.13

Let f:(U,r_R(X),μ_R(X))→(V,σ_R(Y),μ_R(Y)) beamapfromatopologicalspace(U ,r_R(X),μ_R(X)) intoatopologicalspace(V,σ_R(Y),μ_R(Y)).Then,

4. fis$M$βg–continuous.
5. Theinverseimageofeachopensetin(V,σ_R(Y),μ_R(Y))is$M$βg–openinX.

Proof:

Assumethatf:(U,r_R(X), μ_R(X))→(V,σ_R(Y),μ_R(Y))be$M$βg–continuous. LetGbemicroopenin(V,σ_R(Y),μ_R(Y)).ThenG^cismicroclosedin(V,σ_R(Y),μ_R(Y)) .Since f is Mβg –continuous, $f^{-1}(G^c)$ is Mβg-closed in (U,r_R(X),μ_R(X)).But $f^{-1}(G^c)$=X\$f^{-1}$($G$).Thus X\$f^{-1}$($G$) is Mβg-closedin(U,r_R(X),μ_R(X))andsoTherefore,f^{-1}(G)is$M$βg-openin(U,r_R(X),μ_R(X)).Therefore,(a)implies(b).

Conversely,assumethattheiverseimageofeachopensetsin(V,σ_R(Y),μ_R(Y))Mβg-openin(U,r_R(X), μ_R(X)).Letfbeanyclosedsetin(V,σ_R(Y),μ_R(Y)).Byassumption ,$f^{-1}(F^c)$is$M$βg-openin(U,r_R(X),μ_R(X))But$f^{-1}(F^c)$=X($f^{-1}(F)$).Thus$X(f^{-1}(F))$ is(U,r_R(X),μ_R(X)) andso $f^{-1}(F)isM$βg-closedin(U,r_R(X),μ_R(X)).Therefore,fis Mβg-continuous.Hence(b)implies(a).Thus(a)and(b)areequilvent.

Thereom2.14

If f: (U, r_R(X), μ_R(X)) → (V, σ_R(Y), μ_R(Y)) and g: (V, σ_R(Y), μ_R(Y)) →(W, η_R(Z), μ_R(Z)) are any two functions, then the composition gof:(U, r_R(X) μ_R(X))→ (W, η_R(Z), μ_R(Z))is Mβg-continuous if g is continuous and f is Mβg-continuous.

Proof:

Let V be any M closed set in (W, η_R(Z), μ_R(Z)).Since gis continuous ,$g^{-1}(V)$is M-closed in Y and since f is Mβg-continuous , $f^{-1}(g^{-1}(V))$ is Mβg-closed setin(U,r_R(X)μ_R(X)).Thatis$(gof)^{-1}(V)$is$M$βg-closedin(U,r_R(X)μ_R(X)).

Thusgofis$M$βg-continuous.**Remark2.17**

Thecompositionoftwo$M$βg-continuousmapneednotbe$M$βg-continuousasseenfromthefollowingexample.

Example2.18

Let U=V=W={a,b,c}withtopologiesr_R(X)={U,{c},∅},σ_R(X)={U,∅,{b},{b,c}}and

η_R(x)={U,{a,b},∅}.Defineamapf:(U,r_R(X),μ_R(X))→(V,σ_R(Y),μ_R(Y))bethe

identitymapandalso g: (V, σ_R(Y), μ_R(Y)) →(W, η_R(Z), μ_R(Z))betheidentitymap.Thenbothfandgare$M$βg-continuousbuttheircompositiongofis$M$βgnotcontinuous.because,{c} isaclosedsetofW.Therefore,$(gof)^{-1}$({c})={c}isnota Mβg-closedsetof(U,r_R(X),μ_R(X)).Hencegofisnot$M$βg-continuous

Definition3.1

Amapf:(U,r_R(X),μ_R(X))→(V,σ_R(Y),μ_R(Y))issaidtobe$M$βg-irresoluteiftheinverseimageofevery$M$βg-closed setin$Y$is$M$βg-closedinX.

Thereom3.2

A map f: (U, r_R(X), μ_R(X)) →(V, σ_R(Y), μ_R(Y)) is Mβg -irresoluteif and only if theinverseimageofevery$M$βg-open setsin $Y$is$M$βg–openinX.

Proof:

Assumethatfis$M$βg-irresolute.LetAbeany$M$βg–opensetin$Y$.Then$A^c$is

Mβg-closedsetin$Y$.sincefis$M$βg-irresolute,$f^{-1}(A^c)$is$M$βg-closedsetinX.But

,$f^{-1}(A^c)$=X\$f^{-1}(A)$andso$f^{-1}(A)isaM$βg–opensetinX.Hencetheinverseimageofevery$M$βg – open setin Yis$M$βg–open inX.

Conversely,assumethattheinverseimageofevery$M$βg–opensetinYis$M$βg–opensetinX.LetAbeany$M$βg–closedsetin$Y$.Then$A^c$is$M$βg-openin$Y$.Byassumption,$f^{-1}(A^c)$is$M$βg–opensetinX.But,$f^{-1}(A^c)$=X\$f^{-1}(A)$andso $f^{-1}(A)$is$M$βg-closedinX.Thereforefis$M$βg-irresolute.

Thereom3.3

Ifamapf:$(U,r_R(X),\mu_R(X))\rightarrow(V,\sigma_R(Y),\mu_R(Y)isM$βg-irresolute,thenitis

Mβg-continuous,butnotconversely.

Proof:

Assumethatfis$M$βg-irresolute.LetFbeany$M$-closedsetin$Y$.Sinceevery$M$-

closedsetis$M$βg–closed,Fis$M$βg–closedin$Y$.Sincefis$M$βg−irresolute,$f^{-1}(F)$is

Mβg–closedsetinX,Thereforefis$M$βg–continuous.

Remark3.4

The converse of the above thereom need not be true as ssen from the followingexample.

Example3.5

LetU=V={a,b,c}withtopologies$\mu_R(X)=\{U,\emptyset,\{b\},\{c\},\{b,c\}\}$,

$\mu_R(Y)=\{U,\emptyset,\{b\},\{b,c\}\}$. *Let* f: $(U, r_R(X), \mu_R(X)) \rightarrow(V, \sigma_R(Y), \mu_R(Y))$ be the identiy map.Thenthemapfis$M$βg–continuousbutnot$M$βg-irresolute,as{c}is$M$βg–closedinU.Therefore,f isnot Mβg –irresolute.

Thereom3.6

LetX,YandZbeanytopologicalspaces.Forany$M$βg-

irresolutemapf:$(U,r_R(X),\mu_R(X))\to(V,\sigma_R(Y),\mu_R(Y)andM\beta g$–continuousmapg: $(V,\sigma_R(Y),\mu_R(Y))\to(W,\eta_R(Z),\mu_R(Z))$thenthecompositiongof:$(U,r_R(X),\mu_R(X))$

$\to(W,\eta_R(Z),\mu_R(Z))isM\beta g$-irresolute.

Proof:

LetFbeany$M$-closedsetinZ,thenfbe$M\beta g$closed.Sincegis$M\beta g$–continuous,so$g^{-1}(F)$is$M\beta g$–closedsetin$Y$.Sincefis$M\beta g$-irresolute, $f^{-1}(g^{-1}(F))$is$M\beta g$ –closed in X. But $f^{-1}(g^{-1}(F))=(gof)^{-1}$(F), Therefore gof:$(U,r_R(X),\mu_R(X))\to(W,\eta_R(Z),\mu_R(Z))isM\beta g$–irresolute.

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