VOLUME-VI

MARCH 2023

JOSEPHINE RESEARCHER

6

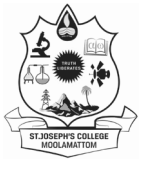
ISBN 978-93-87709-90-4

PUBLISHED BY:

ST. JOSEPH'S COLLEGE, MOOLAMATTOM

RE-ACCREDITED WITH 'A' GRADE IN 2018 (CGPA-3.12. III CYCLE)

JOSEPHINE RESEARCHER VI



St. Joseph's College
Moolamattom
Arakulam P.O., Idukki, Kerala, India

Volume VI, March 2023
ISBN: 978-93-87709-90-4

JOSEPHINE RESEARCHER

Interdisciplinary Research Resource Book

Published from

St. Joseph's College, Moolamattom

Arakulam P.O., Idukki, Kerala, India

JOSEPHINE RESEARCHER

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ISBN: 978-93-87709-90-4

Owned, Printed and Published by

St. Joseph's College
Moolamattom, Arakulam P.O., Idukki, Kerala, India

Printed at

Maptho Printings
Kalamassery
Phone: 91-484-2555115

EDITORIAL

The dawn of this decade witnessed the unmanageable hike of bogus information which disoriented the masses with their verisimilitude. The reliable source of information is imperative in this world of information explosion. *Josephine Researcher VI*, the novel initiative of St. Joseph's College, Moolamattom, brings together the likeminded researchers, scientists, social activists and faculty members belonging to various disciplines to contribute the veritable piece of information to the treasure chest of knowledge. The outcomes of explorations and experiments which infuse life to the pages enthuse the readers with insightful and inconclusive piece of information. This volume which affirms quality rather than the quantum of knowledge reiterates the interdisciplinarity of research paradigm and spurs further researches.

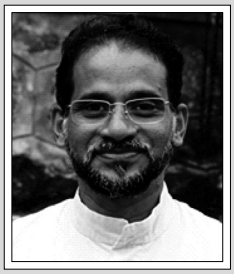
This interdisciplinary research book, which functions as energy pathway, offers dynamic platform for the creative minds to disseminate the distilled knowledge for the inquisitive minds. The treasure trove of knowledge unravels itself before the explorer and demystifies the plurality of knowledge it eludes. On this occasion, we are thankful to the contributors, who are like Alfred Lord Tennyson's Ulysses says, "Yet all experience is an arch wherethro'/Gleams that untravell'd world whosemargin fades/ For ever and forever when I move". The paramount role of the readers in bridging the energy pathway is appreciated on this context too.

We are extremely grateful to our manager **Very Rev. Dr. George Edayadiyil CMI** for his insightful support. We are thankful to **Rev. Dr. Thomas George CMI** (Our Local Manager and Managing Editor). The inspiration and ingenious support of **Dr. Sabukkutty M.G.** (our Principal & Executive Editor) is to be reckoned on this occasion for infusing life to this resource book. We also express our gratitude to Rev. **Dr. Jomon Kottarathil CMI**, our Bursar.

The present issue (Sixth Volume) includes eight research articles from science/ mathematics, seven from social science/commerce and six from literature. We expect that these articles of primary and secondary nature would enable us to have a share in creating a more harmonious world.

For Editorial Team
Dr. Jose James

MASTER BRAINS BEHIND JOSEPHINE RESEARCHER VI



Very Rev. Dr. George Edayadiyil CMI

Very Rev. Dr. George Edayadiyil CMI is the Provincial of St. Joseph Province, Kottayam and performed as the manager of our college. He is the guiding inspiration behind this noble venture. He is a well-known educationalist, noted writer, gifted orator and is an effective administrator. He is also working as Professor of Theology, Dhrmaram Vidhya Kshertam, Bangluru.

Rev. Dr. Thomas George Vengaluvakkel CMI

Rev. Dr. Thomas George Vengaluvakkel CMI is our vibrant and efficient local manager and Prior of St. Joseph's Monastery, Arakulam. He is an approved Research guide in Mahatma Gandhi University and worked as HOD in Physical Education Department of our college. He has published more than 25 Research articles in International Journals. He was the founding Director of St. Joseph's Academy of Higher Education and Research, Moolamattom. He co-authored two Malayalam Books and also published one Malayalam Christian Devotional CD.

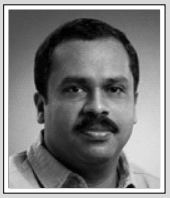
Dr. Sabukutty MG

Dr. Sabukutty MG is the beloved Principal of St. Joseph's College, Moolamattom and has been selflessly serving the institution all along its chronicles of crafting academic repute and laurels for the past twenty six golden years. Spearheading St. Joseph's College to its most cherished and long awaited goal of securing NAAC A grade by being the IQAC coordinator during the tenure 2014-2019, he was assigned the chair of Principal of the institution from 1st May 2021. He became an Associate Professor in 2009 and headed the Department of Mathematics for the term 2015-2021. Besides this, he also dedicates his time in Mathematical Research, and mentoring higher educational institutions across Kerala towards NAAC Accreditation and Ranking.

Rev. Dr. Jomon K Sebastian CMI

Rev. Dr. Jomon K Sebastian CMI is the bursar of our institution. He secured his doctoral degree from Manonmaniam Sundaranar University, Tamilnadu, India on 'Decompositions of Graphs'. Dr. Jomon currently serves as Bursar and Associate editor of *Josephine Researcher VI*. He is a member in the panels of referees for 4 international research journals and a life member of 4 professional societies. He has authored 13 research articles in Graph Theory. He is also the author of 15 literary articles in Malayalam. He has attended 32 conferences and presented 16 papers. He also holds post-graduate degrees in Mathematics and Education. He has over 10 years of teaching experience and about 6 years of research experience.

EDITORS



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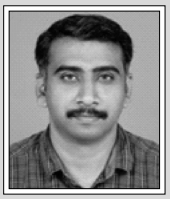
Dr. Praveen Joseph



Dr. Subin Thomas

Dr. Salini L.R.

Ms. Christy Joseph

Dr. Jose James is serving as the Assistant Professor in the Department of Chemistry since 2011 and is an approved research guide in Mahatma Gandhi University under the faculty of science. In his credit, there are 8 International publications, 2 International edited books, 7 International book chapters, 5 National edited books, 8 National book chapters, 21 International Conference presentations and is serving as a reviewer of number of International Journals. He works in collaboration with Prof. Sabu Thomas, Vice-Chancellor of Mahatma Gandhi University in the domain of Polymer Science and Nanotechnology.

Dr. Sr. Sijo Francis, Assistant Professor and Head of Department in Chemistry and and is an approved research guide in Mahatma Gandhi University under the faculty of science. She qualified for the CSIR-UGC examination in Chemical Sciences and had a good score in GATE-2010. She has 12 International peer-reviewed publications, 7 International book chapters and 7 National book chapters. Her research interests include nanomaterials, polymer composites and computational chemistry.

Dr. Praveen Joseph is an Assistant Professor in the Department of Physics, St. Joseph's College Moolamattom. He was conferred his Ph.D degree in Physics from Mangalore University and has 15 years of teaching and research experience. He has published 20 research articles in National and international journals and presented 21 articles in National and international conferences. He is a life member of the academy of Physics teachers, Kerala.

Dr. Subin Thomas earned his Ph.D from the Department of Instrumentation, Cochin university of Science and Technology. He later served as a post doctoral fellow at the School of Pure and Applied Physics, Mahatma Gandhi University, where he worked on Surface Enhanced Raman Spectroscopic applications of graphene. Later, he moved to Cochin University of Science and Technology as a post doctoral fellow and studied functionalization of graphene for biosensing applications. Dr. Subin Thomas is currently working as an Assistant Professor in the Department of Physics, St. Joseph's College, Moolamattom. Dr. Subin Thomas has authored 10 papers and conference papers.

Dr. Salini LR joined the service as Assistant Professor in English, St. Joseph College Moolamttom on September 2021. She had completed her MA, MPhil and Ph.D. from Jawaharlal Nehru University, New Delhi. She had worked in many colleges across India as guest lecturer and adhoc faculty in English. She has published a book titled *Padayani* on 2019. She also had to her credit more than 10 publications in various National journals and had participated in many workshops, seminars and faculty development programs of academic importance.

Ms. Christy Joseph is working as Assistant Professor, in Department of English, St. Joseph's College, Moolamattom. She completed her Post Graduation from Pondicherry University and, M.Phil. from School of Letters, M.G. University. She has published 11 papers in various National and International Journals. She also has four years of teaching experience. Her areas of interest include Postcolonial Literatures and Trauma Studies.

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 ISBN: 978-93-87709-90-4

CASE STUDY ON BREAKUP OF HERO HONDA AND ITS CURRENT CHALLENGES

Dr. Joseph George
Department of Management Studies, St. Joseph's College, Moolamattom

Introduction

Hero Honda Motors Limited, based in Delhi, is the world's third largest manufacturer of motorcycles. Hero Honda is a joint venture that begins in 1984 between the Hero Group of India and Honda of Japan. It has been the world's largest manufacturer of two-wheeled motorized vehicles since 2001,when it produced 1.3 billion motorbikes in a single year.

Hero Honda's *splendor* was the world's largest selling motorcycle that time. Its two plants are in Dharuhera and Gurgaon, both in India. Third plant is at Haridwar, Uttaranchal has also started production by April 2018. It will have production facilities such as lean manufacturing concept, more flexible lines and stream line material flow, within and proximity to achieve Just-In-Time manufacturing. It specializes in dual use of motorcycles that are low powered but very fuel efficient.

Hero Honda Motors is one of the most prominent company of India and it is also one of the constituent of NIFTY. The company is the largest two-wheeler manufacturer in the world and also in India, where it has a market share of about 37.1% in the two wheeler industry. Hero Honda Motorcycles where popular in the market because of their fuel economy and low cost.

History of Hero Honda Motors Ltd.

Before the HERO and HONDA come together as a joint venture, HERO was a brand name used by Munjal Brothers to manufacture HERO motorcycles in 1956. HONDA on the other hand was the last Japanese two-wheeler giant to enter Indian Motorcycle Industry after Yamaha, Suzuki and Kawasaki.

There was a rule in India that any foreign company wants to start a business in India, they need to start a joint venture with Indian company. So in 1984, HONDA and HERO came together as a joint venture to manufacture motorcycles under the brand name HERO HONDA and formed HERO HONDA MOTORS LIMITED.

HERO HONDA is world's third largest two-wheeler maker. India has the largest number of two-wheelers in the world with 41.6 million vehicles. India has a mix of 30% automobiles and 70% two-wheelers in the country. India was the second largest manu-

facturer of two wheelers in the world starting in 1950's with the birth of Automobiles Products of India (API) that manufactured scooter. API manufactured the LAMBRETTAS, but another company Bajaj Auto Limited surpassed API and remain through the turn of the country from its association with Piaggio of Italy (Manufacturer of Vespa scooter).

The licence Raj that existed between 1940's to 1980's in India did not allow foreign company to enter the Indian market and imports were tightly controlled. This regulatory maze before the economic liberalization made business easier for local players to have a seller market. Customers in India were forced to weight for twelve years to buy a scooter from Bajaj. The CEO of Bajaj commented that, *he did not need a marketing department, only a dispatch department*. By the year 1990, Bajaj had a waiting list that was twenty six times its annual output for scooters.

The motorcycle segment had the same long wait times with the manufacturers; Royal Enfeild, Ideal Jawa, and Escorts. Royal Enfeild made a 350 CC bullet with the only four-stroke engine at that times and took the higher end of the market but there was little competition for their customers. Ideal Jawa and Escorts took the middle and lower end of the market respectively.

In the mid 1980's, the Indian Government regulations changed and permitted foreign companies to enter the Indian markets through minority joint ventures. The two-wheeler market changed with four Indo-Japanese Ventures; HERO HONDA, TVS SUZUKI, BAJAJ KAWASAKI and KINETIC HONDA. The entry of these foreign companies changed the Indian market segments from the supply side to the demand side. With a larger selection of two-wheelers on the Indian market, consumer started to gain influence over the product they brought and raised higher customer expectations. The industry produced more models, styling option, prices and different fuel efficiencies. The foreign companies new techniques helped to make the products more reliable and with better quality. Indian companies had to change to keep up with their Global counterparts. The 2006 Forbes 200 most respected companies list has HERO HONDA ranked at 108th position.

Hero Motocorp: History

Hero MotoCorp is the world's single largest two-wheeler motorcycle company. Honda Motor Company of Japan and the Hero Group entered a joint venture to setup Hero Honda Motors Limited in 1984. The joint venture between India's Hero Group and Honda Motor Company, Japan has not only created the world's single largest two wheeler company but also one of the most successful joint ventures worldwide.

During the 80s, Hero Honda became the first company in India to prove that it was possible to drive a vehicle without polluting the roads. The company introduced new generation motorcycles that set industry benchmarks for fuel thrift and low emission. A legendary *Fill it – Shut it – Forget it* campaign captured the imagination of commuters across India, and Hero Honda sold millions of bikes purely on the commitment of increased mileage.

Over 20 million Hero Honda two wheelers tread Indian roads today. These are almost as many as the number of people in Finland, Ireland and Sweden put together. Hero Honda has consistently grown at double digits since inception; and today, every second motorcycle sold in the country is a Hero Honda. Every 30 seconds, someone in India buys Hero Honda's top –selling motorcycle – Splendor. This festive season, the company sold half a million two wheelers in a single month—a feat unparalleled in global automotive history.

Hero Honda became the first company in the country to introduce four–stroke motorcycles and set the standards for fuel efficiency, pollution control and quality. It has an excellent distribution and service network spread throughout the country. Hero Honda bikes currently roll out from its three globally benchmarked manufacturing facilities. Two of these are based at Dharuhera and Gurgaon in Haryana and the third state of the art manufacturing facility was inaugurated at Haridwar, Uttrakhand in April this year. These plants together are capable of producing out 4.4 million units per year.

Having reached an unassailable pole position in the Indian two wheeler market, Hero Honda is constantly working towards consolidating its position in the market place. The company believes that changing demographic profile of India, increasing urbanization and the empowerment of rural India will add millions of new families to the economic mainstream. This would provide the growth ballast that would sustain Hero Honda in the years to come. As Brijmohan Lall Munjal, the Chairman, Hero Honda Motors succinctly points out, *We pioneered India's motorcycle industry, and it's our responsibility now to take the industry to the next level. We'll do all it takes to reach there.*

Honda Motor Company Ltd.: History

Honda Motor Company Limited is perhaps best known as an automaker - it is the third largest automaker in Japan - but the company has its roots in motorcycles, and is the world's top motorcycle manufacturer. Its best market is in the United States, where the majority of its sales are generated. Honda's automobile product line accounts for approximately 90 percent of its sales, and includes well-known U.S. top-sellers such as the Accord, Legend, Civic, Prelude, and the luxury Acura. The Accord is the second most purchased car in the United States, although it actually ranks first on the country's list of most stolen (*and thus, in demand*) vehicles. Honda also produces motorcycles such as the Super Cub, Foresight, and Shadow 750. Furthermore, the company's power products division makes other items that bolster annual sales, such as agricultural and industrial-use machinery, portable generators, outboard motors, and all-terrain vehicles.

Any description of Honda Motor Company's history and success must take into account the contrasting inclinations of its founders—Soichiro Honda and his partner, Takeo Fujisawa. Soichiro Honda's achievements as a mechanical engineer are said to have matched those of Henry Ford. Working in his Japanese machine shop in 1938, Honda concentrated his early efforts on casting a per-

fect piston ring. He soon succeeded in casting a ring that met his standards, and attempted to sell it to the Toyota Corporation.

Toyota rejected Honda's first batch of piston rings, but two years later the company finally placed a large order. At that time, however, Honda ironically found himself facing a major obstacle that came as a result of the order's large size—a shortage of cement. Because Japan was preparing for war, Honda could not secure the cement and materials needed to construct a factory to mass-produce piston rings. Furthermore, he could not produce the quantity of piston rings necessary using his facility at that time. Undaunted, Honda learned how to make his own cement and soon constructed the new facility.

Honda's new factories survived the bombing attacks during World War II, but were unfortunately later destroyed by an earthquake. At that time, Honda sold his piston ring operation to Toyota and went on to manufacture motorbikes instead. He had designed his first bike in the early postwar years when gasoline was very scarce and the need for a low fuel-consuming vehicle was great. After the destruction of his piston ring manufacturing facilities, he decided to attempt selling his motorbike on a larger scale.

To form a company, Honda joined efforts with investor Takeo Fujisawa, whom he had known throughout the 1940s. In 1949 Fujisawa provided the capital, as well as financial and marketing strategies, to start the new company. Honda's motivation for establishing the company-unlike Fujisawa's-was not purely commercial, but was instead to provide himself with a secure financial base so that he might pursue other ambitions such as motorcycle racing.

Growth of Hero Honda Motors Ltd.

Hero Honda experienced great growth throughout its early days. The Munjal family started a modest business of bicycle components. By 2002, Hero Group had sold 86 million bicycles producing 16000 bicycles a day. Today, Hero Honda as an assembly line of nine different models of motorcycles available. It holds the record for most popular bike in the world by sales for its SPLENDOR model. Hero Honda Motors Ltd. was established in joint venture with Honda Motors of Japan in 1984, to manufacture motorcycles. It is currently the largest producer of two-wheelers in the world. It sold 3 Million bikes in the year 2005-2006. Recently it has also entered in scooter manufacturing with its model PLEASURE mainly aimed at girls. HUNK is the latest offering from the HHML stable.

In 1984, Honda and Hero came together as a joint venture to manufacture motorcycles under the brand name Hero Honda and formed HERO HONDA MOTORS LTD.

In 1985, The Company's first motorcycle "Hero Honda CD100" was launched. Hero Honda became the first company in India to introduce 4-stroke motorcycles which set the standards for fuel efficiency.

In 1989, after celebrating the success of CD100 and one lakh motorcycles produced, Hero Honda produced five lakh motorcycles and launched CD100 SS in 1991. There is only causmetic change sin CD100 and CD100 SS.

In 1994, Hero Honda launched a new product / motorcycle named 'SPLENDOR'. Hero Honda SPLENDOR changed the history of the company. SPLENDOR was the successor of CD100.

In 1999, the company launched a new motorcycle named 'CBZ' and in 2001, Hero Honda launched two new motorcycles "HERO HONDA PASSION and HERO HONDA JOY". The Hero Honda Passion have an executive look and it became India's top second selling motorcycle and Hero Honda JOY was one of the most affordable one.

In 2002, Hero Honda KARIZMA and Hero Honda CD DAWN were introduced along with the upgraded models of SPLENDOR and PASSION named SPLENDOR PLUS and PASSION PLUS.

In 2003, Hero Honda introduces a brand new motorcycle "AMBITION 135". In the same year Hero Honda also introduces a new variant of Hero Honda CBZ, named Hero Honda "CBZ STAR".

In 2005, Hero Honda introduced four new motorcycle models namely SUPER SPLENDOR, CD DELUXE, GLAMOR, and all new ACHIEVER. The SUPER SPLENDOR was the flash version of top selling motorcycle in SPLENDOR. On the other hand CD DELUXE was the stylish new entry level commuted offering from HERO HONDA. Hero Honda GLAMOR was a fuel engine with 125CC motorcycle. It also paid for the history of Hero Honda Motorcycles.

Hero Motorcorp - Global Sales

Hero Motors Corp. Global Sales have been almost negative in the 2021 reaching 5.1 million, down 8.4% from the previous year and over 3 million units down from the 2018 peak. International operations count 5.5% of the total, but most are concentrated in the Bangladesh and Nepal.

Following the huge sales lost reported in the 2020, with over 1.3 million down from the previous year, Hero Motor has not recovered in the 2021, due to the hard second half for the domestic Indian market, reaching a global sales level down 27% from the all-time record established in the 2018.

After a moderately recover posted in the first quarter (around 200.000 sales) in the second quarter the Indian company kept struggling and after an *easy* comparison towards the 2020 near-to-zero sales reported in April and May, in June the performance was again awful with sales declining near the half compared with the 2020 and two-third compared with 2019. Unfortunately this negative trend was on in the entire second half, when the Indian market declined over any expectations.

Hero Corp. second half was really negative with sales down 22.2% year-on-year, due to the very low demand in India, where Hero is market leader. The firm is market leader in India and based the 2014-2018 success on the domestic dominion. However, now the slow speed in gaining sales in the international market is a sharp weakness, even compared with other Indian manufacturers. Global Sales in 2021 have been 5.1 million, down 8.4% from the previous year and over 3 million units down from the 2018 peak. International operations count 5.5% of the

total, but most are concentrated in the Bangladesh and Nepal. The company is now focusing to expand activity in Latin America and 2021 sales in the region grew up 63.2%. But numbers are still negligible. Hero exports even in 11 countries in Latin America, but actually with a marginal rule in the market.

Diversification

Throughout the year of enormous growth, The Group Chairman, Mr. Lal has actively looked at diversification. A considerable level of vertical integration in its manufacturing activities has been ample in the group's growth and led to the establishment of the Hero Cycles Cold Rolling Division. Munjal & Sunbeam Castings, Munjal Auto Components & Munjal Showa Ltd. amongst other component manufacturing units.

Then there were the expansion into the automotive segment with the setting up of MAJESTIC AUTO LIMITED, were the first indigeniously designed, moped, HERO MAJESTIC, went into commercial production in 1978. Then came Hero Motors, which introduced HERO PUNCH, in collaboration with global technology leader Steyr Daimier Puch of Austria. Hero Honda Motors was established in 1984 to manufacture 100 CC motorcycles.

The Hero Group also took a venture into other segments like exports, financial services, information technology, which includes customer response services and software development. Further expansion is expected in the areas of insurance and telecommunication.

The Hero Group's phenomenal growth is the result of constant innovations a close watch on costs and the dynamic leadership of the group Chairman, characterized by a culture of entrepreneurship, of right attitudes and building stronger relationships with investors, partners, vendors, dealers and customers.

Labour Relations

In Hero Group there is no organized labour union and family members of employers find ready employment within Hero. The philosophy with regard to labour management is "Hero is growing, Grow with Hero". Hero workers receives a uniform allowance, as well as House Rent Allowance (HRA) and Leave Travel Allowance (LTA). Extra benefits include Medical Check-Ups, not just for workers, but also for the immediate family members. For the majority of the production workers, who are hired. Through contractors, these benefits are out of reach. This and other problems leads to a strike and factory occupation by 4000 temporary workers in the Gurgaon Plant in spring 2006.

Criticisms against Hero Honda

There is a frequent complaint that the biking enthusiasts in India making many auto related to Hero Honda not making serious efforts to upgrade its models as frequently as its competitors like YAMAHA, BAJAJ and TVS. Many bike enthusiasts in India feel that Hero Honda only upgrades the 'stickers' along with the names of its bikes. Sticker upgrading can be easily noticed by observing the technical specifications of the models SPLENDOR, SPLENDOR PLUS, PASSION, PASSION PLUS, KARIZMA,

KARIZMA R. Another frequent complaint made by bike enthusiasts is that Hero Honda has too many bike models with exactly same or similar engines despite of the company claiming that it caters to "all segments". While BAJAJ rolls out new models with many improvements, there have been very less new features upgraded models from Hero Honda. The latest bike from Hero Honda is HUNK, which again has an engine more or less similar to CBZ-EXTREME and now YAMAHA has launched two new bikes YFZR15 and FZ16 to compete with Hero Honda and Bajaj.

Reasons behind Hero Honda seperation

- Honda make a separate entry
- Issue of experts
- Board representation
- Hero's own R&D
- Honda's success
- Honda's reduced interest in joint venture

In 90's and 2000's India was flooded with Hero Honda bikes. A joint venture between the Hero Group of India and Honda Motor Company (JAPAN) was established in 1984. Hero Honda Motorcycles were popular in the Indian market because of their fuel economy and low cost.

But in 2010, the joint venture between Hero Group of India and Honda Group of Japan came to an end. Because. during 2007-2008, Hero Honda wanted to expand itself by exporting to other countries but Honda already had its subsidiary companies in many countries. This raised tensions because Honda believed that Hero Honda will have to compete on its own Since, it could not influence its subsidiaries. There were four board members of Hero Honda and all of them belonged to Honda. So, Honda had access to all strategies and plans of Hero Honda. Hero Honda wanted to scale up its business by focusing and investing in its own Research & Development to which Honda was not comfortable. Honda Motorcycles and Scooters India Pvt. Ltd., a 100% subsidiary company of Honda, launched a 110 CC Motorcycle that become direct competitor to Hero Honda Bikes.

As we all know, Hero Honda was really very popular, for a middle class man the brand was synonymous with bikes. Hero Honda Motors Pvt. Ltd. Was regarded as world's largest manufacturer of two-wheelers. But, there were a lot of internal problems which happened behind the closed doors as we mentioned above other such reasons are:

Problem in export:

According to the agreement between HERO Group and HONDA Group in the year 1984 the joint venture entity is only allowed for the production and consumption of the domestic market with the passage of time this deal was modified and the joint venture entity HERO-HONDA Group was allowed to export to the selected foreign markets like Sri Lanka, Bangladesh, Nepal and Columbia.

However, in 2008 Hero-Honda wanted to enter into more new foreign markets at that time Honda denied to its support and told that the joint venture company have to enter

into the new markets on its own. That means Honda can't help the joint venture entity Hero-Honda to enter into the new markets through its existing subsidiaries this was quite a sad moment for Hero-Honda.

Difference in Vision:

Hero Honda wanted to grow and improve its business by investing in developingand manufacturing its own goods. But the Honda group was not comfortable with this.

Issue of Board of Directors:

In the Board of Hero-Honda, Honda had four seats, through those seats Honda had all the access to Hero-Honda's insider plan while Hero-Honda didn't have any access to Honda's plan and the conflicts between both the groups were rising slowly.

Mutual competition:

Honda motorcycles and scooters India Pvt. Ltd. a 100% subsidiary company of Honda entered India in the year 1999 with an agreement that it will not compete with each other. But in the year 2010 Honda broke that agreement launched motorcycles in the segment of 110CC. Through that segment 70% of Hero-Honda sales were coming. This, made Honda the direct competitor of Hero-Honda.

So, due to all of these reasons the split between Hero and Honda happened. After the split Honda is growing itself in the two-wheeler segment whereas Hero s sill the number one player in that segment.

Hero v/s Honda

Hero Motocorp

- ✓ Description: Hero Motocorp was originally started by brings Mohanlal monjal and brothers in 1923 its an Indian company.
- ✓ Head Quarters: Hero Motocorp is located in New Delhi India.
- ✓ Market Share: Market share of Hero motocorp is 35.9 percentage.
- ✓ Rank: Rank first in India and rank first in the world
- ✓ No. of Plans: Six plants of Hero Motocorps is located in India to outside India (Columbia and Bangladesh)
- ✓ Export: Hero Motocorps export products in 37 countries.
- ✓ Top selling vehicle: Hero Splendor Hero HM Deluxe, Hero glamour Hero Passion etc.
- ✓ No. of employees: 8551 employees working for Hero Motocorp.
- ✓ Output unit: 70 lakh two wheelers sold by Hero Motocorp in year 2019.

Honda Motor Company Ltd.

- ✓ Description: Honda Motor Company Ltd. started by Soichiro Honda in 1946. It is a Japanese Company.
- ✓ Head Quarters: Head Quarter of Honda Motor Company Ltd. is located in Gurgaon, Haryana.
- ✓ Marker share: Market Share of Honda Motorcycles & Scooters – 26.1%
- ✓ Rank: Rank 2nd in India and 3rd in the World.
- ✓ No. of Plants: Four plants of Honda Motor Company Ltd. is located in India.

- ✓ Export: Honda Motor Company Ltd. exports products in 26 countries.
- ✓ Top selling vehicles: Honda Activa, Honda CD Shine, Honda Dio, Honda Unicorn, Honda CB etc.
- ✓ No. of employees: 6000 employees working for Honda Motor Company Ltd.
- ✓ Output unit: 50 lakh two wheelers sold by Honda Motor Company Ltd. in the year 2019.

Market share of Hero & Honda after seperation

Honda Motorcycle and Scooter India remains in the second spot, ruling a share of 24.80 percent which is a little over 24.59 percent in December 2020. TVS Motor Company has gone on to increase its market share by 0.81 percent, moving up from 14.34 percent to 15.15 percent in December 2020 and 2021, respectively.

Brands that have witnessed a positive growth also include Bajaj Auto Ltd which grew from 11.28 percent in December 2020 to 12.50 percent in December 2021. Suzuki Motorcycle India's share increased from 3.16 percent to 3.71 percent.

These are followed by Royal Enfield which has had a drop in market share from 3.59 percent to 3.49 percent in Decembr 2021. India Yamaha Motor's share increased from 3.01 percent to 3.28 percent.

Problem faced by Hero and Honda after its seperation

- **HERO-HONDA doesn't make any choice in the sports field:**

Hero Honda does not make any changes in the field of sports. Other companies like KTM, HARLEY DAVIDSON, YAMAHA, SUZUKI are making so much advantages on this field by providing so many choices for the sports lovers.

- **Less focus on Scooters:**

In earlier times, Hero Honda are the king in the segment of scooters. But now they reduce the focus on manufacturing scooters and focus only on bikes. If they concentrate more on scooters they can yield more profit. Once Hero Honda are the king in the field of introducing scooters in the Indian Market, but now they are down in this area. Other bike manufacturing companies like TVS (their TVS Ntorq is currently dominating sales because of its features, power, performance and also they had introduced wide verities of bike within these short period.

- **Similar models with minute differences:**

There is a frequent complaint that bike enthusiasts in India make many auto related to Hero Honda not making serious effort to upgrade its models as frequently as its competitors like YAMAHA, BAJAJ and TVS etc. They only make changes in their sticker and body design. Many bike enthusiast in India feel that Hero Honda only upgrades its stickers along with the names of its bikes. Sticker upgrading can be easily noticed by observing the technical specifications of the models SPLENDER, SPLENDER+, PASSION, PASSION PLUS, CD100, CD100SS, KARIZMA and KARIZMA R.

- **Branding and Exporting**:

After the split of Hero Honda the exports may not rise as fast as expected because it takes time to understand local markets and to build supply chains. Additionally for HERO they cannot use the HONDA name for exports. Branding will be a challenge.

- **Losses a best opportunity:**

Honda losses the best opportunity for becoming a king in the segment motorcycles in Indian market. India is the leading manufacturing of motorcycles in the world. So, after the split, HONDA losses a precious chance to conquer Indian market.

Solutions for the future success

- ❖ HERO & HONDA need to make an amazing entry in the field of sports. So, many companies are providing wide verities of choices to the riders. HERO & HONDA have to make a higher CC bikes to challenge all the competitors in the sports field like, KTM, HARLEY DAVIDSON, etc. So a unique and attractive model should be produced by HERO& HONDA to acquire a place in sports field and also to attain earlier growth, when they are together.
- ❖ As per National Family Health Survey 2022, India's sex ratio in 2022 is 1020 females per 1000 males. From these data, we can say that females are more in number than males in the country. Both HERO & HONDA provide motorcycles by focusing only on gents. So, if they concentrate on women oriented vehicles, they can conquer a large profit by making scooters for women and also they can provide a suitable and comfortable model of bikes for women and girls who had a craze on bikes.
- ❖ The future is going to a technological hike. Now, so many people changes to electronic motorcycles because they are very eco-friendly and we can avoid the issue of high rate of petrol. But it has so many disadvantages too. There are so many cases reported in the country that indicate, it is very dangerous for use. It is because so many people were died by blasting of these scooters when put it on charging. Another drawback is that these electronic scooters stop running unexpectedly while riding and immediate /quick decline of battery power. So HERO & HONDA have to update more by forecasting future changes by keeping mind these disadvantages and provide a more efficient one with ensuring safety and security, power capacity, safe charging facility etc. will surpasses the other competitors. So, if they introduce advance featured and safety secured electronic bike it will make a hike in their growth history.
- ❖ HERO & HONDA are usually manufactured in affordable way and even any middle class family can buy those bikes but some high class families buy vehicles according to their dignity and status. So, they usually prefer higher end vehicles. In this case, there is no any choice in HERO & HONDA Companies. These companies should develop the bikes that should provide a choice for

the high class people who values their status in the society.

Conclusion

As per the latest information, HERO is the number one motorcycle company in the Indian Market and also HONDA is riding to get stronger. But, actually both HERO and HONDA are not achieving a 100% success as they are in Joint Venture. Both of them has enough caliber to achieve the growth as on when they are together. But they have to find out the causes for these problem and catch-up through the better way.

Here, we have identified some problems within these companies and we also suggest some solutions for the better growth for the future. We know that, HERO and HONDA never joint back, so both the company have to move on with their own strategies and efficient ideas to become a great success in the history.

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 ISBN: 978-93-87709-90-4

INTELLECTUAL PROPERTY RIGHTS: AN OVERVIEW

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ABSTRACT

Intellectual property rights (IPR) have been defined as ideas, inventions, and creative expressions based on which there is a public willingness to bestow the status of property. IPR provide certain exclusive rights to the inventors or creators of that property, in order to enable them to reap commercial benefits from their creative efforts. There are several types of intellectual property protection like patent, copyright, trademark, etc. Patent is recognition for an invention.IPR is prerequisite for better identification, planning, commercialization, rendering, and thereby protection of invention or creativity. Each industry should evolve its own IPR policies, management style, strategies, and so on depending on its area of specialty.

Keywords: Intellectual Property, Patents, copyright, trademarks

Introduction

IPR plays vital role today. Intellectual property rights (IPR) refers to the legal rights given to the inventor or creator to protect his invention or creation for a certain period of time.IPR refers to any original creation of the human intellect such as artistic, literary, technical, or scientific creation. IPR grants the inventor/creator an exclusive right for a certain period of time for use of his invention/creation.

The laws and administrative procedures relating to IPR have their roots in Europe. The trend of granting patents started in the fourteenth century. The first known copyrights appeared in Italy. Patent act in India is more than 150 years old. The inaugural one is the 1856 Act, which is based on the British patent system and it has provided the patent term of 14 years followed by numerous acts and amendments.

Types of IP Protection

A variety of Intellectual efforts including:

1. Patents
2. Trademarks
3. Copyright
4. Geographical Indications

A patent is awarded for an invention. Patents can be granted for products and processes. As per the Indian Patent Act 1970, the term of a patent was 14 years from the date of filing except for processes for preparing drugs and food items for which the term was 7 years from the date of the filing or 5 years from the date of the patent, whichever is earlier.

Trademarks relate to any mark, name or logo under which trade is conducted for any product or service and by which the manufacturer or the service provider is identified. Trademarks can be bought, sold, and licensed. Trademark has no existence apart from the goodwill of the product or service it symbolizes.

<TM>

The trademark symbol <TM> is a symbol to indicate that the preceding mark is a trademark, specifically an unregistered trademark. It complements the registered trademark symbol <®> which is reserved for trademarks registered with an appropriate government agency.

Copyright relates to expression of ideas in material form and includes literary, musical, dramatic, artistic, cinematography work, audio tapes, and computer software.

© Copyright Symbol

Geographical indications are indications, which identify as good as originating in the territory of a country or a region or locality in that territory where a given quality, reputation, or other characteristic of the goods is essentially attributable to its geographical origin. A geographical indication (GI) is a sign used on products that have a specific geographical origin and possess qualities or a reputation that are due to that origin.

Controller General of Patents, Designs, and Trade Marks, Department for promotion of industry and Internal Trade, Govt. of India

The Office of the Controller General of Patents, Designs & Trade Marks (CGPDTM) is located at Mumbai. The Head Office of the Patent office is at Kolkata and its Branch offices are located at Chennai, New Delhi and Mumbai. The Trade Marks registry is at Mumbai and its Branches are located in Kolkata, Chennai, Ahmedabad and New Delhi. The Design Office is located at Kolkata in the Patent Office. The Offices of The Patent Information System (PIS) and National Institute of Intellectual Property Management (NIIPM) are at Nagpur. The Controller General supervises the working of the Patents Act, 1970, as amended, the Designs Act, 2000 and the Trade Marks Act, 1999 and also renders advice to the Government on matters relating to these subjects. In order to protect the Geographical Indications of goods a Geographical Indications Registry has been established in Chennai to administer the Geographical Indications of Goods (Registration and Protection) Act, 1999 under the CGPDTM.

https://ipindia.gov.in/index.htm is the official website for Controller General of Patents, Designs, and Trade Marks, Department for promotion of industry and Internal Trade, Govt. of India. It will provide all acts, rule, amendments etc relating to Intellectual property Rights.

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 ISBN: 978-93-87709-90-4

DESIRE FOR SOCIAL FREEDOM AMONG MARRIED WOMEN

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ABSTRACT:

The major objective of the study was to evaluate the perspectives on desire of social freedom in accordance with marital status. Questionnaire method was used to collect data from 327 participants including Females (N=251) and Males (N=76) in the age group of 18-40 from southern Kerala. Convenient sampling method was used to select participants. The study revealed that, marital status influenced the perspective on desire for women's social freedom. The unmarried people showed more desire for women's social freedom than the married people. Further, the perspectives on desire for women's social freedom significantly varied among different age groups.

Keywords: Women's Social freedom, marital status, Age group

Introduction

Marriage is an institution that admits man and woman to family life. It is a stable relationship in which a man and a woman are socially permitted to live together without losing their status in the community. Marriage is not merely concerned with the couple; rather it affects the whole society and future generations. The responsibilities it entrusts a couple with are thus both heavy and delicate. In Hindu view, marriage is not a concession to human weakness, but a means for spiritual growth. Man and woman are soul mates who, through the institution of marriage, can direct the energy associated with their individual instincts and passion into the progress of their souls. The institution of marriage has been regarded as the central feature of all forms of human society. It lays down the nucleus of society. It is one of the most important social institutions of all the societies of the world. There is no greater event in a family than a wedding, dramatically evoking every possible social obligation, kinship bond, traditional value, impassioned Sentiment, and economic resource (Jain, 2019). Marriage in India is considered as an important social event and is supposed to transmit traditional values across generations. Hence, in orthodox so-

ciety, lone women (unmarried/widow/ divorcee/ separated) are subject to disrespect in anticipation that they are rebelling against patriarchy. Again, in this type of society, majority of Indian women are discouraged to opt job, therefore, marriage becomes the only option for their future settlement and security. Hence, life of Indian women is supposed to spin around their marital status, which possibly has some influence on their level of empowerment (Biswas & Mukhopadhyay, 2018**).**

Women Social freedom refers to women's desire to be free from social taboos, conventions, rituals, and roles which provide them with lower status in society (Bhusan, 1987). Women Social freedom means the will of women obtaining freedom from social custom tradition religious ritual which is giving them lower-level financial freedom, political rights, self-relevant freedom from bonds of cast, freedom from orthodox thoughts, own options for selection of life partner participation in decision making (Rajkumari& Kumar,2018). For centuries women have been treated as week, obedient, shy, and timid partner of the men and thereby have enjoyed an inferior status in society. In recent years desire for social freedom among women has manifested itself in protest and revolt against the traditional social norms and taboos. With the growth in education and vocational opportunities women throughout the world have become more conscious of their rights of equality and freedom. They demand equality in true sense of the in all spheres of life (Mitra, 2019).

According to Jan (2014) the factors such as educational status, type of family and the personal income of women significantly influenced general desire for social freedom. Moreover, in a marital relationship, women may face lots of difficulties including household chores, child rearing, marital rape, career selection etc. The study of Ban (2018) evidenced such practices clearly in his findings. Triple role/double burden and triple burden of works are the terms that are used to describe the amount of workload among women who are not only involved in economic activities, but are also burdened by the unequal share of unpaid domestic labour. Triple role of a woman refers to her, reproductive role, productive role, and the role of community management. The reproductive role of a woman includes care and maintenance (childbearing, rearing and caring) the productive role relates to activities that generate income and the community management role is mostly concerned with functions related to community level activities, domestic work, healthcare etc. In a family where both the parents are employed, women, more than often spend a significant amount of time in household chores, child rearing, caring for the sick member etc. If the average amount of time spent by a married woman doing unpaid work is accounted for, it is evident that a woman spends more than twelve hours a day working. Still, many view it as a "woman's" work and undervalue it, considering it to be too insignificant for being recognized as "real" work. The collective situation around the globe is similar. With conditions exacerbated even more so in most nations of Asia. The traditional mindset of the public in countries like India and Nepal

is ever resilient, even among the ones with high influencing powers; policy makers and employers. In most societies, low-income women are highly dependent as they mostly undertake roles that involve care and unpaid work. Along with being engaged in reproductive role, which is, physically and mentally arduous, they are responsible for domestic work, agricultural work and for gathering of basic necessities like firewood and water. The societal expectations of women to be able to impeccably juggle their career, children and household must stop. It is not just to expose women to the choice of compromising either their career or their family when men rarely face such debilitating choices.

Pew Research Center survey (2013) found that, among parents with at least some work experience, mothers with children under age 18 were about three times as likely as fathers to say that being a working parent made it harder for them to advance in their job or career. One reason mothers are more likely than fathers to say it is harder to get ahead in the workplace may be that women are much more likely than men to experience a variety of family-related career interruptions (Parker,2015). Women assess their marriages and opportunities through the lenses of other institutions and factors, such as family, education, religion, and economy. Women's perceived level of autonomy, choice availability, historical circumstances, internal perceptions of self-efficacy and self-worth, support from valued other, and sense of belonging greatly influence one's perceptions and attainment of opportunities outside of marriage (Lauer, 2016).

Society makes some unwritten rules also for young adults that makes some restrictions and societal control over them. It is existed as a social taboo as part of some culture. These may be the reason that they crave more for their social freedom. Higher level of education, opportunities and exposures make them think about their social freedom. Young generation experiences lots of restrictions due to the parental anxiety. Among these young women suffers a lot especially unmarried woman. According to the study of Corey and Chen (2019), parental pressure could result in negative emotional responses and internal conflict in young adult women. This has negative consequences for their emotional well-being and career exploration processes. Most of the parents considered unmarried status of women as a burden for them. So, they try to settle and become engaged their daughters by means of marriage as early. Parents believed that marriage assured security and is the stepping stone for the bright future for their daughters.

The attitude of Indian parents towards their girl child clearly reflected in the study of Bankar and Collumbien et al, (2018). According to them, once a girl reached menarche in India, parents get concerned about demonstrating her 'good' virtue, an essential aspect for finding a good matrimonial match. Good virtue requires modesty, a deferential demeanor, proficiency in household chores and above all sexual purity. Early marriage becomes part and parcel of the symbolic display of segregation, modesty, and chastity. The supremacy of virginity means unmarried girls are in need of both

restraint and protection, limiting their access to public spaces. Gendered power dynamics are embedded in space, organized into the "masculine" public domain, and the "feminine" private sphere. Popular discourse associates' women's safety with the modesty of her clothing, with *burkhas* and *salwar kameez* designed to hide the female body from public view. As custodians of family honor, girls are socialized to fear not only potential violence in public spaces but also the threat of public censure that will impact her 'reputation.' The fear of sexual harassment maintains male privilege, diminishes women's feelings of safety and belonging in public places and restricts their freedom of movement. Fear and social control significantly limit girls' individual agency to access public space, a structural barrier in any intervention aiming to increase female education and participation as citizens in society. These all curtailed the social freedom of unmarried women.

Objectives

- To find out whether there is any significant difference in perspectives on desire of women's social freedom based on their marital status.
- To find out whether there is any significant difference in perspectives on desire of women's social freedom based on their age.

Hypotheses

- There will be significant difference in perspectives on desire of women's social freedom based on their marital status.
- There will be significant difference in perspectives on desire of women's social freedom based on their age.

Sample and Sampling

The sample consists of 327 adults from southern Kerala through convenient sampling.

Tools

1. A self-prepared demographic data sheet was used to collect personal details such as age, gender, religion, marital status etc.
2. Women social freedom scale developed by Bhusan (2017) was used to assess social freedom. The scale possesses high reliability (0.75). The scale is significantly correlated with Eysenck's Radicalism Scale and ensuring construct validity.

Procedure

The data was collected through direct approach and by using Google forms. The

Variable	Mean of unmarried women (N=279)	S. D	Mean of married Women (N=48)	S. D	't' value
Women's social freedom	35.68	5.01	31.0	6.931	5.62**

**significance level at 0.01 level

doubts, if any clarified during the administration.

Results and Discussion

Mean, standard deviation and corresponding 't' value of Women's Social Freedom based on Marital status.

The above table shows that the mean of unmarried sample is 35.68 and the standard deviation is 5.01. The mean of the married sample is 31.0, the standard deviation is 6.93 and the corresponding't' value is 5.62. It is statistically significant at 0.01 level. It indicates that perspectives on desire of women's social freedom is higher in unmarried samples. This result was probably due to the responsibilities occurred in the life of married people. They must bear additional responsibilities include household chores, children bearing, rearing, family expenses, etc. than the unmarried people. Unmarried people bargaining more for their social freedom may be the cumulative effect of awareness, ideologies, exposures, and opportunities they get as part of their education. In the case of unmarried people, they are more passionate about their life, career, and financial independence and more. Hence hypothesis, there will be significant difference in the perspectives on desire of women's social freedom based on marital status is accepted.

Present study supported the study of Narvekar (2014), found that women's social freedom is higher in unmarried sample, and the study conducted by Mitra (2019), the study revealed that unmarried women showed higher desire for social freedom than married women. Present study contradicted to the study of Rajkumari and Kumar (2018). They found that women's desire for social freedom higher in married sample than unmarried sample.

ANOVA of Women's Social Freedom with respect to Age group

Variable		Sum of squares	df	Mean Square	F
Women's social freedom	Between Groups	684.68	2	342.34	11.73**
	Within Groups	9453.31	324	29.17	
	Total	10138.00	326	342.34	

**Significant at 0.01 level

The table indicates that the calculated value is higher than the table value, there is a significant difference in perspective on desire of women's social freedom in terms of age groups. Hence the hypothesis, there will be significant difference in the perspectives on desire of women's social freedom is accepted at 0.01 level. The results of group mean analysis given below;

Post Hoc Test related to age group

Age groups	N	1	2
Age 31-40	19	29.52	
Age 26-30	20		33.40
Age 18-25	288		35.47
Sig.		1.000	0.15

From the table it is evident that the age group 18-25 possess higher level of desire of women's social freedom. The result may be the cumulative effect of education, generation gap, and the younger adults does not bear additional responsibilities like children, household works, family expenses etc. According to the study of Jan (2014), increase in age, family status, education level and personal income of women have shown highly significant impact on women's desire for social freedom. As younger generation gets more education it reflects in their ideologies also. That is the reason that they argue for social freedom. According to the societal norms the aged people enjoy much social freedom than the younger ones. It exists as asocial taboo in certain cultures. The age group 31-40 kept a difference with other groups.

Conclusion

The status of women in the society does not undergo much changes even today. The study indicates that perspectives on desire for social freedom is higher in unmarried young women. Women in India carry a strong desire for freedom. Women have been given equal rights in our constitution. However, it is a sad reality that women are still slaves as they were ages ago. It is pleasant to talk about women liberation; but, no one has really given them real freedom despite all the laws.

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 ISBN: 978-93-87709-90-4

MACHIAVELLIANISM AND SELF – ESTEEM IN ADOLESCENTS

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ABSTRACT

The study aims to explore machiavellianism and Self-esteem in Adolescents. machiavellianism in adolescents has been found to be risk factors for a variety of antisocial behaviours, from entitlement and exploitation to self-absorption and defensive egotism to violent psychopathology. Researcher suggests that machiavellianism lacks empathy and emotion. Adolescents have varying levels of self-esteem, which appears to be influenced by such factors as gender, ethnicity, and social class. The current study expands how the personality trait is associated with anti-social and manipulated behaviours in adolescents and how it is affecting their self- esteem. The sample consisted of 450 adolescents including girls (N=229) and boys (N=221) aged between12–18. The Children's Machiavellian Scale developed by Mach and Nachame (1969) was used in the study. The Self-esteem inventory developed by Immanuel Thomas and Sam Sananda Raj (1985) was used to assess the self-esteem of Adolescence developed. The results suggested machiavellianism related with age, but no relationship was observed with self-esteem. machiavellianism is negatively related to age but not related with self-esteem. Further, the study revealed that religion influenced machiavellianism. The obtained data were analysed using 't' test, ANOVA and correlation.

Key words: machiavellianism, self-esteem, adolescents

Introduction

Machiavellianism is "the employment of cunning and duplicity in statecraft or in general conduct". The word comes from the Italian Renaissance diplomat and writer Niccolò Machiavelli, born in 1469, who wrote Il Principe (The Prince), among other works. In modern psychology, machiavellianism is one of the dark triad personalities, characterized by a duplicitous interpersonal style, a cynical disregard for morality, and a focus on self-interest and personal gain. The 1992 review by Fehr and colleagues described Machiavellian motivation as one of cold selfishness or pure instrumentality. Rather than having a unique set of goals, individu-

als high in machiavellianism (referred to casually as "Machs") were assumed to have typical intrinsic motives (e.g., sex, achievement, and sociality). Whatever the motives, Machs pursue them in duplicitous ways. Machiavellians are identified not show the moral emotions of sympathy, remorse and so on. They lack empathy & feelings and do not share emotions with the person who is being manipulated. Machiavellians are unable to connect with others' emotions; in fact, they are disconnected with their own emotions, just like Alexithymics (Wastell and Booth (2003),. Machiavellians due to the emotional deficiency, treat people as an object or means to ends. Machiavellianism was positively associated with an inability to identify feelings.

Most commonly, self-esteem is defined on the basis of two psychological processes: evaluation and affect (Mruk, 2006). Evaluation accentuates the role of cognition, while affect emphasizes the role of feelings as they pertain to self-esteem. Self-esteem is important because it shows ourselves how we view the way we are and the sense of our personal value. Thus, it affects the way we are and act in the world and the way we are related to everybody else. Carl Rogers (1902-1987), an advocate of humanistic psychology, theorized the origin of many people's problems to be that they despise themselves and consider themselves worthless and incapable of being loved. This is why Rogers believed in the importance of giving unconditional acceptance to a client and when this was done it could improve the client's self-esteem. Self-esteem plays an important role in how well the people do in their lives, which is not obvious to them, so that it can determine how successful they become. Shilling (1999) also states that people with higher self-esteem seek to diversify their investment portfolio. People with higher levels of self-esteem will be motivated to preserve and improve their socioeconomic status. As a result, individuals with higher levels of self-esteem may derive a greater utility stream from wealth due to the status and self-image enhancement it provides.

Emotional development during adolescence involves establishing a realistic and coherent sense of identity in the context of relating to others and learning to cope with stress and manage emotions (Santrock, 2001), processes that are life-long issues for most people. Self-esteem develops uniquely for each adolescent, and there are many different trajectories of self-esteem possible over the course of adolescence. (Zimmerman, Copeland, Shope, & Dielman, 1997). Thus, self-esteem, whether high or low, may remain relatively stable during adolescence or may steadily improve or worsen. Many of the factors already described in developing adolescents influence identity development and self-esteem during adolescence. Studies have found that one-third to one-half of adolescents struggle with low self-esteem, especially in early adolescence (Harter, 1990; Hirsch & DuBois, 1991). The results of low self-esteem can be temporary, but in serious cases can lead to various problems including depression, anorexia nervosa, delinquency, self-inflicted injuries and even suicide.

Objectives

To find out whether there is any significant gender difference in machiavellianism and self-esteem of adolescents.

To find out whether there is any significant age difference in machiavellianism and self-esteem of adolescents

To find out whether there is any significant religion difference in machiavellianism and self-esteem of adolescents.

Hypotheses

There will be significant gender difference in machiavellianism and self-esteem of adolescents.

There will be significant age difference in machiavellianism and self-esteem of adolescents.

There will be significant religion difference in machiavellianism and self-esteem of adolescents.

Sample and sampling

The study was conducted on a group of adolescents (N=450) including boys (N=221) and girls (N=229) from Thodupuzha Taluk aged between 12-18. The researcher used convenience sampling method to select the sample.

Tools

Demographics data sheet - A demographic data sheet prepared by the researcher was used to collect relevant personal details of the sample.

MACH IV (Test for machiavellianism). The Children's Machiavellian Scale developed by Mach and Nachame (1969) was used in the study. The scale demanded reliability of .58

Self-esteem Inventory developed Immanuel Thomas and Sam Sananda Raj (1985) of Kerala University. The split half reliability co- efficient of the test is 0.95. The inventory can be considered as a valid test for measuring self-esteem.

Results and Discussions

Mean standard deviation and corresponding 't' value obtained by the adolescents in machiavellianism and self-esteem with respect to gender.

Variable	Mean of female (229)	SD	Mean of male (221)	SD	't'
Machiavellianism	69.67	9.52	70.35	9.53	-.751
Self-esteem	67.89	9.30	68.13	9.39	-.267

The above table shows that the machiavellianism of adolescents is not varied with reference to gender. Since the 't' value -.751 is lesser than the table value at 0.05 level at significance, it is not significant. Adolescents belonging to male and female sex not varied each other in self-esteem also. The 't' value is -.267 and it is not significant. So it can be concluded that there are no significant differences in

machiavellianism and self-esteem of adolescents categorized on the basis of gender.

ANOVA of machiavellianism and self-esteem of adolescents with respect to different religion

Variable		Sum of Squares	Mean Square	F
Machiavellianism	Between Groups	1171.340	585.670	6.615**
	Within Groups	39576.438	88.538	
	Total	40747.778		
Self-esteem	Between Groups	436.831	218.415	2.521
	Within Groups	38730.060	86.644	
	Total	39166.891		

The above table reveals that the calculated F value of machiavellianism is 6.615 and it is higher than the table value 4.60 and it is significant at 0.01 level. So there is significant difference in the machiavellianism of adolescents on the basis of religion. The results of group mean analysis are given below:

Post hoc test

Religion	N	Subset for alpha = 0.05	
		1	2
Christian	207	68.5700	
Hindu	162	70.3951	70.3951
Muslim	81		72.9877
Sig		.300	.088

The group mean of Christian adolescents is M=68.57, Hindu adolescents is M=70.39 and Muslim adolescents is M=72.98. Results show that Christian students have low level of machiavellianism while Muslim adolescents have high level of machiavellianism. Hindu adolescents show moderate level of machiavellianism and is not varied from Christian adolescents and Muslim Adolescents.

The correlation of machiavellianism and age.

Variables	Age	Self-esteem
Machiavellianism	-.133**	0.58
Self-esteem	-.009	

**Correlation is significant at the 0.01 level

The results from above table shows that Age is keeping a significant relationship with machiavellianism. The r value of machiavellianism with age is -.133 and the relationship is significant at 0.01 level. machiavellianism is negatively correlated with age suggesting that machiavellianism

decreases with age. The r value of self-esteem with Age is -.009 and it is no significant relationship. The negative relation shows decreases of age with self-esteem. The table also shows that the r value of machiavellianism with self-esteem is 0.58 and it is no significant relationship. The positive relation shows increases of self-esteem with machiavellianism.

Conclusion

The main purpose of the study is to understand machiavellianism and self-esteem in adolescents with respect to age and religion. Religion and age groups significantly influenced machiavellianism traits whereas self-esteem was not influenced by religion. Studies in machiavellianism and self-esteem have many uses in social work. This study can be used as a reference for the social workers, doctors, psychologists and teachers who are working with children and adolescents to find out particular behaviors mostly antisocial behaviors, bulling and emotional detachment in adolescents. Effective behavior modifications can be evolved with reference to this study.

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 ISBN: 978-93-87709-90-4

IMPACT OF COVID-19 PANDEMIC IN ONLINE SHOPPING

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ABSTRACT

With the spread of COVID-19 pandemic the importance of e-commerce had a tremendous growth. COVID-19 outbreak has turned the purchasing of necessary things from physical shops miserable. It was serious issue affecting everyone across the world. It's mostly caused by the fear of spreading virus. The goal of the study is to examine how the COVID-19 has affected the internet buying habits of people. For this a constructed questionnaire has been framed and surveyed on the basis of convenient sampling. And the results showed that COVID-19 played a major role in online shopping and 90% of respondents were recommend online shopping during COVID-19 as a safety measure.

Introduction

Online shopping is method of buying products and services through electronic devices such as mobile or computers by using internet. E- Commerce platforms have transformed the retail scene due to the advancement of internet and digital technologies. In online shopping consumers can monitor price changes, compare functionality of identical items, can see the opinion of others who purchased the product etc…

As the COVID-19 pandemic continues to influence the world, online shopping, online food deliveries etc… have increased in demand. Consumers shopping habits have been dramatically changed as a result of lockdown. The global spread of COVID-19 has been accompanied by a lot of uncertainty and the humans respond to this crisis in different ways. Anyway no one can left behind without any resource. This pandemic were made changes in shopping behavior of the people all over the world. This study concentrates on investigating how the COVID-19 outbreak influenced the online shopping behavior of rural consumers and their satisfaction level.

Literature Review

1. **Bindia Daroch, Gitika Nagrath and Asshutosh Gupta(2021):** This research paper speaks about the consumer behav-

ior towards online shopping which further examines various factors limiting consumer for online shopping behavior. This Research paper ascertains the problems that consumers face during their shopping through online stores.

2. **Bharathi Agarval and Deepa Kapoor:** The study is conducted to know more about online shopping behavior of the consumers and dealers during the period of COVID-19 pandemic. The study focused to find out better strategies for the online dealers for making better chooses to the customers and make an analysis about various trends available in the market regarding online shopping.

3. **Kavitha Rajayogan and Muthumani (2017):** It stated that tremendous boom and growth of E-Commerce industry induced them to conduct an empirical study to examine the factors influencing the buying behavior of online shoppers in Chennai city with the primary objective to understand to dominant dimensions and determinants of buying behavior of e-shoppers. The result indicate that time and cost are significantly inducing the online shopping behavior further, age, gender, marital status, size of the family and monthly family income have significant association with respect to buying behavior of e-shoppers in one of the metropolitan city of Tamil Nadu.

Statement Of The Problem

Online shopping sites are widely used by people during COVID-19 pandemic. Shopping through online were increased in these times and the study is relevant in this present scenario. This study attempt to analyse the growth of online shopping and the satisfaction level of customers while shopping online during COVID-19 pandemic.

Objectives

1. To analyze the growth in online shopping during COVID pandemic.
2. To measure the satisfaction level of online customers during COVID-19 pandemic.

Methodology

This study focuses on studying impact of COVID-19 in online shopping of people. Secondary data is used to get the relevant data, and a structured questionnaire is used to obtain data from online shopping consumers.

Sources Of Data

Data required for the study was collected from the primary as well as secondary sources. For primary data collection the questionnaire method was used for collecting data from respondents. And the secondary sources like journals, web pages and magazines were used for getting theoretical background.

Sampling Plan

The population of the study consists of rural people's who are facing lockdown at Kumily Gramapanchayath, Idukki District, Kerala. The sample size used for the study was 50. Convenient sampling method has been adopted for the study. The study period was from 01/04/2021 to 15/07/2021.

Analyis and Interpretation

Impact of COVID-19 in online shopping in consumers was tested using a questionnaire.

Table 1: Classification based on online shopping made during COVID-19 pandemic

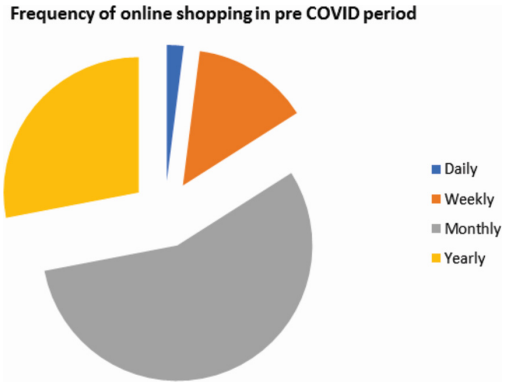
Category	Frequency	Percentage
Yes	50	100
No	0	0
Total	50	100

The above table shows the classification based on online shopping made during COVID-19 pandemic. Through this we can interpret that 100% of the respondents were made an online shopping during COVID-19 pandemic.

Table 2: Classification based on frequency of online shopping in pre COVID period

Category	Frequency	Percentage
Daily	1	2%
Weekly	7	14%
Monthly	28	56%
Yearly	14	28%
Total	50	100%

Figure 1

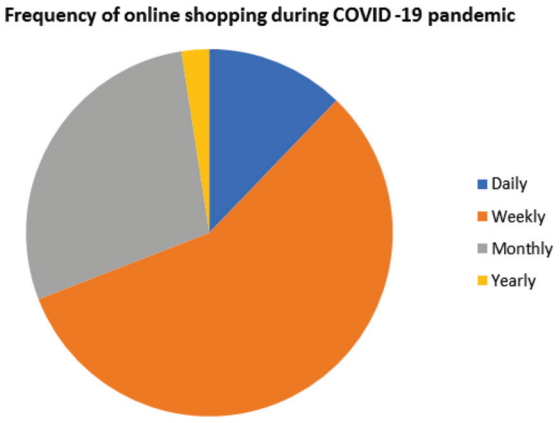


Above table and chart shows the classification based on frequency of online shopping during pre COVID period. 2% of the respondents made online shopping daily, 14 % of them shop weekly, 56% of them shop monthly and rest 28% of respondents made online shopping yearly. Based on the survey conducted, most of the respondents are made online shopping every month.

Table 3: Classification based on the frequency of online shopping during COVID-19

Category	Frequency	Percentage
Daily	6	12
Weekly	28	56
Monthly	14	28
Yearly	2	4
Total	50	100

Figure 2



Above table and figure shows that 12% of respondents made online shopping every day during COVID-19 pandemic, 56% of the respondents made online shopping weekly, 28% of respondents made online shopping

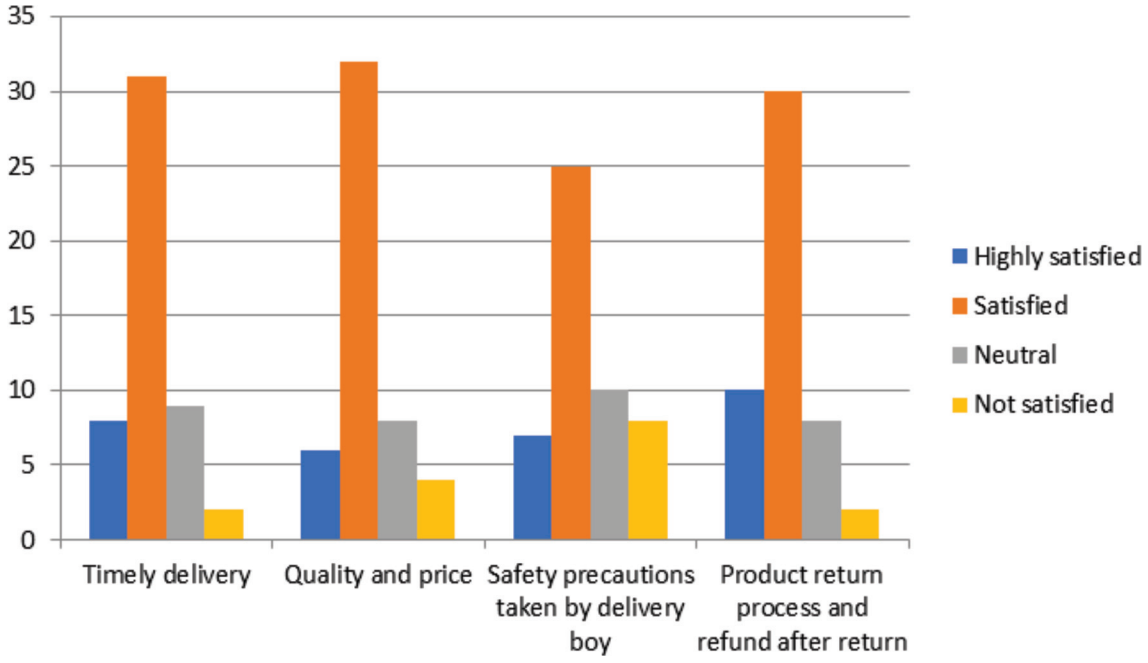
every month and rest 4% made yearly. According to this survey there is a growth in frequency of online shopping in daily and weekly.

Table 4: Classification based on the satisfaction level of online shopping during COVID-19

	Highly satisfied	Satisfied	Neutral	Not satisfied
Timely delivery	8	31	9	2
Quality and price	6	32	8	4
Safety precautions taken by delivery boy	7	25	10	8
Product return process and refund after return	10	30	8	2

Figure 3

Satisfaction level with online shopping during COVID-19 pandemic



From the above table and figure we can interpret that most of the respondents are satisfied in online shopping with regards to timley delivery, quality,return process etc…

Findings

- The study revealed that there is an increase in frequency in online shopping during COVID-19 pandemic.
- Most of the respondents are highly satisfied with timely delivery, quality,price, safety,and product return and refund process.
- There is a hike in daily and weekly purchasing products from online during COVID-19 than pre COVID period.

Recommendations

1. E-commerce operators should give importance to timely delivery and refund immediately after product return.
2. To give some more efforts to make product available to all pincodes.

Conclusion

The current research study is based on the impact of COVID-19 in online shopping. Based on the samples collected from 50 respondents the result shows that COVID-19 plays a major role in tremendous growth in e-commerce sector. Hence this paper discovers the satisfaction level of consumers too.

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 ISBN: 978-93-87709-90-4

AN ANALYSIS OF CHALLENGES FACED BY WOMEN ENTREPRENEURS

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ABSTRACT

Women entrepreneurs face a series of problems right from the beginning till the enterprise functions. Women in rural areas have to suffer still further. This study has been conducted to analyze the major challenges faced by women entrepreneurs with special reference to Thodupuzha Taluk. For this a structured questionnaire has been framed and has been surveyed. Data collected on the basis of convenient sampling. And the results, challenges are always there but majority of respondents get enough support from family, government and financial institutions.

Introduction

Women constitute around half of the world population. India. In traditional societies women were confined to the four walls of the houses, performing household activities. In the modern societies women have participation in all sorts of activities. Women have been performing exceedingly well in different spheres of activities like education, politics, administration, space, social work and so on. Women entrepreneurs occupy a critical in the process of economic development of a country. The entry of women into business is a recent phenomenon in India. It is found that women enter in business as an extension of their household activities. In certain businesses, women entrepreneurs are doing exceedingly well and excelling their male encounters. This study attempts to find out the challenges faced by women entrepreneurs in Thodupuzha Taluk and to analyze their role in the economic development of our nation.

Statement of the Problem

This study attempts to analyze the challenges faced by women entrepreneurs Thodupuzha taluk and to analyze their role in the economic development of our nation. It is a study conducted with special reference to Thodupuzha Taluk. There are lot of problems faced by women entrepreneurs regarding raising of funds ,marketing their products, competition, male domination and so on. Also this study attempts to analyze the

supports received by women entrepreneurs from home, society, government etc…

Objective

1. To find out the major challenges faced by women entrepreneurs in Thodupuzha Taluk.
2. To analyze the support received by women entrepreneurs from various sections of the society.

Sources of Data

Data required to study was collected from primary as well as secondary sources. For primary data collection questionnaire method was used. And for secondary data collection, data collected from sources such as magazines, journals, web pages etc…

Sampling Plan

The population of the study consists of women entrepreneurs in Thodupuzha Taluk who are facing various challenges. The sample size used for the study is 100. Convenient sampling method has been adopted for the study.

Theoritical Frame Work

Women enter into entrepreneurship due to economic factors which pushed them to be on their own and urge them to do something independently. Women prefer to work from their own work residence, difficulty in getting suitable jobs and desire for social recognition motivate them towards self-employment. We see a lot of women professionals in engineering, medicine, law etc. They are also setting up hospitals, training centers, etc.

"An enterprise owned and controlled by a women having a minimum financial interest of 51 per cent of the capital and giving at least 51 per cent of the employment generated by the enterprise to women".

- ***Government of India***

"A woman entrepreneur can be defined as a confident, innovative and creative woman capable of achieving self economic independence individually or in collaboration, generates employment opportunities for others through initiating, establishing and running the enterprise by keeping pace with her personal, family and social life."

- ***Kamal Singh***

Women Entrepreneurship

Women Entrepreneur" is a person who accepts challenging role to meet her personal needs and become economically independent. A strong desire to do something positive is an inbuilt quality of entrepreneurial women, who is capable of contributing values in both family and social life. This is great news. But, a part of women in some parts of the country still do not know their power. They don't know that they can break the domination over men and move on, walk on and fight for their freedom.

Women contribute significantly to the running of family businesses mostly in the form of unpaid effort and skills. The value of this effort is underestimated both by the families that take it for granted and in academic studies. On the other hand, many of the enterprises defined as being run by women (that is, enterprises in which women hold the controlling share) are in fact run in their names by men who control operations and decision

making. Programs meant to reach women entrepreneurs can succeed only if they take note of this paradox as well as of the familial and social conditioning that reduces the confidence, independence and mobility of women.

Federation of Indian Women Entrepreneurs (FIWE), which id a National-level organization, founded in 1993, is today, one of India's Premier Institution for Women thoroughly devoted towards entrepreneurship Development, having a large membership base of 15,000 individual members / professional and more than 28 Member Associations spread throughout the county. The objective of the organization is to foster the Economic Empowerment of Women. FIWE endeavors to provide: Networking platform for women, Technical know-how, Industry research & expertise, skill development & training and brings the businesswomen on a common Forum.

Qualities required for an entrepreneur

An effective entrepreneur requires certain basic qualities, it's mentioned below:

1. Innovative thinking and farsighteness.
2. Quick and effective decision making skill.
3. Ability to mobilize and marshal resources.
4. Strong determination and self confidence.
5. Accept and adopt the dynamic environment of a business.
6. Alertness to latest scientific and technological changes.

Majority of the women who have these qualities, but they never got a platform to showcase their talents and hence they don't know their real abilities. Matching the basic qualities requires for entrepreneurs and the basic characters of Indian women reveal that, much potential is available among the Indian women on their entrepreneurial ability. This potential is to be recognized, brought out and exposed for utilization in productive and service sectors for the development of the nation.

Analysis and Interpretation

Challenges faced by women entrepreneurs and supports received by them was tested using a questionnaire. It's analyzed on the basis of following factors.

Table 1:
Classification on the basis of major challenges faced by women entrepreneurs.

Items	Always	Often	Sometimes	Rarely	Never
Lack of experiences in marketing your products and services, Inability to explore new markets etc.	22%	24%	16%	20%	18%

Items	Always	Often	Sometimes	Rarely	Never
No Safety and security in your location- unable to work late night, disturbances from men etc	24%	30%	20%	10%	16%
Lack of experience in managing your enterprise like dealing with customers, employees, problems in maintaining accounts etc.	14%	26%	30%	18%	12%
No opportunities to attend entrepreneurial programmes like EDP (Entrepreneurial Development Programme)	20%	20%	30%	12%	18%
Too Much Government regulations/bureaucracy	16%	24%	26%	24%	10%
Difficulty in managing business due to Family responsibilities	10%	20%	30%	20%	20%
Difficulty to with stand in a male dominated society	20%	34%	8%	32%	6%
Lack of education	40%	20%	26%	10%	4%
Unable to get sufficient raw materials	16%	28%	20%	26%	10%
Problems of getting sufficient fiancé	32%	24%	14%	10%	20%
Tough competition from similar business run by men	28%	24%	28%	14%	6%
High cost running business	30%	22%	16%	8%	24%
Limited mobility like in ability to drive vehicles feeling un comfortable while dealing with men etc.	18%	20%	28%	24%	10%
Lack of entrepreneurial aptitude	10%	18%	30%	24%	18%
Too any legal formalities	32%	20%	12%	20%	16%
Exploitations by middle men	20%	14%	34%	20%	12%
Lack of self confidence	14%	22%	30%	14%	20%

Inference:

The above table shows the analysis of the problems faced by women entrepreneurs.17 problem are taken for the study and responses are recorded as always, often, sometimes, rarely, and never.

Majority of the women entrepreneurs that is 32% of total samples are always facing two main problems, they are: problems of getting sufficient finance and limited mobility 20% and 10% of the respondents are never facing the above two problems.

34% of the women entrepreneurs are often facing the problem of with standing in a male dominated society and 32% of the women entrepreneurs are rarely facing the problem of with standing in a male dominated society and only 6% are never facing such a problem.

34% of the women entrepreneurs are sometimes facing the problem of exploitations

24% of the respondents are never facing the problem of high cost of running business. But 30% of the respondents are always facing that problem.

Table 2: Analysis of support for women entrepreneurs from the family

Particulars	Frequency	%
Yes	62	62%
No	38	38%

The analysis shows that 62% of the respondents are getting support from their family and only 38% are not getting support from their family.

Table 3:
Analysis of support from government

Particulars	Frequency	%
Yes	48	48%
No	52	52%
Total	100	100%

Inference:

The table show that 52% of the respondents are of the opinion that they are not getting support from government and only 48% are getting

Table 4: Support from banks and other financial institutions

Particulars	Frequency	%
Yes	72	72%
No	28	28%
Total	100	100%

Inference:

The above table shows that only 72% of the respondents are receiving support from banks and other financial institutions.

Findings

1. Majority of the women entrepreneurs got support from their family.
2. Only below half the samples got support from the government.
3. 72% of the respondents are receiving support from banks other financial institutions.
4. Majority of the women entrepreneurs facing two main problems, they are: problems of getting sufficient finance and limited mobility. Majority of the women entrepreneurs are sometimes facing the problem of exploitations and the problem of high cost of running business.

Suggestions

Right efforts from all areas are required in the development of women entrepreneurs and their greater participation in the entrepre-

neurial activities. Entrepreneurship basically implies being in control of one's life and activities and women entrepreneurs need to be given confidence, independence, and mobility to come out of their paradoxes. The following measures are suggested to empower the women to seize various opportunities and face challenges in business.

- An Awareness programme should be conducted on a mass scale with the intention of creating awareness among about the various areas to conduct business.
- Attempts should be there to enhance the standards of education of women in general as well making effective provisions for their training, practical experience and personality development programmes, to improvise their over-all personality standards.
- Educational institutes should tie up with various government and non-government agencies to assist in entrepreneurship development mainly to plan business projects.
- International, National, Local trade fairs, Industrial exhibitions, seminars and conferences should be organized to help women to facilitate interaction with other women entrepreneurs.
- Making provision of micro credit system and enterprise credit system to the women entrepreneurs at local level.
- In the initial stages women entrepreneurs may face problems but they must persevere, believe in themselves and not give up mid way.

Thus by adopting the following aforesaid measures in letter and spirit the problems associated with women can be solved. Entrepreneurship is not a bed of roses to women. Women participation in many kinds of economic activities to complement to their family income, their participation in no way reduced their family duties. The task of women has become more tedious and full of challenges. Let us all make efforts to help women rediscover her.

Conclusion

We always viewed that a smart women can pick up a job any day, but if she becomes an entrepreneur she can provide a livelihood to 10 more women at least..!! Highly educated, technically sound and professionally qualified women should be encouraged for managing their own business, rather than development on wage employment outlets. The unexplored talents of young women can be identified, trained and used for various types of industries to increase the productivity in the industrial sector.

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 ISBN: 978-93-87709-90-4

A STUDY ON THE IMPACT OF FIIS ON INDIAN STOCK MARKET

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ABSTRACT

FII inflows and control have emerged as important policy issue in India. Among the Indian policy makers, FII flows are believed to have a positive impact on the country's development. FII inflows, to the equity market increase stock prices, lower cost of equity capital and encourage the investment by Indian firms and lead to improvements in securities market design and corporate governance. The FII inflows have the potential of influencing the process of economic development of India through the positive impacts on macro-economic fundamentals of the country. Present study is very broader and covers capital market indices and its comparison with FII. But, study is only going to cover foreign investments in form of equity. The time period is from 2008 to 2018 as it will give exact impact in both the bullish and bearish trend. The study will provide a very clear picture of the impact of foreign institutional investors on Indian stock indices. In order to analyse the collected data statistical tools such as correlation and regression have been used.

Keywords: FIIs, NIFTY, SENSEX

Introduction

Since 1990-91, the Government of India embarked on liberalization and economic reforms with a view of bringing about rapid and substantial economic growth and move towards globalization of the economy. As a part of the reforms process, the Government under its New Industrial Policy revamped its foreign investment policy recognizing the growing importance of foreign direct investment as an instrument of technology transfer, augmentation of foreign exchange reserves and globalization of the Indian economy. Simultaneously, the Government, for the first time, permitted portfolio investments from abroad by foreign institutional investors in the Indian capital market. The entry of FIIs seems to be a follow up of the recommendation of the Narasimhan Committee Report on Financial System. While recommending their entry, the Committee, however did not elaborate on the objectives of the suggested policy.

The committee only suggested that the capital market should be gradually opened up to foreign portfolio investments. From September 14, 1992 with suitable restrictions, Foreign Institutional Investors were permitted to invest in all the securities traded on the primary and secondary markets, including shares, debentures and warrants issued by companies which were listed or were to be listed on the Stock Exchanges in India.

The Foreign Institutional Investors (FIIs) have emerged as an important player in the Indian equity market in the recent past. This study makes an attempt to understand whether there exists a relationship between FII and equity market.

Literature Review

Gordon and Gupta, (2003) found causation running from FII inflows to return in BSE. They observed that FIIs act as market makers and book profits by investing when prices are low and selling when they are high. Hence, there were contradictory findings by various researchers regarding the causal relationship between FII net inflows and stock market capitalization and returns of BSE/ NSE. Therefore, there was a need to investigate whether FIIs are the cause or effect of stock market fluctuations in India.

Tanupa Chakraborty (2007) has examined the Foreign Institutional Investment (FII) flows, i.e., capital flows across national borders, to emerging market economies (EMEs). The empirical study has been undertaken to throw some light on the direction of causality between FII flows and Indian stock market returns using data on both the variables from over the period April 1997-March 2005. The study showed that BSE National Index return series show greater variability than net FII flows. It may be noted that as information flows in financial markets drive both stock market returns and investment flows.

Anand Bansal and J.S. Pasricha (2009) studied the impact of market opening to FIIs on Indian stock market behaviour. They empirically analyzed the change of market return and volatility after the entry of FIIs to Indian capital market and found that while there is no significant change in the Indian stock market average returns; volatility is significantly reduced after India unlocked its stock market to foreign investors.

Statement of the Problem

\The issue of whether FII flow affects stock market returns or the other way round is a matter of some controversy. It has been perceived in some quarters that FII flows are the major drivers of stock markets in India and hence a sudden reversal of such flows may harm the stability of its markets. Contrary to this belief, it is viewed by others that FII flows react to the existing crisis in the stock market, possibly exacerbating it rather than causing it. An analysis of the direction of causality to understand the possible devastating impact of FII flows on the Indian economy is important from the view point of Indian policy makers especially when such flows have recorded a sharp rise over the last decade. But, as very few studies have been done so far in this regard, the present empirical study has been undertaken to throw some light on the cause and effect

relationship between FII flows and Indian stock market returns.

Objectives

The present study has been undertaken with the following objectives:

1. To analyse the trend in FII investment in India
2. To find out the impact of FII on Indian Stock Market

Methodology

The study is done to analyse the trend of FII in India, sector wise FII in India and also examines the relationship between the movement of the Indian stock market and the FII flow into Indian markets. The study is analytical in nature. The study takes monthly data of 10 years into consideration from 2008-2018. The period has been selected so that the impact on Indian stock market can be ascertained from the initial period FII investment was permitted in India. BSE SENSEX and S&P CNX NIFTY 50, the two biggest indices, have been selected for the study.

Sources of Data

The study consists of secondary data. The data is collected from journals, internet, actual financial reports etc. The data related to FII flows has been collected from the SEBI website while the data related to Monthly closing value of SENSEX and NIFTY have been taken from the BSE and NSE website respectively. Yearly closing index values are taken so that they represent the real economic conditions of that period. Individual BSE SENSEX and NIFTY

Tools for Analysis

In order to analyze the collected data statistical tools such as correlation and regression have been used. Various line graphs have been used to show proper pictorial representation of the data for easy understanding. Correlation coefficient is a statistical measure that determines the degree which two variable's movements are associated. Its value ranges from -1 to 1. The analysis has been made by correlating the FII purchases and the closing value of the indices for that particular year to identify whether a relationship exists between them. 'Pearson correlation' has been used as data sets are real and it gives an accurate statement of the strength of linear association between the two variables.

The regression analysis is used to evaluate the effects of independent variables on a single dependent variable. In the current study an effort has been made to study the impact of FII on Indian stock exchange.

Analysis and Interpretation

4.2.1 Descriptive statistics

Table 1. Descriptive statistics

	LFII	LBSE	LNSE
Mean	4.841481	4.315028	3.795719
Median	4.842077	4.290508	3.773069
Maximum	5.216415	4.55588	4.042485
Minimum	4.339714	3.94898	3.440137
Std. Dev.	0.161112	0.135131	0.137532
Skewness	-0.31838	-0.5236	-0.42094
Kurtosis	3.141221	3.108213	2.926184
Jarque-Bera	2.109285	5.49541	3.541291
Probability	0.348317	0.064075	0.170223
Sum	576.1362	513.4883	451.6905
Sum Sq. Dev.	3.062942	2.15472	2.231967
Observations	119	119	119

In order to normalize the data natural log of the data is taken. The Table 1 contains the descriptive statistics of three series viz. FII, BSE SENSEX and NSE Nifty. This analysis presents an insight into the mean, median, standard deviation etc of the three times series data. The standard deviation shows that there is variability among yearly standard deviation among the NIFTY, Net FIIs Flows. The standard deviation is highest in case of FIIs followed by NIFTY and SENSEX. Three series are showing negative skewness here data set has its tail extended towards the left. It is an indication that both the mean and the median are less than the mode of the data set.FII and BSE SENSEX are mesokurtic that is normally distributed where NSE Nifty is platykurtic.

4.2.2 Trend analysis

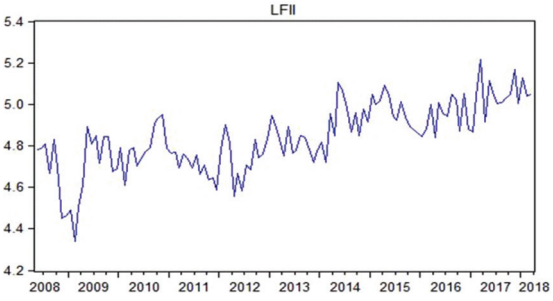

Figure 1. Trend of FII

The trend analysis presented in Figure 1 suggests that FIIs capital flows have grown significantly in last one decade. The FIIs investment has increased over the years with fluctuating trend depending on the market sentiment. During the year 2008 there was a decrease in the FII flows into the Indian economy because of the great depression in U.S. Apart from that, FII flows shows a positive trend in India and it shows the economic growth of the nation.

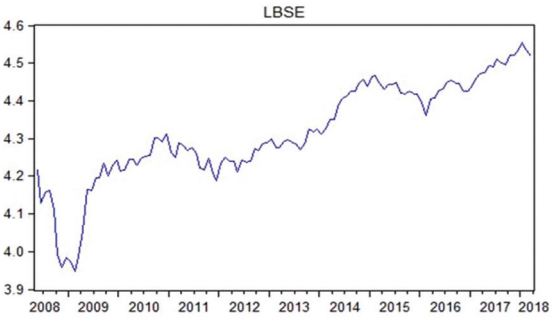

Figure 2. Trend of BSE SENSEX

The trend of BSE SENSEX in the Figure 2 also shows a positive trend over 10 years except in the case of the year 2008. On 21 Jan 2008, the BSE fell by 1408 points to 17,605 leading to one of the largest erosions in investors wealth, the fall was due to the decrease great depression in U.S. Apart from that it shows a gradual increasing trend.

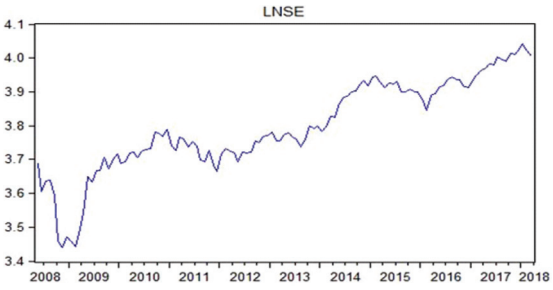

Figure 3. Trend of NSE Nifty

The trend of NSE Nifty in Figure 3 also shows a positive trend over 10 years except in the case of the year 2008.It reveals the strength of the Indian capital market.

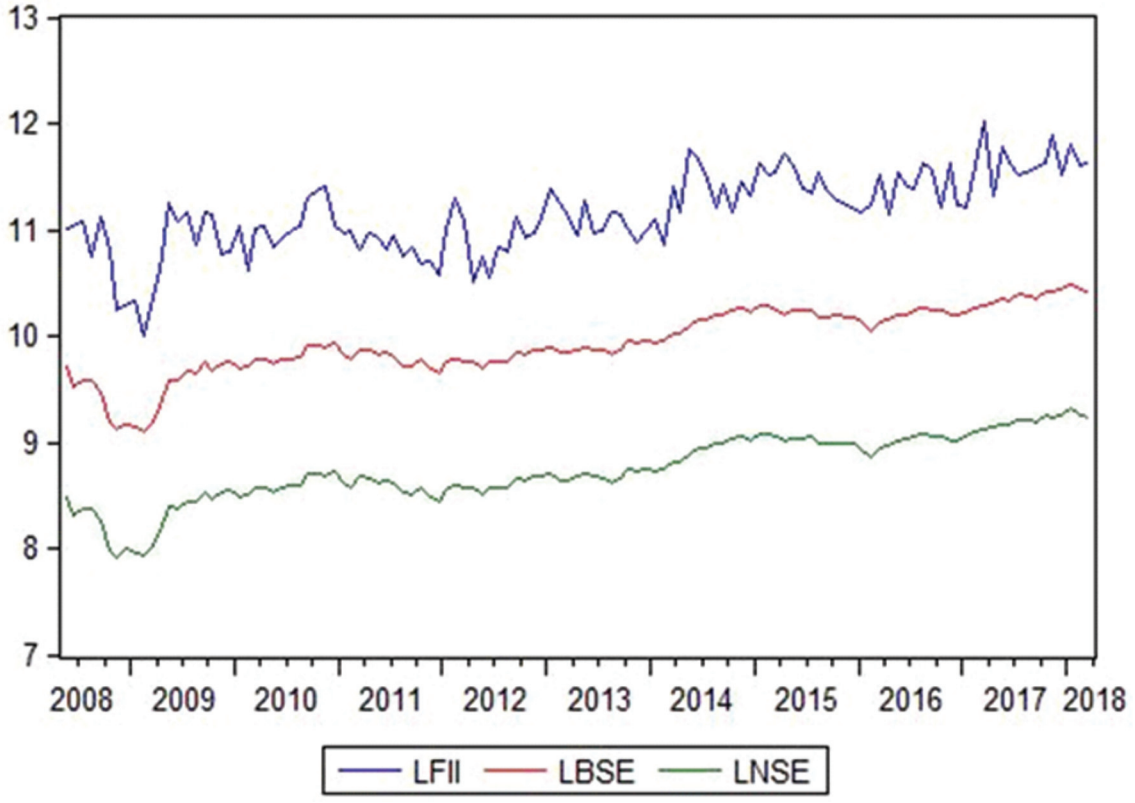

Figure 4. Trend of FII, BSE SENSEX and NSE Nifty

The trend analysis presented in Figure 4 suggests that FIIs capital flows have grown significantly in last one decade and this analysis depicts that FIIs have shown good interest in Indian stock market because of tremendous investment opportunities available in the Indian economy. The FIIs investment has increased over the years with fluctuating trend depending on the market sentiment. The present study has taken NIFTY and SENSEX as representative to Indian stock market because they are both well recognized at national and international level. The trend of NIFTY, SENSEX and monthly net FIIs flows in last ten years is presented in the graph reveals all three variables have moved together over the period of study but the fluctuations of FIIs flows is more pronounced than NIFTY and SENSEX. It is also observed from the graph that fluctuation in NIFTY and SENSEX follows same pattern as is observed in case of FIIs flows but reverse is not true for the same. This lime lights that trend in fluctuation in indices is corroborating with fluctuation in FIIs flows pattern, however, every time fluctuation in net FIIs is not matching with the trend in indices.

Correlation Analysis

Table 2: Correlation between FII and BSE SENSEX

	FII	BSE SENSEX
FII	1	0.829889 (0.0000)*
BSE SENSEX	0.829889 (0.0000)*	1

p-value is given in the parenthesis

*accepted at 1% level of significance

Table 3: Correlation between FII and NSE Nifty

	FII	**NSE NIFTY**
FII	1	0.830393 (0.0000)*
NSE NIFTY	0.830393 (0.0000)*	1

p-value is given in the parenthesis

*accepted at 1% level of significance

Pearson's correlation analysis is used to study the degree of statistical relationship between the Net FIIs flows, NIFTY and SENSEX. Tables 2 and 3 present the output of correlation analysis, run for the 10 yearly monthly data of FIIs flows, NIFTY returns and SENSEX returns. Based on the results it can be deduced that there is a positive highly significant correlation between FIIs flows and NIFTY (0.8303) and SENSEX (0.8298). The correlation is significant at 1 per cent level of significance. The exhibit reveals that FIIs investment has significant and positive relationship on the stock market volatility. But in order to get more clarity about the relationship, regression is preferred.

Regression Analysis

Table 4. Regression between FII and BSE SENSEX

Dependent Variable:	BSE_SENSEX
Method:	Least Squares
Sample:	01/05/2008-31/03/2018
Included observations:	119

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7105.631	958.3082	7.414766	0.0000
FII	0.195738	0.012166	16.08917	0.0000
R-squared	0.688715	Mean dependent var	21615.62	
Adjusted R-squared	0.686055	S.D. dependent var	6309.467	
S.E. of regression	3535.247	Akaike info criterion	19.19562	
Sum squared resid	1.46E+09	Schwarz criterion	19.24233	
Log likelihood	-1140.139	Hannan-Quinn criter.	19.21458	
F-statistic	258.8614	Durbin-Watson stat	1.23186	
Prob (F-statistic)	0.0000			

In running the regression analysis, monthly BSE SENSEX has been taken as the dependent variable and the monthly FII investment is considered as the independent variable. To test the above-mentioned relationship, linear regression model fitted with the econometric technique of ordinary least square (OLS) has been done. Regression equation looking at relationship between BSE SENSEX and FII flows is as follows:

Y (BSE SENSEX) = a+bX (FII).

From the above Table 4, it is found that the adjusted R establishes a relationship nearly 68.83 % because the coefficient of determination R^2 is 0.6883 of the total variables in the daily BSE SENSEX of Bombay stock exchange. This means that whatever changes have taken place, in the daily BSE SENSEX, the FII investments is responsible up to 68.83 % only. This implies that FII have strong influence on the monthly BSE SENSEX of Bombay stock exchange. The regression equation Y (BSE SENSEX) = a+bX (FII) shows that for every unit change in FII there is 0.195 unit change in BSE SENSEX. The value of (Alpha) is 7105.631 which show that the other factors are more responsible for this relationship.

Findings

- FII movement shows a positive trend over a period of ten years.
- FII has a strong influence on the stock market as compared with other macro-economic factors. Both indices move in direction of FII's investment.
- There is a strong impact of FII on Indian stock market with evidence from BSE SENSEX and NSE Nifty.

Recommendations

- A FII flows over a period of ten years is acting as an indicator to the retailers for making investment decisions because FII and Indian stock market are having a positive relation.
- FII has a strong impact on the Indian stock market. By increasing the FII there will be a positive result in the capital market.

- Government should set a minimum limit as well as maximum limit, within which FII invest in India, in order to avoid volatility in Indian stock market (BSE SENSEX & NSE Nifty).
- Government should liberalize the policies for promoting FII in the field of food and beverage industry.
- There is no stability of FII in India, so Govt. should take initiatives for stabilizing it.

Conclusion

The study conducted observed that FII shows a positive trend over a period of ten years. It can be observed that during the past 10 years there has been a gradual increase in the FII investment. This reflects an increase in the confidence of the FIIs. It can be stated that FIIs have significant influence on the movements of the stock market indexes in India. There is a steadily growing influence of FIIs in the domestic stock market if one looks at the total FII trade in equity. FIIs and the movements of SENSEX are quite closely related in India and FIIs wield significant influence on the market sentiments and price trends. This is because other market participants perceive the FII flawless in their assessment of the market and tend to follow the decisions taken by FIIs. FIIs are playing the role of movers and shaker in the Indian stock market as they injected the money in the market and encourage the other investors to make investment. When the prices of indices go up they pull the money and shake the market.

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 ISBN: 978-93-87709-90-4

GREEN APPROACHES IN NANOPARTICLE SYNTHESIS

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Introduction

Nanotechnology is a dynamic branch of science which encompasses rapid innovations and continuous changes. Although different physical, chemical and biological preparation strategies were invented to fabricate nanostructures with specific functions, novel methods of production of nanoparticles are called for. As a result, we have many protocols adopted in the synthesis of nanoparticles. This chapter is an attempt to review different methods of the preparation of the various noble metal nanoparticles. This chapter also looks into the general synthesis of noble metal nanoparticles.

Synthesis of nanoparticles

The beauty of miniature science is brought into reality by nanotechnology. Nano size attributes remarkable properties of the noble metals which can be tailored according to our provision [1]. Nanoscience and technology provide the research and developmental activities that have been grown explosively worldwide during the past few years. It has revolutionized the world by making the life of common man more comfortable. The secondary process on the surface of nanomaterials makes them useful as low-cost catalysts, value-added products, pollution-controlling systems etc. Nanomaterials are also important in health-care, cosmetic, food, paint, and drug industries.

Nanoscale architecting generally follows, the 'bottom-up' and 'top-down' approaches. The stitching together of the individual building blocks (atoms/molecules) and the cutting down of large structures are the respective processes involved. By controlling the surface features and surface chemistry, novel functionalities can be incorporated into the nanostructures. The physical methods of nanofabrication follow the 'top-down' approach whereas the chemical and biological techniques follow the 'bottom-up' procedures. Each method has its own merits and demerits.

Physical methods

The physical methods for the preparation of nanoparticles include UV-irradiation, electric discharge, ball milling, spray pyrolysis, lithographic techniques, sputter deposition, diffusion, and decomposition techniques. The

main processes used are etching and grinding. Eventhough the physical methods need expensive experimental setup, they produce ultra-pure nanoparticles. In the evaporation-condensation process, several hours of heating at high temperature under high voltage is required.

Chemical methods

The chemical methods include like seeded-growth, sol-gel process, chemical vapour deposition, polyol synthesis, chemical reduction, and co-precipitation techniquiues. In simple reduction method, the nanoparticles are produced using chemical reducing agents. The common reducing agents used are formaldehyde, ethylene glycol, polyethylene glycol (PEG), carbon monoxide, hydrogen peroxide, acetylene, hydrogen, Tollens reagent, N, N-dimethylformamide (DMF), sodium borohydride ($NaBH_4$), hydroxylamines, oxalic acid, citric acid, glucose, starch, and other sugars [2]. The nucleation and growth parameters in the synthesis of nanoparticles were controlled by using another class of chemicals called capping agents. The capping agents provide stability to the system and by preventing from aggregation. Typical chemical capping agents include long-chain hydrocarbons that are decorated with heteroatoms. Oleic acid (OA), sodium oleate, trioctylphosphine (TOP), polymers such as polyvinyl alcohol (PVA), polyethylene glycol (PEG), polyacrylic acid (PAA), polymethylmethacrylate (PMMA), polyvinylpyrrolidone (PVP) and the block copolymers poly(acrylic acid)-block-polystyrene (PAA-b-PS) [3]. Oxygen, nitrogen, phosphorus, and sulfur-based ligands present in these capping compounds attribute stability to the nanoparticles. Usually, in chemical reduction, the cationic surfactant cetyltrimethylammonium bromide (CTAB) is used to control the shape and size of the nanoparticles. The green-chemical method exploits the benefits of biological reducing agents like plants as well as the chemical capping agents like cetyltrimethylammonium bromide [4].

Green methods

The biosynthetic protocols in the nanoparticles preparation are based on the 12 principles of green chemistry [5] and it reduces the extensive and excessive use of toxic chemicals. The environmental concerns regarding the use of natural and renewable resources are obeyed here [6]. Green synthetic strategies mainly concentrate on three factors; solvents, reducing agents, and capping agents [7]. Incorporation of the most common green solvent, water, reduces solvent-induced pollution and also brings biocompatible nanostructures [8]. It also decreases cost of the production. Preparation of nanoparticles using sustainable green reductants and surfactants by pursuing the eco-friendly routes is a recent development [9]. The use of unicellular biological entities like bacteria, fungi, virus, and algae bring ultrapure nanoparticles from metal ion precursors [10]. The multicellular plant residues assure purity of the products along with the harmless by-products and wastes [11]. Green nanoparticles cover all the aspects of human life, including health care, food, textile, cosmetic, paint, electronic, mechanic, fuel production, and wastewater treatments. Nanomaterials wonderfully act as good cata-

lysts in various chemical reactions like adsorption, polymerization, reduction, and degradation [12].

Microorganism-assisted method

This is the most common method used for the preparation of metallic nanoparticles. The preparation of metallic nanoparticles via microbial assistance has two alternative pathways namely, extracellular and intracellular. The extracellular method involves the addition of metal ion precursor solutions towards the sub-cultured microorganisms [13]. The rapid colour change of the culture medium indicates the generation of nanoparticles. The major factors affecting the biological synthesis are the concentration of the metal ion solution, amount of microorganisms used, and the reaction conditions like temperature, pH and the period of reaction [14]. The size, shape, and crystalline characters of the nanoparticles depend on the above-mentioned factors. The preparation of nanoparticles aiding different microorganisms is a time-consuming technique and we cannot deny the high probability of contamination also. The aseptic working atmosphere and expert culture handling skills were inevitable for the purity of the nanoparticles. The main advantage of these nanoparticles is their suitability in the biological applications [15]. Noble metal nanoparticles prepared using the renewable source, the microalgae, has many biomedical applications [16].

The mechanism of microbial reduction of metal ions was not known precisely. Some of the proteins present in the microorganisms act as reductase enzymes. Silver and gold nanoparticles were stabilized by these proteins. The protein binding is happened either through their cysteine residue or through their free amino acid [17]. The involvement of NADH-dependent reductase in the reduction phenomena is reported by many researchers. The reduction of metal ions happened simultaneously with the oxidation of NADH to NAD^+ [18]. The role of flavonoids, naphthoquinones and anthraquinones which have high redox potentials in the electron shuttling process is also established [19].

Plant-assisted method

Plants are the chemical factories of Nature. Availability and diversity are the important features of plants. Production of nanoparticles by the plant reducing agents belongs to the 'bottom-up' approach of nanoparticles synthesis [20]. Plant parts, used are the leaves, roots, flowers, bark, stem, latex, fruits, and seeds. Each plant has a unique array of plant chemicals, comprising of vitamins, proteins, terpenoids, alkaloids, flavonoids, tannins [21], polyphenols, sugars, amino acids, organic acids, biopolymers etc. [22]. These secondary metabolites effectively did the reducing and capping actions. Abiding by the principles of green chemistry, the plant-based synthesis of nanoparticles proved its simplicity, inexpensiveness and toxin-free character [23]. Studies based on a number of plant reduced nanoparticles have proved that these nanoparticles are quite stable by virtue of their crystalline nature. Green nanoscience brought revolutionary changes in the biomedical field since it utilized the natural resources for the preparation and stabilization processes [24]. Many

successful reports were found in the literature regarding the synthesis of nanoparticles using plant extracts [25]. Nanoparticles reduced using plant extracts were clean and avoids multistep preparation process and can be easily scaled up into large-scale.

Microwave-assisted method

In microwave heating, an electromagnetic radiation is used to heat the material under very high temperatures and pressures. The microwave region of the electromagnetic spectrum was in between infrared waves and radio waves (wavelengths between 0.01-1 m, frequency 0.3-30 GHz). Domestic microwave oven has a microwave frequency of 2.4 GHz and their unique thermal effects have been employed in the chemical synthesis. In closed vessels, Arrhenius law of rate operates and the reaction time is dramatically reduced.

The interaction between polar/polarisable materials and electromagnetic radiation results in the following processes. Microwave facilitates dielectric heating that converts electric energy into kinetic energy which ultimately resulted in the heating process. The transferring of heat occurs either through conduction or collision. Dielectric heating may be due to dipolar polarization or ionic conduction. In dipolar polarization, heat is generated by polar molecules; either the solute or solvent. In a suitable oscillating electromagnetic field, the dipoles try to align themselves with the field. This alignment causes the rotation and the ultimate end is the heating of the system. It occurs mainly due to friction. The rupturing of hydrogen bonds in the polar molecules happened by the microwave irradiation. In ionic conduction process, the back and forth oscillation of the dissolved ions occurs under microwave environment. The oscillation causes the collision of charged particles with nearby molecules/ atoms and results in heating action. Thus, polar molecules or solvents enhance the effects and a little or no heating occurs in non-polar solvents with low dielectric constants [26]. The microwave heating characteristics of a specific substance or solvent depended on its ability to convert microwave energy to heat energy and are expressed by the term, the loss tangent (tan ä= Dielectric loss/Dielectric constant). Solvents with a high tan ä like ethylene glycol, ethanol, DMSO, methanol, nitrobenzene, DMF, water etc. help rapid microwave heating.

In conventional heating, the heating process is not efficient and the rate of heating is slow. The heat energy is transferred first from the hot oil/water to the surface of the vessel and then to the reaction contents. The chance of local overheating and decomposition of sensitive materials cannot be avoided. In microwave heating direct in-core heating occurs. The radiation passes through the reaction vessel and the contents are heated on a molecular basis of direct interaction with the molecules. The faster it attains the target temperature the fewer will be the by-products. The efficient homogeneous heating process increases the yield and purity of products. Since the microwave frequency is ample to make the rotation of the polar molecules without the breaking of any chemical bonds in the molecule, the heating occurs solely by kinetic means.

Microwave-assisted synthesis is a new protocol in the synthesis of nanoparticles and it directly stimulates the nucleation process faster than the conventional methods. Microwave-assisted synthesis is a green method, which eliminates the use of toxic chemicals and reduces the preparation period [27]. It is a non-classical source of energy which improves the quality and quantity of the products [28]. Microwave irradiation technique (MIT) is an effective and effortless method for the preparation of metal nanoparticles. By the selective heating of polar molecules [29], it provide uniform nucleation and growth of the nanoparticles [30]. The reduction of metal salts using plant phytochemicals under microwave irradiation is a rapid method for the synthesis of noble metal nanoparticles [31].

Noble metal nanoparticles

Physicochemical properties of inorganic metal nanoparticles (Pt, Pd, Cu, Zn, Fe, Al, Ag and Au) in view of their large surface-to-volume ratio offer a new hope in the current science and technology. Among the noble metal nanoparticles, silver and gold nanoparticles are of much more importance owing to their applicability in various fields.

Platinum nanoparticles

Platinum nanoparticles are of particular interest because of their specific practical applications. The high content of peroxidase enzymes, proteins and vitamins present in the quail egg yolk was used in the green synthesis of spherical platinum nanoparticles [32]. The phenolic biomolecules present in the medicinal plant, *Taraxacum laevigatum* were used in the synthesis and stabilization of the spherical platinum nanoparticles. The nanoparticles exhibited strong antimicrobial property against both the gram-positive (*Bacillus subtilis*) and gram-negative (*Pseudomonas aeruginosa*) microorganisms [33]. The quasi-spherical platinum nanoparticles prepared from the precursor chloroplatinic acid using gum olibanum (*Boswellia serrata*) showed good peroxidase activity and can be employed in the colourimetric detection of Hg^{2+} ions. The amide linkages of the proteins and the hydroxyl and carboxylate groups of the proteoglycans which are soluble in water executed the reduction and capping activities [34].

Palladium nanoparticles

Season independent dried powder of the leaf *Anacardium occidentale* produced spherical palladium nanoparticles from $PdCI_2$ in the water phase. The oxidation of hydroxyl groups of polyols or glycosides forced the reduction of Pd^{2+} ions to palladium nanoparticles. The encapsulation of the nanoparticles by the COO^- groups together with the plant proteins stabilized the nanoparticles [35]. The proteins, carboxylate, and hydroxyl functional groups of the gum olibanum were responsible for the reduction and capping of the palladium nanoparticles [36]. Bioactive compounds in the root extract of *Asparagus racemosus* Linn have reduced the palladium and platinum metal salts to their nanoparticles [37]. The zero-valent palladium nanoparticles loaded with activated carbon were used for the removal of methylene blue from the water bodies [38]. The palladium nanoparticles prepared using the

reducing agent $NaBH_4$ and cetyltrimethylammonium bromide (CTAB) as capping agent have been used for the reduction of eosin-Y and the oxidation of NADH [39].

Copper nanoparticles

The surfactant-free copper nanoparticles synthesized using the leaf extract of *Ginkgo biloba* L. exhibited good catalytic activity in the [3+2] cycloaddition reactions between the organic azides and alkynes (Click reaction) at the room temperature [40]. The household waste material *Labeo rohita* scales were used for the green synthesis of copper nanoparticles and showed good photocatalytic activity in the degradation of the textile dye, methylene blue [41]. The copper nanoparticles synthesized by employing the bacteria *Morganella morganii* as reducing and capping agent showed a high level of purity [42]. Copper nanoparticles generated in a cellulose matrix show an excellent antibacterial property and can be used for packaging purposes [43]. Chitosan (biopolymer) supported copper nanoparticle has proved significant antibacterial activity against the gram-negative and gram-positive microbes [44].

Zinc oxide nanoparticles

Zinc oxide nanoparticles are n-type semiconducting metal oxides [45]. The reports showed that the ZnO nanoparticles can be prepared by using any one of the green reducing agents viz. plants, bacteria, fungi or algae. The phytochemicals like polyphenols, polysaccharides, vitamins, alkaloids, and terpenoids were responsible for the reduction and capping actions. The geometries of the nanoparticles were quasi-spherical, spherical, hexagonal and rod-shaped [46]. The green synthesized crystalline ZnO nanoparticles with quasi-spherical geometry proved a good varistor response [47]. The reduction of zinc acetate dihydrate utilizing the aqueous extract of the ornamental flower *Nyctanthesar bortristis* produced hexagonal zinc oxide nanoparticles with an excellent antifungal potentials [48]. ZnO nanoparticles were more toxic to gram-negative bacterium *Escherichia coli* than the gram-positive bacteria *Staphylococcus aureus* [49]. The green synthesized ZnO nanoparticles using different plant extracts were compared with chemically synthesized nanoparticles for their antioxidant and antidiabetic activities and found that the former produced better results because of the protein and amino acid constituents in the plant extracts [50]. The zinc oxide nanoparticles prepared using the aqueous leaf extract of *Eclipta prostrate* exhibited significant concentration-dependent cytotoxicity towards the liver cancer cells Hep-G2 [51]. The green synthesized ZnO nanoparticles using aqueous extract of *Cassia fistula* have hexagonal wurtzite structure and showed excellent antimicrobial and antioxidant properties [52]. Zinc oxide nanospheres were synthesized by *Azadirachta indica* leaf extract showed photocatalytic activity in the degradation of methylene blue along with their antibacterial effects against gram-positive and gram-negative bacteria [53].

Iron nanoparticles

Iron nanoparticles were prepared by the chemical co-precipitation method and by

green reducing agents. The iron metal ion precursors used for the synthesis of iron nanoparticles are $FeSO_4$, $FeCl_2 \cdot 4H_2O$, $FeCl_3 \cdot 6H_2O$ or $Fe(NO_3)_3$. The phenolic compounds (polyphenols, phenolic acids, tannic acid, flavonoids), proteins, sugars, alkaloids, and certain coenzymes present in the plant moieties did the reduction process. The iron nanoparticles generated were magnetite (Fe_3O_4), Iron (III) oxide (Fe_2O_3) or Iron oxyhydroxides (FeOOH) nanoparticles [54]. Iron (III)oxide, (Fe_2O_3) nanoparticles may be α-Fe_2O_3 (hematite), β-Fe_2O_3, γ-Fe_2O_3 (maghemite), and ε-Fe_2O_3 [55]. Leaf extracts of green tea leaves produced a mixture of iron oxide and iron oxohydroxide nanoparticles and were used as catalysts in the degradation of methylene blue and methyl orange [56]. Iron nanoparticles synthesized using tea extracts are used as a catalyst for the oxidative removal of monochlorobenzene from the wastewater [57]. The polyphenols and caffeine present in the tea leaves did the reduction of iron nanoparticles [58]. Iron nanoparticles prepared using the leaf extract of *Lawsonia inermis* and *Gardenia jasminoides* showed significant antibacterial activity against different microorganisms which is estimated by the well-diffusion assay [59]. The plant extract of *Phyllanthus emblica* and the fungal strain *Fusarium oxysporum sp* displayed different levels of antimicrobial activity against different microorganisms [60].

Silver and gold nanoparticles

From ancient times onwards, gold has greater importance because of it's monetary, the ornamental, artistic, and good medicinal values. The role of gold in the diagnosis, as well as treatment praxis, improves its medicinal value. Gold (Au) generally exists in the +3 and +1 oxidation states, but -1, 0, +2 and +4 are also feasible. Au (III) is a hard acid which preferably form stable complexes with hard bases. But Au (I) is a soft-acid and favours the formation of complexes with soft-bases like thiosulfate ions. Silver is used for making ornaments from ages. The wound healing, antiseptic, disinfectant and food preserving properties of the silver metal are also known. The most important oxidation state of silver is +1. The +2 and +3 oxidation states are also known. Ag^+ is an oxidizing agent and is considered as soft acid.

Plant extract-supported synthesis of gold and silver nanoparticles has been plentifully reported recently [61]. The shape and size-dependent physical properties of metal nanoparticles can be tailored according to our provision. Generally, the plant-reduced silver nanoparticles have more or less spherical geometry. The plant reduced gold nanoparticles generally have spherical, triangular, cubical [62], decahedral or icosahedral shapes [63].

Conclusion

This chapter is primarily discussed two points. The first point was the different approaches for the synthesis of nanoparticles. The second point of discussion was on the different noble metal nanoparticles

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 ISBN: 978-93-87709-90-4

TOUGHENED COMPOSITE OF SBR AND CARBON BLACK (N660)

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ABSTRACT

A classic set of polymeric micro-composites has been fabricated using an elastomer - styrene butadiene rubber [SBR] and with carbon black (CB)-N220 as a filler and reinforcing agent. This synthesized composite can be promisingly employed as a toughened material in a wide service range with excellent thermal stability, optimum storage modulus, and excellant morphological pattern. TEM, SEM, AFM, and Raman imaging are successfully employed for the morphological characterization. Mechanical and thermal features of composites have been carefully studied in detail. The fabrication and characterization adopted in this work can definitely act as a platform for the design of new toughened material with excellent performance and cost-effectiveness.

Key words: Rubber composites, Toughed composites, composite, carbon black

Introduction

Composites or composite materials are available in nature or engineered fusing two or more materials with considerably different chemical and physical properties which remain distinct at microscopic or macroscopic level within the finished structure. Polymer composite are the most abundantly used matrix material [1]. Generally, the mechanical properties of polymers are inadequate for many structural purposes, particularly their low strength and stiffness as compared to metals and ceramics. These difficulties are overcome by reinforcing other materials with polymers. Secondly processing of this type of matrix composites does not demand high pressure and high temperature [2]. Simpler equipment's are required for manufacturing polymer matrix composites [3]. For this reason, polymer composites developed rapidly and soon became popular for structural applications [4]. Polymer composites [5-11] are used because overall properties of these composites are superior to those

of the individual polymers. The elastic modulus is greater than that of the neat polymer but is not as brittle as ceramics.

In the present work, firstly carbon black (CB) is incorporated into SBR matrix to form SBR-CB composite. The morphologies of the composite were analyzed with transmission electron microscopy (TEM), scanning electron microscopy (SEM) and atomic force microscopy (AFM). Confocal Raman mapping had been employed to elucidate the effect of filler and polymer components in the resultant morphology of composite with special reference to blend ratio for the first time. This protocol in composite is a novel and brilliant approach for the fabrication of toughened materials.

Experimental Section

Styrene butadiene rubber (Synaprene 1502) with 25% styrene content was used for this study was supplied by Indian Synthetic Rubber Limited (ISRL). Dicumyl peroxide (DCP 99%), was purchased from Aldrich and used as such. Carbon black of the type general purpose furnace (GPF-N660) is employed in our study and was obtained from Phillips carbon black limited, Cochin, India. Its characteristics are size of 60± 5 nm, surface area of 146±3 m^2/g and carbon purity of 97 ± 0.4%.

Preparation of SBR - carbon black composites

The following preparation strategies have been adopted for the preparation of composites based on SBR and carbon black. SBR was masticated in a two-roll mixing mill at room temperature for 3 minutes and after which required amount of carbon black, GPF –N660 (5/10/20/50 phr-parts per hundred rubber) is added and milling was continued up to 8 minutes. It was mixed with 1 phr DCP in a two-roll mixing mill and mixing ends in 11th minute. The cure properties of the mix were taken on a rheometer and the optimum cure time was determined. The mixes were cured at 150°C on a hydraulic press to get SBR- carbon black composites.

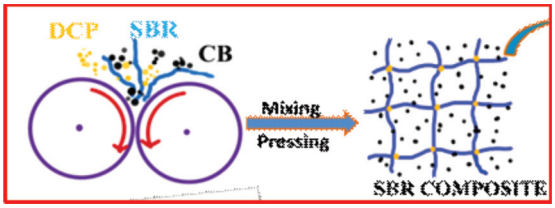

Figure 1
Scheme of Preparation of Composite

Representation of micro composites

The composites based on SBR and carbon black can be represented as $^{a}\mathbf{SG}_{n}$ ('a' indicate weight of DCP per 100 grams of SBR rubber, S indicates SBR rubber, G stands for GPF-N660 carbon black, n indicates weight of GPF-N660 per 100 grams of SBR rubber. The composition of different composites employed for various characterizations can be summarized in Table1.

Table 1 Composition of composites based on SBR and CB

Type of Composites	DCP (Phr)	CB (Phr)
$^{1}S_{100}$(Neat SBR)	1	0
$^{1}SG_{5}$	1	5
$^{1}SG_{10}$	1	10
$^{1}SG_{20}$	1	20
$^{1}SG_{50}$	1	50

Out of the different SBR-CB composites, composite with 50phr carbon black ($^1SG_{50}$) having excellent mechanical performance and good dispersion. The size dimensions composites is 8cm length x 6Cm breadth x 4mm thickness (±0.5mm).

Characterization

Tensile strength (TS) and elongation at break (EB %) were measured using a tensile testing machine at a crosshead speed of 50 mm/min. The TS measurements were done using dump bell specimens, at room temperature, as per the ASTM D-412 test method. The instrument used was Tinius Olsen HT50 kT UTM. The Shore A hardness was measured using a Durometer for the semi-IPNs and IPNs *as per ASTM D-2240 test method*. The toughness of the samples was estimated using the area under the stress-strain curve. Detailed impact measurements using pendulum impact tester (Izod and Charpy) and compact tension mode will be a subject of our future publications.

The density of the samples was measured at room temperature using the hydrostatic technique according to ASTM D-792.The morphology of composites was studied using JEOL-JEM 2010 model scanning electron microscope. The samples were cryogenically fractured, sputtered with gold and examined under microscope. The morphology of composites was further studied using JEOL-JEM 2010 model high resolution transmission electron microscope. Ultrathin sections of bulk specimens (Cryo cut specimens ~100nm thickness) prepared using an ultra-microtome (Leica, Ultracut UCT) were placed on 300 mesh Cu grids (35mm diameter) and were analyzed without staining. Samples were examined under WITEC ALPHA 300RA-Confocal Raman spectrometer for Raman imaging.

Results and Discussions

Firstly, we evaluate the mechanical and morphological features of composite. Then only we can move to the characterization modalities and results of IPN composites.

3.1. Mechanical Properties of SBR-CB Micro composite

On moving from neat SBR ($^1\mathbf{SG_0}$) to Composite with 50 Phr CB loading ($^1\mathbf{SG_{50}}$), enhancements in mechanical properties are observed. The mechanical behaviors of SBR-CB composites are depicted in the Table 3.

Table 2. Effect of CB (N660) loading on mechanical properties of composites

Composition	Density (g/CC) (±0.03)	TS (MPa)	EB (%)	Young's modulus (MPa)	Hardness Shore A(±3)	Toughness ($x10^{-7}Jm^{-3}$)
$^1\mathbf{SG_0}$	0.95	0.91±0.1	83±2	0.17±0.01	42	4.13±0.2
$^1\mathbf{SG_5}$	1.03	1.18±0.1	102±2	0.2±0.15	47	6.56±0.7
$^1\mathbf{SG_{10}}$	1.08	1.38±0.1	137±3	0.39±0.02	53	10.92±0.8
$^1\mathbf{SG_{20}}$	1.09	2.43±0.1	154±3	0.42±0.03	56	19.85±0.9
$^1\mathbf{SG_{50}}$	1.10	5.63±0.1	186.90±4	0.46±0.04	63	63.35±1.3

The incomparable potential of CBs for reinforcing an elastomeric matrix can be clearly exposed from the Table 4. This phenomenon is more clearly revealed in Figure 2.

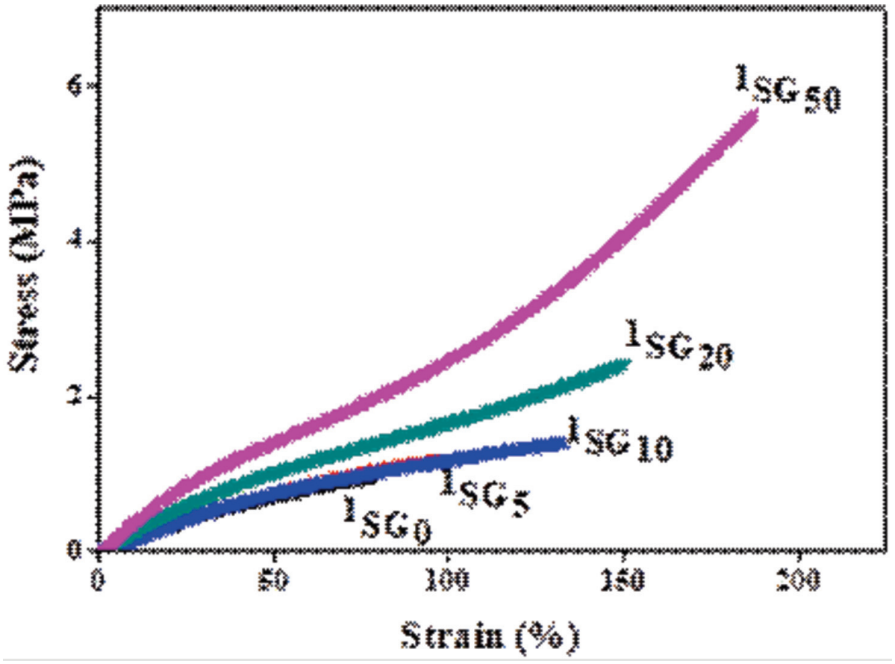

Figure 2 Stress–strain curves for neat SBR and their composites

SBR-CB micro-composite show a very interesting trend of increase in mechanical properties with carbon black loading. The addition of 50 phr of CB in the SBR matrix leads to a 170% increase in Young's modulus, whereas the tensile strength and elongation at break increase 518% and 100%, respectively.

In the case of composite, the usual trend between tensile strength (TS) and elongation is that one grows while the other decreases. In SBR-CB composite, TS enhances with loading of CB up to 50 phr, whereas the elongation at break is surprisingly improved. This unexpected behavior is thought to be related to the excellent dispersion and high interfacial contact between CB filler and the SBR matrix. It leads to reduced stress concentration in the SBR matrix which in turn leads to high plastic deformation. AS CB loading enhances, network formation of CB in composite occurs and the CB particles are anchored with the SBR chains. This phase reorganization prevents catastrophic failure in SBR-CB composite. This specific and uniform distribution pattern of CB in heavily loaded composite ($^1SG_{50}$) enables the system to transfer its stress from polymer chain to CB network [12,13] upon stretching. This mechanism can be schematically represented in in Figure 3.

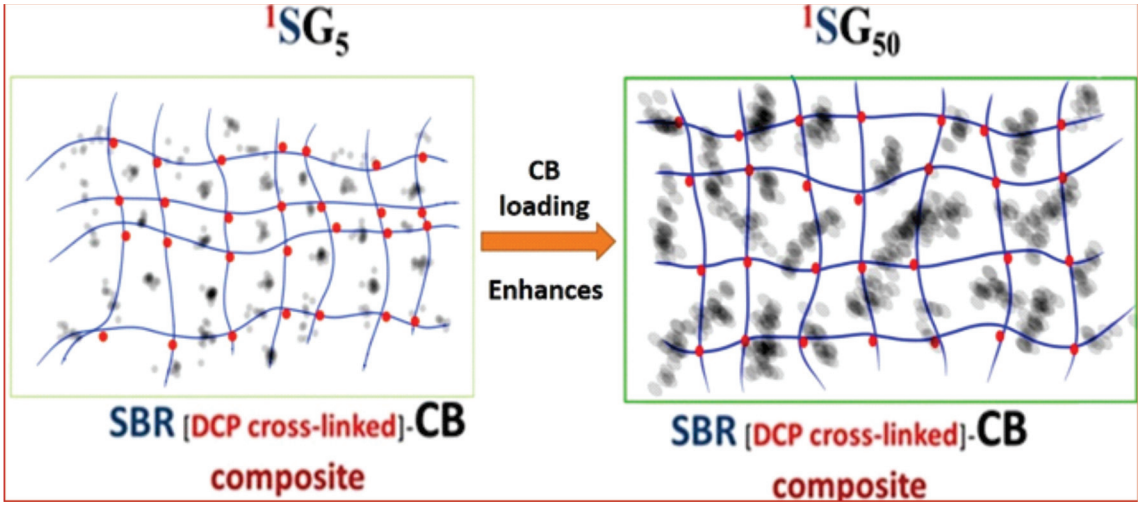

Figure 3 Phase reorganization associated with transition from SBR-CB composite with lower CB loading (1SG5) to SBR-CB composite with higher CB loading(1SG50).

The formation of CB network with highly anchored SBR chains with effective interfacial interaction should contribute to increasing the elongation at break of these composite. The proposed mechanism is well supported by TEM images of SBR-CB composite of varying CB loading (Figure 4). This observation is in good agreement with the already existing reports[14]

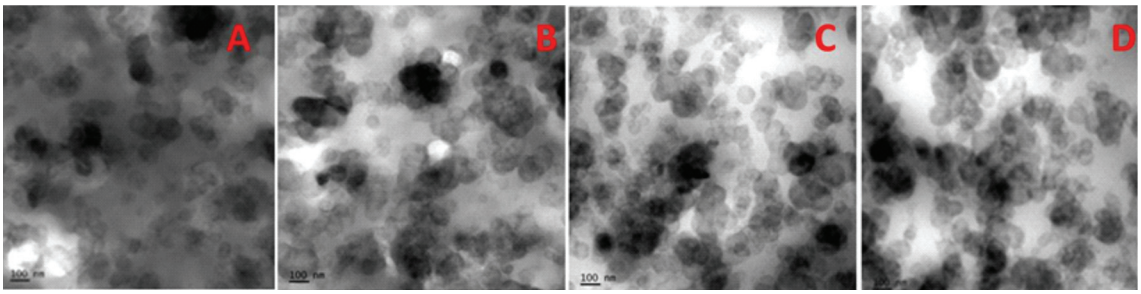

Figure 4 Transmission electron micrograph of composites with varying amount of CB(A) $^1SG_5$, (B) $^1SG_{10}$, (C) $^1SG_{20}$ and (D) $^1SG_{50}$

Hardness and density of the composite material enhance with carbon black loading. The experimental improvement in stiffness and hardness of the material is due to better dispersion of CB in SBR matrix [15]. The tensile toughness of SBR-CB composites enhances with CB loading.The incorporation of CB improves significantly the mechanical properties of SBR micro-composites and is due its better interfacial interaction with SBR. Such results havealready been reported in literature. These observations are in good agreement with already existing reports [16].

Morphology of micro composites

TEM images of micro composites

Figure 4 depicts the high-resolution transmission electron microscopic images of SBR-CB composites containing varying amount of carbon black. Micro composite loaded with 5 phr CB (^{1}**SG$_5$**), CBs are insufficient to cause a well-connected network structure, even though it shows a tendency for CB network formation in SBR matrix. As the CB loading enhances to 50 phr (^{1}**SG$_{50}$**), highly entangled three dimensional CB network structure is formed [17]. This structure is responsible for high mechanical performance of this composite with respect to neat SBR matrix. At 50phr CB loading, the composite adopt interconnected net like pattern and this distribution pattern [18] causes enhancement in mechanical performance of resultant micro composite especially tensile strength, modulus, EB and toughness value.

Confocal Raman mapping of micro composites

Figure5(a) depicts confocal Raman spectrum of carbon black and SBR-CB composite. The spectrum of carbon black show two characteristic Raman modes of CB, at <"1300 cm"^{1} (D-band) which corresponds to a disordered state of carbon, attributed to sp^{3}bonded (tetrahedral) carbons; and the G band,<"1600 cm"^{1}, corresponds to the graphitic carbon (ordered state), sp^2-bonded(trigonal) carbons[19]. In SBR-CB composite represents an exact replica of CB spectrum with additional peak at 1000 cm-^{1}. It corresponds to aromatic ring in SBR phase [20].The characteristic D and G bands of composite are almost identical to CB and it indicates the absence of chemical interaction between SBR and CB in composite.

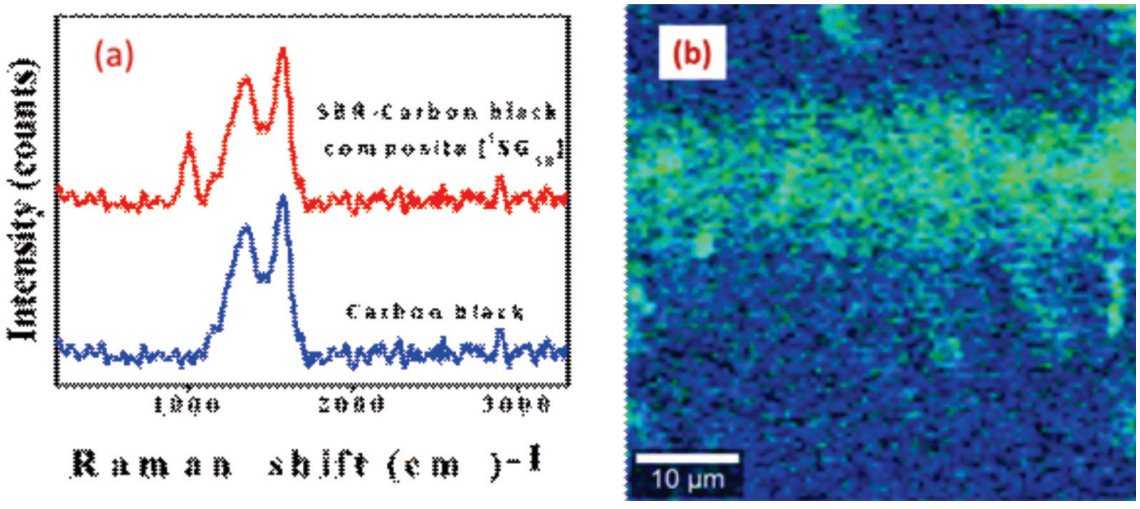

Figure5 (a) Confocal Raman spectrum of carbon black and SBR-CB composite (^{1}SG$_{50}$) and (b) Raman image of composite

For Raman mapping, the micro-composite was applied for area scan using D and G band (for CB) and 1000 cm^{-1} (for SBR part), we get Raman image of SBR-CB composite [Figure 5(b)] The blue and green colored regions are responsible for SBR and CB respectively. From the figure, it is clear that CB is uniformly distributed in SBR matrix of composite.

Conclusions

Mechanical properties and morphological features of newly fabricated SBR-CB micro composites are analyzed in detail. Incorporation of CB in the SBR matrix leads to increase in young's modulus, density and hardness of resultant composite. A model for special tendency of simultaneous increase in tensile strength and elongation at break of composite with CB loading is formulated. The interconnected network formation of CB in SBR matrix is proved through Raman images and TEM pictures. Composite with well dispersed morphology and optimum storage modulus with high toughness and stiffness can perform as a potential candidate for toughened material.

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 ISBN: 978-93-87709-90-4

A REVIEW ON THE ADVANCEMENT OF TENSEGRITY AND DEVELOPMENT OF A TENSEGRITY STRUCTURE

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ABSTRACT

Tensegrity is a kind of architecture and design principle that applies when a discontinuous set of compression elements is opposed and balanced by a continuous tensile force. Tensegrity structures consist of strings (in tension) and bars (in compression). Strings are strong, light, and foldable, so tensegrity structures have the potential to be light but strong and deployable. The article describes principles, construction, research and develpment in the field of tensegrity and applications of tensegrity.

Introduction

Tensegrity is a design principle that applies when a discontinuous set of compression elements is opposed and balanced by a continuous tensile force, thereby creating an internal prestress that stabilizes the entire structure. Tensegrity structures maintain their stability, or integrity, through a persistent tensional force, hence the term tensegrity. It is a kind of architecture, that looked like it was built by nature instead of by humans. (Donald E. Ingber and Misia Landau, 2012)

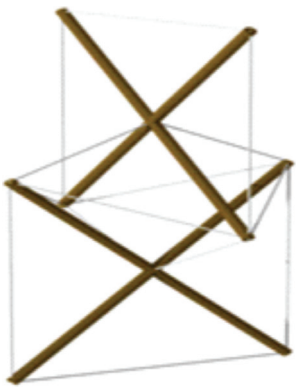

Fig.1: First tensegrity structure developed in 1949.

Kenneth Snelson, in 1949, created the first tensegrity structure using two X-shaped wooden struts suspended in air by a taut nylon cable (Fig.1). For much of history, architecture had been preoccupied with making things stable but Snelson's X-structure unlocked a world in which structures could be flexible and firm, holistic and hierarchical. Over the past 60 years, artists, engineers, and architects have used the lessons of tensegrity to build previously impossible structures space frames, deployable moonbase shelters, as well as sky-piercing sculptures.

Emergence of the idea of tensegrity

Though tensegrity was first realized in the mid 20th century, hints can be seen in a 1920 sculpture by the Russian constructivist artist, Karl Ioganson (Emmerich, 1988; Motro, 2003). Yet Ioganson's purpose was to show how a tensile structure could be deformed rather than made stable. Fuller perceived that nature's forms were the result of matter being acted upon by force and, in 1917, proposed that nature itself is a finite energy system consisting of the forces of tension and compression acting synergetically, a theory he would later term Energetic-Synergetic Geometry (Fuller, 1961). Though compression had been considered dominant and, for this reason, had been favored by architects and builders, Fuller was finding tension to be the stronger and more versatile force.

Tensegrity in art, science and nature

Tensegrity is a principle that is realized only through man-made objects. In the man-made world, in the wire bicycle wheel, the wheel's hub and rim acted as discontinuous compression elements, each resisting the deforming pull of the tension-bearing spokes, and was impressed by how the spokes could be made thinner and thinner without compromising the wheel's stability. Civil engineers were using the principles of tensegrity to build pavilions, domes, and space frames the girded structures that span the ceilings and walls of barns and other large buildings. Articles on tensegrity were beginning to appear and the first textbooks were being written (Kenner, 1976).

The principles of tensegrity are best realized in art and the vaster universe is the result of tensegrity (Snelson, 1990). Tensegrity was a design principle of nature (Fuller, 1982). The planets is an isolated compression elements held in place by the invisible but pervasive tensile force of gravity. This arrangement- *discontinuous compression, continuous tension* - was mirrored in the atom, with its swirl of electrons orbiting around the nucleus, all bound together by attractive and repulsive forces operating at the subatomic level. The human frame with its many tensile muscles, ligaments, and tendons pulling up on the rigid bones of the body, thereby stabilizing and supporting them against the force of gravity, is a prime example of tensegrity at work. In the last few decades, scientists have shown that tensegrity is a fundamental design principle of nature, operating at the level of organs, tissues, cells, and even molecules (Ingber, 1998). The behavior of cultured cells were reproduced by building a simple stick-and-string tensegrity model. But real cells have a nucleus. To rep-

licate nature more closely, a smaller tensegrity sphere was placed at its center and the flattened cell appeared to polarize, with the nucleus moving to the region of the base where the greatest pulling forces were being exerted. The living cells exhibit precisely these same behaviors (Wang et al., 1993, 2001; Kumar et al., 2006; Brangwynne et al., 2006), The researchers showed how more complex cell shapes, such as the long extended processes of nerve cells, can be established using tensegrity (Joshi and Heidemann, 1985). Incorporating the ideas about the cytoskeleton and extracellular matrix into an ambitious model of cellular tensegrity, develop new insights and predictions into how cells and tissues form, how they function, and how cancers can arise (Ingber, 1985; 1993; 2003a). there are mathematical model of tensegrity that predicts how cells from many different tissues behave mechanically (Stamenovic, 1996). The cell is, in fact, interconnected all the way down from the extracellular matrix to the cytoskeleton to the chromosomes and genes (Maniotis et al., 1997).

Recent Developments

The principle of tensegrity can be used to create structures that were flexible and firm, and engineers, architects, and artists would build on their work throughout the last century and into the present one. Over the past 30 years, there has been an explosion of activity in the areas of civil engineering and architecture to systematize, categorize, and develop algorithms for the building of a wide range of tensegrity structures, have made tensegrity design accessible to a wider audience (Motro, 2003; Burkhardt, 2008). Mathematicians such as Robert Connelly have been studying the underlying geometric principles of tensegrity structures, defining them as a system of points and vertices, in an effort to understand how various tensegrity structures maintain their stability and to define which structures are possible and which are not (Connelly and Back, 1998).

From Form to Function

The mechanical forces exerted at the surface of the cell can be transmitted to the nucleus, resulting in biochemical changes and ultimately, in genetic ones—the turning on and off of genes. This process, known as "mechanotransduction," is central to the way cells, and also tissues and organs, respond to physical force: the way bone and cartilage respond to compression; muscle and skin respond to tension; blood vessels to the pressure of blood flow (Ingber 2003b). Through tensegrity, even the force of gravity may influence the growth of cells, tissues, and organs, (Ingber, 1999; Ingber, 2006). Over the past 30 years, mechanotransduction, and tensegrity has attracted the attention not just of biologists but of physicians and other health care practitioners who have long suspected that mechanical manipulations can exert a profound effect on the tissues and organs of the body (Ingber 2003c; Levin, 2002).

The principles of tensegrity, in particular its modular and hierarchical aspects, are also being used to understand how molecules self-

assemble to form cells; how cells form into tissues; and how tissues join together to create organs with specialized shapes and functions. Tissues are made up of layers of cells attached to extracellular matrix. These cells exert a tensile force, pulling up on the extracellular matrix. Normally, the extracellular matrix resists their pull, but during organ formation, local chemical signals can cause some areas of the matrix to thin and pull apart, like a run in a stocking. According to the cellular tensegrity model, cells attached to the thinned regions should stretch as well, which, in turn, should signal them to divide and grow while their undeformed neighbors remain quiescent. It turns out, extracellular matrix has also been observed to thin uncontrollably during tumor formation, which led to understand that changes in the extracellular matrix might be stimulating the cell growth that drives cancer.

Researchers have also shown that the cytoskeletal frameworks of individual cells are linked to the matrix, and to one another, through mechanical connections that span the cell membrane and link to central nuclei, forming a continuous, prestressed structural network (Wang et al., 1993, 2009). These intercellular connections produce a kind of harmonic coupling, helping to coordinate the timing of activities of cells in far-flung corners of tissues, organs, and the entire body (Pienta and Coffey, 1991; Ingber 2006). In this way, tensegrity exerts its influence not just in space but also time. Although the term 'tensegrity' is not always used, the concept that tensional prestress is key to providing overall cell shape stability and cytoskeletal coherence has become widely accepted. The individual actomyosin filaments that make up the cytoskeleton, and which generate its tensile forces, are themselves built from smaller molecules that do not physically touch but instead gain their stability through attractive forces, creating a kind of molecular tensegrity. It turns out, many cellular proteins, and even DNA itself, gain their shape and stability through a similar arrangement, namely by intramolecular attractive forces coming into balance with regions of the molecule that resist being compressed (Ingber, 1998; Ingber, 2000; Morrison *et al*, 2011). Molecular modelers are drawing on these discoveries to simulate how proteins fold and take on specific shapes, efforts which could someday lead to the development of new therapeutics. Inspired by these and other findings, including the observation that crystals and many other inorganic substances assume a geodesic form, Ingber recently proposed that the origin of life itself may have been driven by hierarchical self-assembly (Ingber, 2000). In this view, tensegrity along with other fundamental natural design principles such as energy minimization, topological constraints, and self-emergence of autocatalytic systems provides an explanation not just for the origin of the first cells but also for the evolution of increasingly complex multi-modular structures such as tissues and organs, each exhibiting progressively more sophisticated functions.

From Macrocosm to Microcosm

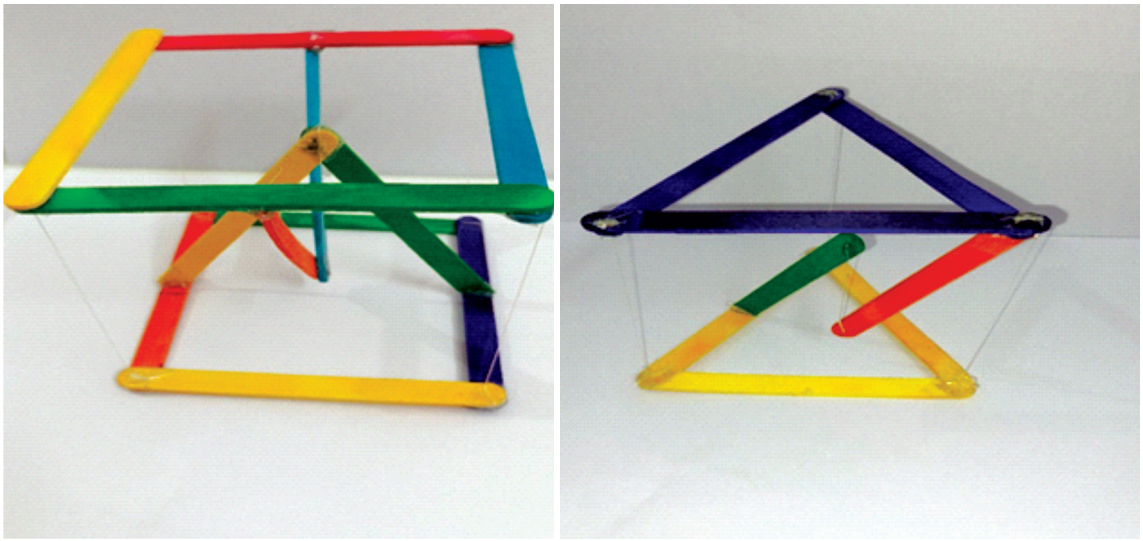

Fig. 2: Two tensegrity structures developed in the laboratory.

The key to tensegrity is that it lets force and matter work together in the way they were designed to, by nature. Biologists, too, have been using the principles of tensegrity to build nanotubes and other nanodevices that might someday deliver drugs directly to cells or help regenerate tissues. Working with DNA instead of carbon, nanobiologists such as Ned Seeman, William Shih, and Tim Liedl are using tensegrity designs to build molecular structures composed of DNA struts held together by tensile chemical bonding forces (Seeman, 2010; Liedl *et al*, 2010). Tensegrity can be used to build macroscale robots that can move individually and, at the same time, self-assemble into larger collectives that behave in a coordinated manner, much like tissues that form from groups of smaller cells (Paul *et al* 2006; Yu *et al*., 2008).

Conclusion

Nature has no separate departments of mathematics, physics, chemistry, biology, art, or architecture. To fully explore tensegrity, one must span all these disciplines. Many have made this leap, their efforts can be seen in fields as diverse as nanotechnology, tissue engineering, architecture and space exploration. If the future is one in which solutions to our most pressing societal and environmental problems come from nature, then tensegrity will likely become even more central. Tensegrity is not an easy concept to grasp. It is best seen and felt by building own tensegrity structures. The authors have constructed 2 tensegrity structures in the laboratory as shown in the fig. 2 to grasp the concept of tensegrity.

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 ISBN: 978-93-87709-90-4

A BRIEF STUDY ON KOROVKIAN'S FIRST THEOREM AND APPROXIMATION OF CONTINUOUS FUNCTIONS BY POSITIVE LINEAR OPERATORS

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ABSTRACT

This survey paper contains an introduction to Korovkin-type theorems, especially, the first theorem on Korovkin and to some of their applications concerning the approximation of continuous functions by positive linear operators.

1. Introduction

Korovkin-type theorems provide simple and useful tools for determining, if a given sequence of positive linear operators, on a function space is an approximation process or converges strongly to the identity operator.

These theorems present a varieties of subsets of functions which guarantee that the approximation holds on the whole space provided it holds on them. The custom of calling these kinds of results are known as Korovkin-type theorems, refers to P. P. Korovkin who in 1953 discovered such a property for the functions 1,x and x^2 in the space C([0,1]) of all continuous functions on the real interval [0,1] as well as for the functions 1, cos and sin in the space of all continuous 2Π-periodic functions on the real line.

After this discovery, several mathematicians have undertaken the program of extending Korovkin's theorems in many ways to several settings, including function spaces, abstract Banach lattices, Banach algebras, Banach spaces and so on. Such developments described a theory which is nowadays referred to as Korovkin-type approximation theory. This theory has fruitful connections with real analysis, functional analysis, harmonic analysis, measure theory, probability theory and partial differential equations. The leading applications are concerned with approximation theory, where it appear as a significant tool.

2 Preliminaries

Let (X, d) be a metric space and $x_0 \in X$. Let $r > 0$. Then,

$$B(x_0, r) = \{x \in X / d(x_0, x) < r\}$$

$$B'(x_0, r) = \{x \in X / d(x_0, x) \leq r\}$$

$F(X)$ denotes the set of all real valued functions defined X. If M is a subset of $F(X)$, then by $\mathbb{L}(M)$ we designate the linear subspace generated by M. We can denote the linear subspace of all functions $f : X \to R$ that are bounded, endowed with the norm of uniform convergence defined by $||f||_\infty = \sup_{x \in X} |f(x)|$.The symbols $C(X)$ and $C_b(X)$ denote the linear subspaces of all continuous (resp. continuous and bounded) functions in $F(X)$.

3 Korovkian's first theorem

Theorem 1. *(Korovkian [4]) Let $(L_n), n \geq 1$ be a sequence of positive linear operators from $C([0, 1])$ into $F([0, 1])$ such that for every $g \in \{1, e_1, e_2\}$*

$$\lim_{n \to \infty} L_n(g) = g \text{ uniformly on } [0, 1]$$

. Then for every $f \in C[0, 1]$,

$$\lim_{n \to \infty} L_n(f) = f \text{ uniformly on } [0, 1]$$

Proof. For every $x \in [0, 1]$ consider the function

$$d_x t = |x - t|, (0 \leq t \leq 1)$$

Then,

$$d_x^2 = e_2 - 2xe_1 + x^2\mathbf{1}$$

If $(L_n), n \geq 1$ is a sequence of positive linear operators satisfying the assumptions of theorem , we get

$$\lim_{n \to \infty} L_n(d_x^2)(x) = 0$$

uniformly with respect to $x \in [0, 1]$, because for $n \geq 1$

$$L_n(d_x^2) = (L_n(e_2)x^2) + 2x(L_n(e_1)x) + x_2(L_n(1)1)$$

.

□

Theorem 2. *([1]) Let (X, d) be a metric space and consider a lattice subspace E of $F(X)$ containing the constant functions and all the functions $d_x^2 (x \in X)$. Let $(L_n), n \geq 1$ be a sequence of positive linear operators from E into $F(X)$ and let Y be a subset of X such that*

1. $\lim_{n\to\infty} L_n(1) = 1$ *uniformly on* Y

2. $\lim_{n\to\infty} L_n(d_x^2) = 0$ *uniformly with respect to* $x \in Y$

Then for every $f \in E \cap UC_b(X)$

$$\lim_{n\to\infty} L_n(f) = f \text{ uniformly on } Y$$

.

Proof. Let $f \in E \cap UC_b(X)$. f is uniformly continuous. Hence for every $\epsilon > 0$, there exist a $\delta > 0$ such that $|f(x) - f(y)| \leq \epsilon$ whenever $d(x, y) < \delta$

If $d(x, y) \geq \delta$, then

$$|f(x) - f(y)| \leq 2||f||_\infty \leq \frac{2||f||_\infty}{\delta^2} d^2(x, y)$$

For $x \in X$, we obtain,

$$|f(x) - f| \leq \frac{2||f||_\infty}{\delta^2} d_x^2 + \epsilon \mathbf{1}$$

Hence for $n \geq 1$,

$$|L_n(f)(x) - f(x)L_n(1)(x)| \leq L_n(|f(x) - f|)(x) \leq \frac{2||f||_\infty}{\delta^2} L_n d_x^2(x) + \epsilon L_n(1)(x)$$

Hence we can say that $\lim_{n\to\infty} L_n(1) = 1$ uniformly on Y

□

Theorem 3. *Let* (X, d) *be a metric space and* E *is a subset of* $F(X)$ *. Let* $(L_n), n \geq 1$ *be a sequence of positive linear operators from* E *into* $F(X)$*. For* $x \in X$

1. $\lim_{n\to\infty} L_n(1) = 1$

2. $\lim_{n\to\infty} L_n(d_x^2) = 0$

Then for every bounded function $f \in E$ *that is continuous at* x

$$\lim_{n\to\infty} L_n(f) = f$$

.

Proof is similar to that of Theorem 3

Theorem1 was obtained by P.P Korovkian in 1953. It has many important applications in the study of positive approximation process in $C[0, 1]$.

One of them is related to the *Bernstein operators* on $C([0, 1])$ which are defined by

$$B_n(f)(x) = \sum_{x=0}^{n} f(\frac{k}{n}) \binom{n}{k} x^k (1 - x)^{n-k}$$

$(n \geq 1, f \in C[0, 1], 0 \leq x \leq 1)$

Theorem 4. *([2]) For $f \in C[0,1]$*

$$\lim_{n\to\infty} B_n(f) = f \text{ uniformly on } [0,1]$$

Proof. Each B_n is a positive linear operator in $C[0,1]$. Also $B_n(1) = 1, B_n(e_1) = e_1$ and $B_n(e_2) = \frac{n-1}{n}e_2 + \frac{1}{n}e_1$
Hence from Theorem1 $\lim_{n\to\infty} B_n(f) = f$ uniformly on $[0,1]$ □

Theorem 5. *([5]) For every $fC([0,1])$, there exists a sequence of algebraic polynomials that uniformly converges to f.*

It is known as the **Stone-Weistrass theorem** in analysis. In fact it is a particular version of the *Korovkin* theorem. It is known as **restricted version of Korovkian theorem**.

Theorem 6. *([3])[Restricted version of Korovkian Theorem] The restricted version of Korovkins theorem and Weierstrass approximation theorem are equivalent.*

Proof. Let $(L_n), n \geq 1$ be a sequence of positive linear operators from $C[0,1]$ to $B[0,1]$ such the $\lim_{n\to\infty} L_n(g) = g$ uniformly on $[0,1]$ for every $g \in \{1, e_1, e_2\}$. From Theorem1 $\lim_{n\to\infty} L_n(d_x^2)(x) = 0$ uniformly in $x \in [0,1]$

For $m \geq 1$ and $x, y \in [0,1]$, we have

$$|x^m y^m| \leq m|yx|$$

Hence,

$$|e_m - y^m 1| \leq m|e_1 - y1| (y \in [0,1])$$

Then by Cauchy-Schwartz inequality implies, for any $n \geq 1$ and $y \in [0,1]$,

$$|L_n(e_m) - y_m L_n(1)| \leq mL_n(|e_1 - y1|) \leq m\sqrt{L_n(1)}\sqrt{L_n(e_1 - y1)^2} = m\sqrt{L_n(1)}\sqrt{L_n(d_y^2)}$$

Therefore, $\lim_{n\to\infty} L_n(e_m) = e_m$ uniformly on $[0,1]$ for any $m \geq 1$.

Hence $\lim_{n\to\infty} L_n(P) = P$ uniformly on $[0,1]$ for every algebraic polynomial P on $[0,1]$.

Setting $M := \sup_{n\geq 1} ||L_n|| = \sup_{n\geq 1} L(1) < +\infty$

Fixing $f \in C([0,1])$ and $\epsilon > 0$, there exists an algebraic polynomial P on $[0,1]$ such that $||f - P|| \leq \epsilon$, and an integer $r \in \mathbb{N}$ such that $||L_n(P) - P|| \leq \epsilon$ for every $n \geq r$, so that

$$\begin{aligned} ||L_n(f) - f|| &\leq ||L_n(f) - L_n(P)|| + ||L_n(P) - P|| + ||P - f|| \\ &\leq M||f - P|| + ||L_n(P) - P|| + ||P - f|| \\ &\leq (M+2)\epsilon \end{aligned}$$

Thus we can conclude that $L_n(f)$ converges to f uniformly . Hence the theorem is proved.

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 ISBN: 978-93-87709-90-4

CARBON DIOXIDE AS A CHEMICAL STORAGE MATERIAL AND ITS UTILIZATION

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1.1 Introduction

Energy and environment are two of the most important issues in this century. More than 80 % of our energy comes from the combustion of fossil fuels and it is agreed that carbon dioxide produced from the combustion process to be the most important anthropogenic gas leading to global warming. The linear warming trend over the 50 years from 1956 to 2005 (0.10 to 0.16° C per decade) is nearly twice that for the 100 years from 1906 to 2005[1]. As a result, there is an urgent need to reduce global carbon dioxide emissions in the short term through technical advancement and legislation, physical or chemical storage and conversion to other useful products. The key issue is how to achieve a reduction without compromising our economic growth, national security and living standards. Carbon capture and sequestration (CCS) at large emission sources such as power plants has been proposed as a strategy to decrease the accumulation of CO_2 in the atmosphere[2].

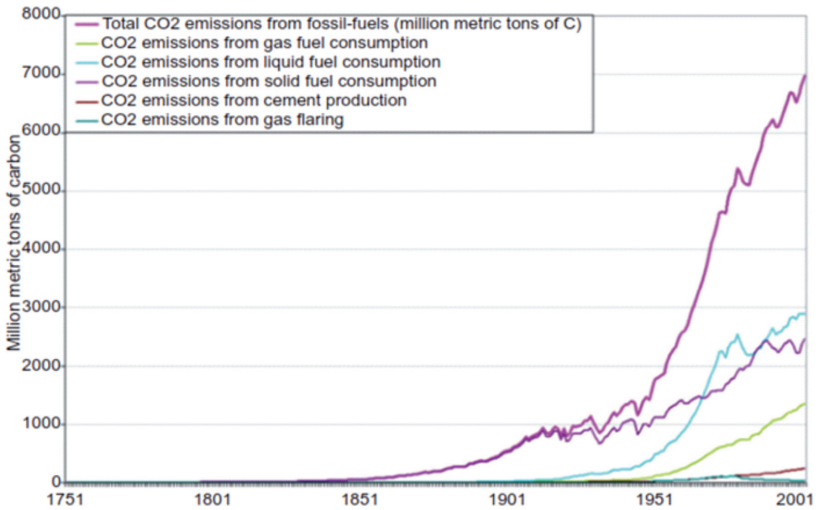


Fig. 1:
The origin of CO_2 emission

Proposed sequestration methods include geological or deep sea storage and mineralization. To reduce our dependence on imported petroleum, the development and expansion of natural gas to liquid (GTL) and coal to liquid (CTL) technology has been proposed. GTL and CTL yield syngas, a mixture of hydrogen and carbon monoxide, which is then converted into liquid fuels via the Fischer-Tropsch process[3], and both are well developed technologies[4-7]. CO_2-enhanced oil recovery (EOR) and CO_2-enhanced gas recovery (EGR) are techniques in which compressed CO_2 is injected into depleted oil and gas fields to increase production. In the case of CO_2-EOR, the CO_2 tends to dissolve in the oil making it less viscous and easier to extract. Oil and gas formations offer excellent near-term potential for CO_2 storage because the geologic conditions that trap oil and gas are also conducive to long-term geologic storage of CO_2.

CO_2-enhanced coal-bed methane recovery (ECBM) production involves injecting CO_2 into a coal seam to displace and produce methane gas. Due to preferential adsorption of CO_2, this has the added benefit of storing a portion of the injected CO_2 by adsorption on the organic-rich surfaces within the coal, which tends to displace the less strongly adsorbed methane. CO_2-enhanced geothermal systems(EGS) is a novel technology that enables cost effective energy extraction from formations that would otherwise not be suitable as a geothermal energy source. The enhancement comes from using supercritical CO_2 instead of water or brine as the working liquid to recover heat and generate electric power via a supercritical CO_2 turbine. The CO_2 is continuously cycled through the system with additional CO_2 added to replace losses.

It is also worth noting that the fraction of CO_2 produced via the use of chemicals is approximately 10% of the total, the remainder being derived from energy products. However, if efficient technologies capable of converting CO_2 into energy - rich products (fuels) were to be developed, then a much greater amount of CO_2 could be converted into usable products. This would result in a much more signiûcant step in the direction of chemicals and energy production, with a close to zero carbon - emission level.

1.1.1 Applications of CO_2 in Chemical Synthesis

CO_2 is safe (non-toxic non-flammable), economical, abundant and most oxidized form of carbon. CO2 has been suggested as a sustainable replacement for organic solvents in a number of chemical processes[8].

There are several motivations for producing chemicals from CO_2 whenever possible. (1) CO_2 is a cheap, nontoxic feedstock that can frequently replace toxic chemicals such as phosgene or isocyanates. (2) CO_2 is a totally renewable feedstock compared to oil or coal. (3) The production of chemicals from CO_2 can lead to totally new materials such as polymers described below. (4) New routes to existing chemical intermediates and products could be more efficient and economical than current methods. (5) The production of chemicals from CO_2 could have a small but significant positive impact on the global carbon balance[9].

A widely accepted idea is that CO_2 is so thermodynamically and kinetically stable that it is rarely used to its fullest potential. However, due to the electron deficiency of the carbonyl carbons, CO_2 has a strong affinity toward nucleophiles and electron-donating reagents. In other words, CO_2 is an "anhydrous carbonic acid", which rapidly reacts with basic compounds[10]. For example, organometallic reagents such as Grignard reagents readily react with CO_2 even at a low temperature. Water, alkoxides, and amines also add to CO_2 in similar manners to produce compounds with a carboxyl or carboxylate group. These reactions conveniently produce carbonic and carbamic acids.

The potential uses of CO_2 in chemical applications are shown in Figure 2, where some of the products (carboxylates, carbonates, and carbamates in routes A and B) are obtained by incorporation of the entire CO_2 molecule. The reactions bearing such products will have a low energy content and may occur at room temperature, or lower. Processes in which CO_2 is reduced to other C1 or Cn molecules (Figure 2, routes C and D) require an input of energy.

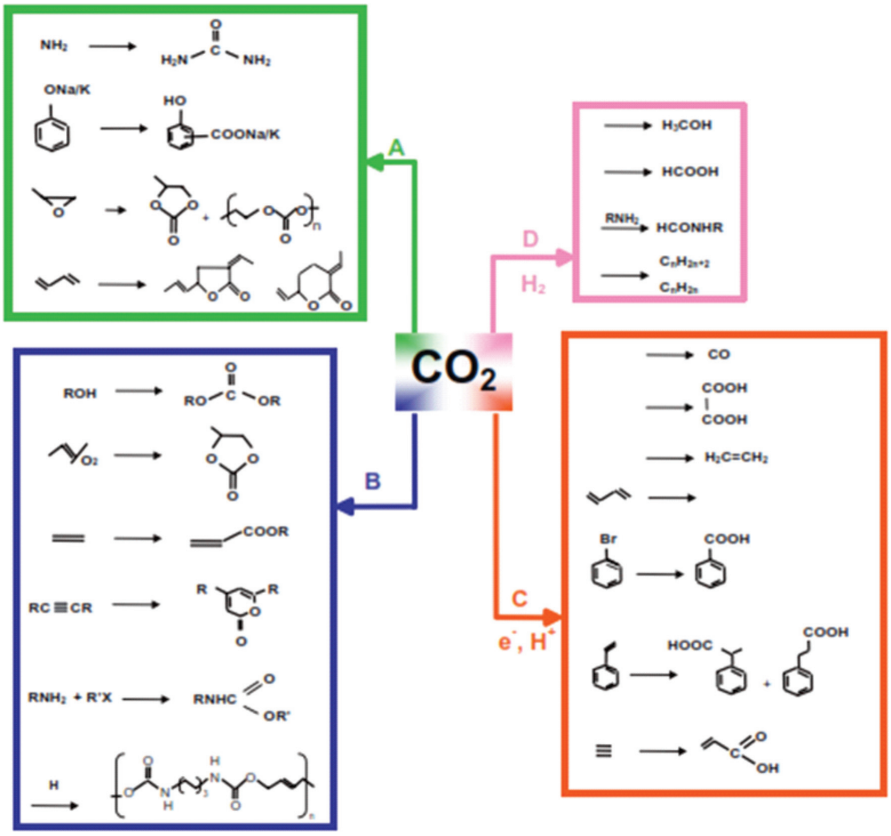


Fig 2: The possible applications of CO_2 in chemical synthesis[11]

Organic carbonates are roughly categorized into cyclic and linear carbonates[12]. Because both compounds have three oxygens in each molecule, they are relatively suitable from a thermodynamic point of view as synthetic targets starting from CO_2. Four industrially important organic carbonates are ethylene carbonate (EC), propylene carbonate (PC), dimethyl carbonate (DMC), and diphenyl carbonate (DPC). EC, DMC, and DPC are useful intermediates for manufacturing polycarbonates through a non-phosgene process[13,14]. In addition, EC, PC, and DMC are employed as electrolytes in lithium ion batteries and are widely used as aprotic polar solvents. Furthermore, the excellent properties of DMC as a fuel additive have attracted much attention[14]. Currently, the largest future application of organic carbonates is as a substitute for phosgene in the syntheses of polycarbonates[13] and polyurethanes.

The use of sc–CO_2 as a solvent and reagent represents an application that reduce not only the amount of waste organic solvents, but also the emission of CO_2 derived from the combustion of spent solvents. The dry - reforming of methane is a technology that may pressurize the gas – to liquid (GTL) approach by converting methane and CO_2 into liquid fuels at the liqueûed natural gas (LNG) extraction well. The photoassisted electrochemical reduction of CO_2 in water represents a very interesting technology that may allow the efficient use of residual or intermittent energies, with the concomitant conversion of large volumes of CO_2 into chemicals or fuels.

1.1.2 Copolymerization of CO_2 and epoxide

The copolymerization of CO_2 with epoxides has been known since 1969 when Inoue et al. combined $ZnEt_2$, water, CO_2 and PO to yield a small quantity of polymeric material[15,16]. Shortly after the initial discovery from Inoue et al. the effect of dihydric molecules (e.g. resorcinol[17] , dicarboxylic acids [18] and primary amines[19]) in combination with $ZnEt_2$ was studied on the copolymerization of CO_2 and PO. In 1976–1977 Kuran et al. developed new catalyst systems with trihydric phenols such as pyrogallol and 4-bromopyrogallol[20,21].

The ûrst catalytic observations (PO/CO_2) with these systems suggested that monoprotic molecules such as alcohols and secondary amines exclusively yield cyclic propylene carbonate (PC) whereas di- and tri-protic species yield PPC[21-25]. In order to overcome the low activities generally encountered, Soga et al. synthesized the ûrst well-deûned heterogeneous catalyst system from a $Zn(OH)_2$/glutaric acid mixture for the copolymerization of CO_2 and PO [23]. The ûrst homogeneous single-site catalyst was developed by Inoue et al. in 1986, comprising a tetraphenylporphyrin ligand (tpp) with an aluminum metal center[26]. In 1995 a series of discrete zinc phenoxide derivatives as catalysts were synthesized by Darensbourg et al. These catalysts demonstrated moderate activities for PO/CO_2 copolymerization. with approximately 10% polyether content even under high CO_2 pressures (55 bar)[27-29].

To date, the most successful systems for CO_2-epoxide coupling have typically involved a

(salen) Cr(III) or Co(III)-based catalyst with some sort of added onium salt cocatalyst. In cases where no cocatalyst is employed, a bimetallic pathway is preferred, and catalysts such as the zinc â-diiminate of Coates et al.[30], the linked (salen)Cr(III) of Rieger et al[31]., the heteronuclear zinc complexes of Lee et al.[32,33], and the bimetallic systems of Williams et al.[34] have also proved effective for the selective copolymerization reactions.

1.1.3 Poly (Propylene Carbonate)

PPC has become an emerging material in the landscape of thermoplastic polymers. Most of its essential properties are known. It is biocompatible and biodegradable, which makes it attractive for packaging purposes. PPC is a material with unusual thermal properties. The glass transition temperature (Tg) of PPC is 35–40 ^{0}C, which hinders its broad utility as a bulk material[35]. Therefore, efforts are being directed to employ aliphatic polycarbonates as additives and pore formers. For application as a ûlm, a lower T_g is desirable, whereas for application as a container a higher T_g is a prerequisite. Through the incorporation of further monomers the T_g can be increased, as well as through the preparation of composites with ûllers. Alicyclic polycarbonates, such as poly (cyclohexene carbonate) (PCHC), typically have much higher Tg's (115 ^{0}C for PCHC) resulting in materials with properties very similar to poly (styrene)[29]. PPCs with high ether linkage content (80% ether) have been reported to exhibit excellent solubility in supercritical CO2, a rare property for non-fluorinated polymers.[36]

1.2 Recent Catalyst Developments for CO_2/epoxide Copolymerization

Though it had initially been overlooked due to stability issues between active cobalt(III) and inactive cobalt(II), (salen)$Co^{III}X$ complexes exploded in the mid-2000s as excellent catalysts for the selective copolymerization of propylene oxide with CO_2.

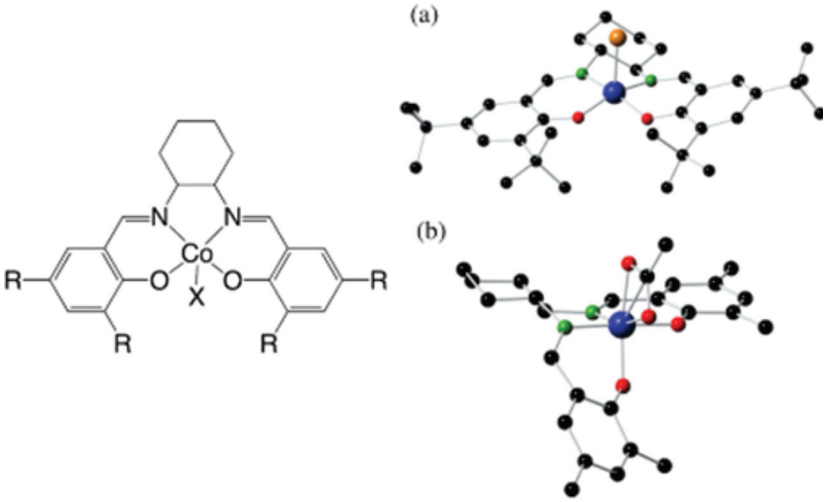
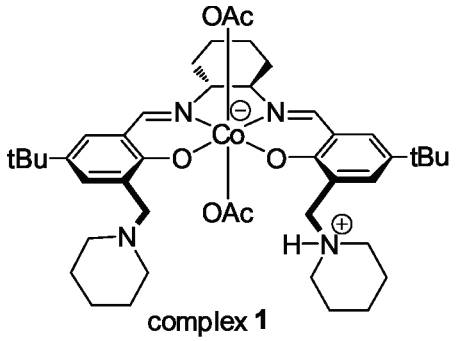


Fig. 3: General (salen) CoX complex and crystal structures of (a) (R,R) N,N'-bis (3,5-di-tert-butylsalicylidene)-1,2-cyclohexanediamino cobalt(III) chloride[37] in the typical trans-conûguration and (b) (R,R)-N,N'-bis(3,5di-methylsalicylidene)-1,2-cyclohexanediamino cobalt(III) $_K^2$ -acetate in a cis-â conûguration[38].

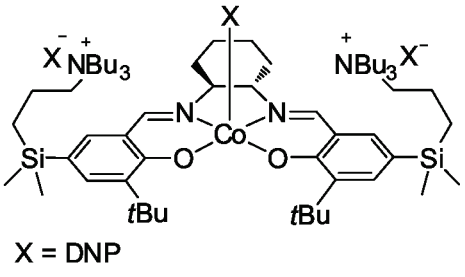
The Coates and Lu groups were able to produce poly(propylene carbonate) with >99% selectivity at room temperature in neat propylene oxide from various (salen) CoX complexes and onium salt cocatalysts[39,40]. In each case, the yields were typically held below 50%, as the increased viscosity of the solution at higher conversions would eventually lead to increased backbiting to cyclic propylene carbonate. These cyclic carbonate can also block the metal center from incoming epoxides, as cyclic carbonates are better ligands than epoxides.

1.2.1 Single Component Salen Catalysts

In 2006, Nozaki and coworkers published the ûrst example of cobalt catalysts with aminated arms appended at the 3-position of the salen ligand for CO2–epoxides coupling[41].



complex **1**

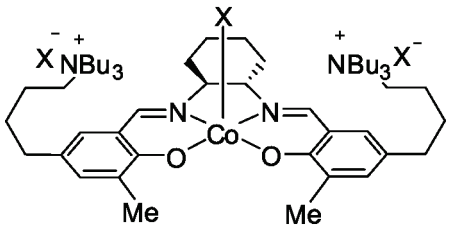


complex **2**

Complex **1**'s piperidinyl arms allow for controlled chain transfer reactions, whereby a proton shufûes between the amine and free polymer chains in solution. At increased (~80%) conversions, **1** was able to maintain 96% selectivity for copolymer production when reactions were run in neat PO.

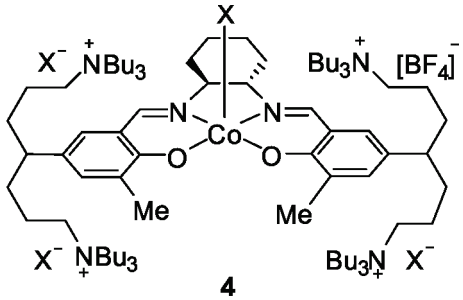
The next major advance came in 2007, by our group synthesized cobalt salen complex **2** bearing quaternary ammonium salts bound at the 5-position of each phenyl ring of the salen ligand[42]. **2** is able to operate at temperatures of up to 90 ^{0}C, achieving a TOF of up to 3500 h^{-1}. By combining the catalyst and cocatalyst into one single complex, the epoxide : catalyst ratio was also able to be lowered to as small as 50 000 : 1, which is more than ten times greater than that of traditional catalyst–cocatalyst loadings. Significant decrease in catalytic performance was observed by the replacement of $SiMe_2$ with CH_2 in **2**. However, a methyl group substitution instead of bulky *tert*-butyl group enhanced the catalytic performance (**3**). The catalytic performance was enhanced significantly with **4** containing four quaternary ammonium cations[43]. The attained catalyst per-

formance at high temperature (80 °C) and 20 bar CO_2 pressure, is the highest so far in CO_2/PO copolymerization (TOF of 22000 h^{-1}) with very low PO catalyst feeding ratio of 100000:1 (PO : **4**) which produced a copolymer with a molecular weight (M_n) of 285000.



3

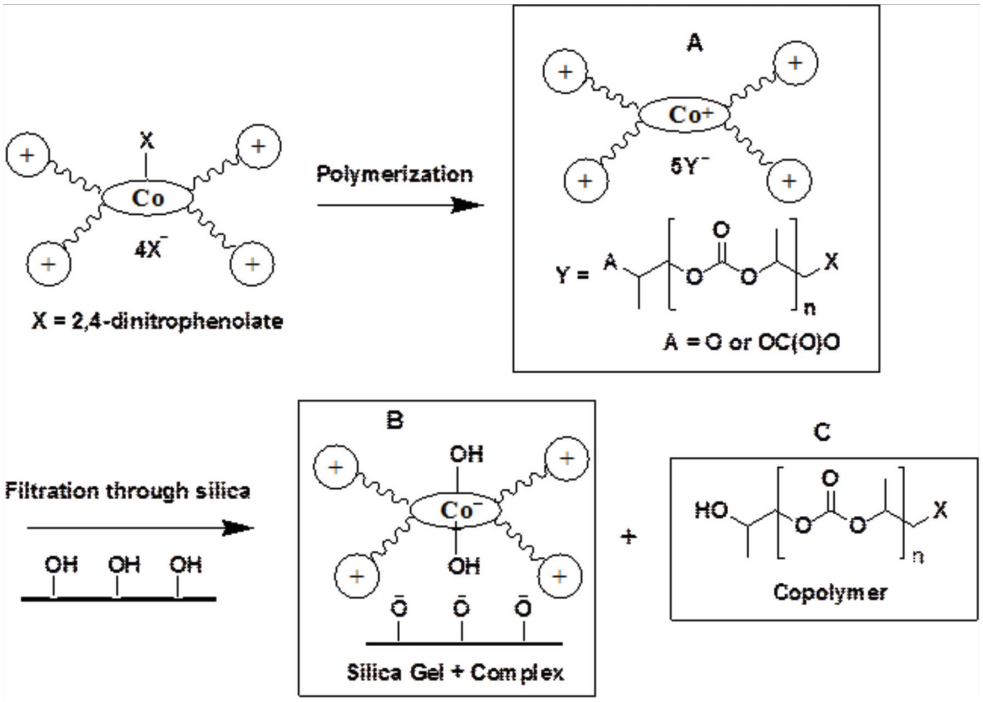
X = DNP



4

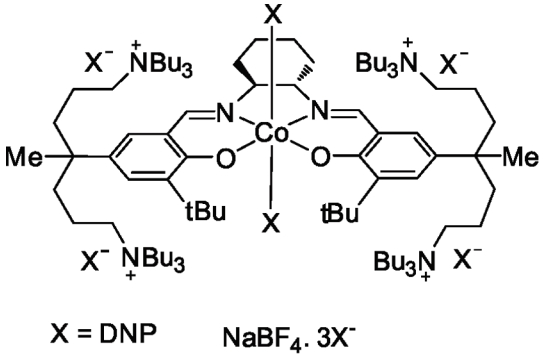
X = DNP

The catalytic system showed 99% selectivity for copolymer (mole ratio of PPC over cyclic carbonate) formation and at an extremely low feeding ratio (150000:1) catalytic activity was satisfactory with a selectivity of 96%.Even though the catalyst loading was very low, the isolated resin was yellow in colour and the cobalt content became 26 ppm. A catalyst recovery strategy was devised for catalyst **4** (scheme 1).

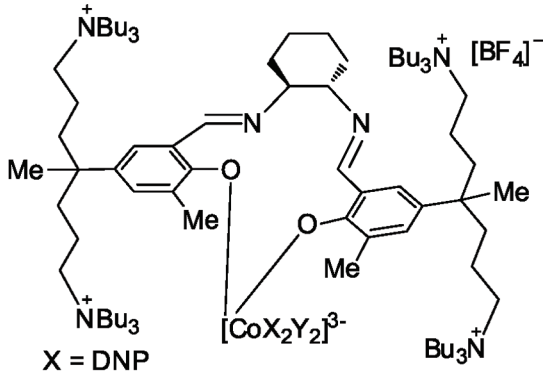


Scheme 1. A general catalyst separation scheme after the copolymerization[44].

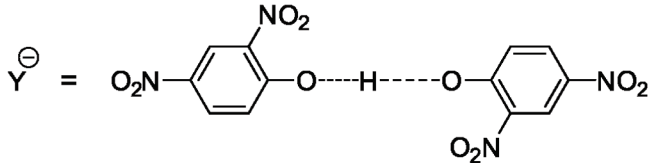
It was proposed that, the initiator, DNPs countered to tethered ammonium cation became polymer chain with growing end either carbonate or alkoxide anions. When the copolymerization solution was passed through a short pad of silica, the coloured complex was caught on the silica pad and protonated polymer passed through the silica pad giving a colourless resin with 1-2 ppm cobalt contamination. Complex **4** was recovered and reactivated by first treating with $NaBF_4$ followed by 2 equivalent of 2,4-dinitrophenol and 3 equivalent of NaDNP. Recovery yield was 90% and showed little reduction in catalytic activity even after 5th recovery. Even though catalyst **4** showed excellent catalytic performance, ligand preparation scheme was economically less efficient and lengthy and hence modified. When introduced an additional methyl substituent in **4,** which enabled bulk scale production of catalyst **5** without much reduction in catalytic performance (TOF 16000 h^{-1}). These developments enabled the construction of a pilot plant of continuous commercial process.[45]



5a



5b



Interestingly, both the structure and the activity of the complex rely heavily on the nature of the substituent at the 3-position of the phenyl rings. If it is tert-butyl group, as in complex 5a, the cobalt remains locked in the typical salen tetradentate pocket and the catalytic activity is high (TOF H" 1300 $h^{"1}$), though in the same realm of other catalysts[43]. However, if a methyl group is placed at the 3-position, as in complex 5b, the cobalt no longer coordinates through the imine nitrogens and sits outside the salen pocket, coordinating instead to the four 2,4-dinitrophenoxide moieties[46]. This unusual

binding mode allows for the greatly increased activity and stability, with a TOF of >20 000 h^{-1} at 80 ^{0}C, reaching M_n of up to 300 000 g mol^{-1}. Later improvements involved exchanging the 2,4-dinitrophenoxides for 2,4-dichlorophenoxides or 4-nitrophenoxides for increased laboratory safety[47].

1.3 Double Metal Cyanide Catalysts

Double metal cyanide catalysts (DMC) were first discovered in 1960s was useful for ring opening polymerization of epoxide[48]. Various improvements made DMC catalysts much more attractive for commercial manufacture of polyether polyols[49]. Several improvements on DMC catalysts has been made during recent decades[50]. DMC catalysts provides good performance over base catalysts used in industry for ring opening polymerization. Compared to conventional base catalysts DMC catalysts gives narrow molecular weight distribution, low level of unsaturation and viscosity.

According to the literature reports mostly DMC catalysts were prepared by mixing aqueous solutions of an excess amount of $ZnCl_2$ and Potassium hexacyanocobaltate and at the same time ^{t}BuOH was added as complexing agent[51]. The resulting catalyst powder was washed with ^{t}BuOH-water mixture several times to remove K^+ ions. Incorporation of K^+ ions severely reduces activity[52] of DMC catalyst. DMC catalysts are sensitive to their preparation process and shows great differences in catalytic activity even if they were prepared from same materials. However the detailed mechanism of DMC catalysts regarding its structure has not been illustrated and it is difficult to cultivate a single.

We have reported tuning of carbonate linkage of 0-64 % by using highly active salen Co(III) catalyst[43] and DMC catalyst by dual catalysis[51]. Chapter 5 reports a new method of preparation of highly active DMC catalysts which provide a carbonate linkage up to 65 %. The new DMC catalyst provides poly (propylene carbonate-*co*-propylene oxide) having a carbonate linkage of 65% consistently and this catalysts is compatible with wide range of various carboxylic acids which were used as chain transfer agents to produce low molecular weight poly (propylene carbonate-*co*-propylene oxide)-diols [poly (PC-*co*-PO)-diols]. While conventional catalysts are compatible with very few caraboxylic acids. Low molecular weight poly (PC-*co*-PO)-diols were used in polyurethane industry.

1.4 Immortal CO_2/epoxide Copolymerization

The first example of living polymerization was discovered by Professor Szwarc in1956[53]. The reaction was the polymerization of styrene initiated with organo-alkali metal compounds. In an ionic mechanism, the reaction between ions with the same sign of charge cannot occur, and there is a possibility that ions on the terminals of growing polymer molecules will stay "living" for a long time. It was found when the second portion of styrene was added after completion of the consumption of the initially charged styrene the polymerization again ensued. . Thus, the polymer was called living polymer. Living does not mean immortal. In the aforemen-

tioned anionic polymerization of styrene, the living polymer can be instantly "killed" upon the addition of a protic compound such as water, phenol, carboxylic acid or even hydrogen chloride. In contrast, in the immortal polymerization[54], the polymer cannot be killed even by the addition of a protic compound. Control of molecular weight in polymer synthesis is of primary importance for the molecular design of polymeric materials and immortal polymerization can be used as a powerful tool.

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 ISBN: 978-93-87709-90-4

CHROMATIC M-POLYNOMIAL OF ROOTED PRODUCT OF PATHS AND CYCLES

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Abstract

The concept of chromatic M-polynomial is studied in relation to topological indices in recent literature. In this paper, the notion of chromatic M-polynomial is determined for the rooted product of paths and cycles.

Keywords: chromatic M-polynomial,χ^--chromatic M-polynomial, χ^+-chromatic M-polynomial, rooted product, path, cycle.

MSC 2020: 05C15, 05C31.

1 Introduction

The *chromatic number* of a graph G, denoted by $\chi(G)$, is the cardinality of the minimum set of colors which allows a proper coloring of G. The set of all vertices of G which have the color c_i is called the *color class* of that color c_i in G. The cardinality of the color class of the color c_i, denoted by $\theta(c_i)$, is the *strength* of that color in G. We can define a function $\zeta : V(G) \to \{1, 2, 3, \ldots, \ell\}$ such that $\zeta(v_i) = s$ if and only if $\varphi(v_i) = c_s; c_s \in \mathcal{C}$.

The scheme of coloring the vertices of G, where c_1 is assigned to maximum possible number of vertices, then c_2 is assigned to maximum possible number of remaining uncolored vertices and proceed in this manner until all vertices are colored, is called a χ^-*-coloring* of G. In a similar manner, if c_ℓ is assigned to maximum possible number of vertices, then $c_{\ell-1}$ is assigned to maximum possible number of remaining uncolored vertices and proceed in this manner until all vertices are colored, then such a coloring is called a χ^+*-coloring* of G.

A *topological index* of a graph G is a real number which is preserved or invariant under isomorphism. The chromatic versions of certain topological indices have been introduced in [5]. In this paper, we discuss the chromatic analogue of certain polynomials related to the topological indices of a graph G. For graph coloring and for all terms and definitions, not defined specifically in this paper, we refer to [2]. Unless mentioned otherwise, all graphs considered here are undirected, simple, finite and connected.

2 Chromatic M-Polynomial of Graphs

The concept of chromatic polynomials of graphs together with the minimal and maximal parameter coloring was introduced in [7] and the Schultz polynomial of graphs was studied in [1, 3]. Motivated by these studies, the chromatic M-polynomial is defined in [6] as follows:

Definition 2.1. [6] Let G be a connected graph with chromatic number $\chi(G)$. Then, the *chromatic M-polynomial* of G, denoted by $\mathcal{M}_\chi(G, x, y)$, is defined as

$$\mathcal{M}_\chi(G, x, y) = \sum_{u,v \in V(G)} M_{i,j} x^i y^j.$$

where M_{ij} is the number of edges in G whose one end vertex has the color c_i and the other end vertex has the color c_j with respect to the given χ-coloring of G.

Definition 2.2. [6] Let G be a connected graph with chromatic number $\chi(G)$ and φ^- and φ^+ be the minimal and maximal parameter coloring of G. Then,

(i) the χ^-*-chromatic M-polynomial* of G, denoted by $\mathcal{M}_{\chi^-}(G, x, y)$, is defined as

$$\mathcal{M}_{\chi^-}(G, x, y) = \sum_{u,v \in V(G)} M^-_{i,j} x^i y^j$$

where M^-_{ij} is the number of edges in G whose one end vertex has the color c_i and the other end vertex has the color c_j with respect to the given χ^--coloring of G, and

(ii) the χ^+*-chromatic M-polynomial* of G, denoted by $\mathcal{M}_{\chi^+}(G, x, y)$, is defined as

$$\mathcal{M}_{\chi^+}(G, x, y) = \sum_{u,v \in V(G)} M^+_{i,j} x^i y^j$$

where M_{ij} is the number of edges in G whose one end vertex has the color c_i and the other end vertex has the color c_j with respect to the given χ^+-coloring of G.

A useful result on chromatic M-polynomial of bipartite graphs, which we refer here, is given below.

Theorem 2.3. *[6] A graph G with m edges has* $\chi(G) = 2$ *if and only if* $\mathcal{M}_{\chi^-}(G, x, y) = mxy^2$ *or* $\mathcal{M}_{\chi^+}(G, x, y) = mx^2y$.

Now, we can determine the chromatic M-polynomials of rooted product of paths and cycles. Note that while drawing figures of the product graphs, the convention of marking the color of each vertex inside the respective vertices is used.

3 Chromatic M- Polynomials of Rooted Product of Graphs

The *rooted product* of two graphs G_1 and G_2, denoted by $G_1 \circ G_2$, is the graph obtained by taking $|V(G_1)|$ copies of G_2 and identifying one vertex (root) of each copy of G_2 to the corresponding vertex of G_1 (see [4]). The following result discusses the chromatic M- polynomials of the rooted product paths.

Proposition 3.1. *Let P_n and P_m be paths on n and m vertices, respectively. Then,*

$$\mathcal{M}_{\chi^-}(P_n \circ P_m, x, y) = (m+n-1)xy^2. \tag{1}$$

Proof. The rooted product $P_n \circ P_m$ is a tree, whose chromatic number is 2. Since $P_n \circ P_m$ is a tree on $n+m$ vertices, the number of edges is $n+m-1$. By Theorem 2.3, all the $n+m-1$ edges take the color c_1 and c_2 at the either ends. Hence, we have, $\mathcal{M}_{\chi^-}(P_n \circ P_m, x, y) = (m+n-1)xy^2$. The Figure 1 gives an example of $P_n \circ P_m$. □

Using the same argument above and interchanging the colors c_1 and c_2 in Equation 1, we get the next result.

Corollary 3.2. *Let P_n and P_m be paths on n and m vertices, respectively. Then,* $\mathcal{M}_{\chi^+}(P_n \circ P_m, x, y) = (m+n-1)x^2y$.

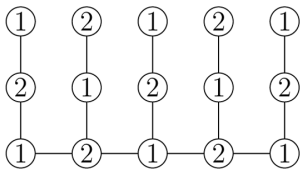

Figure 1 $P_5 \circ P_3$.

Now, we move on to find the chromatic M-polynomial of the rooted product of a cycle and a path.

Proposition 3.3. *Let C_n be a circle on n vertices and P_m be a path on m vertices. Then,*

$$\mathcal{M}_{\chi^-}(C_n \circ P_m, x, y) = \begin{cases} mnxy^2, & \text{if } n \text{ is even;} \\ (mn-3)xy^2 + 2xy^3 + x^2y^3, & \text{if } n \text{ is odd.} \end{cases} \tag{2}$$

Proof. Let C_n be a circle on n vertices and P_m be a path on m vertices. Then, the rooted product $C_n \circ P_m$ is a unicyclic graph on mn vertices with mn edges. Here, we have to consider two cases: **Case 1:** Let n be even. Then, the chromatic number of $C_n \circ P_m$ is 2. Hence, again by Theorem 2.3, $\mathcal{M}_{\chi^-}(C_n \circ P_m, x, y) = mnxy^2$.

Case 2: Let n be odd. Then, the chromatic number of $C_n \circ P_m$ is 3. The possible color pairs and their frequencies are given in Table 1. Thus, we get, $\mathcal{M}_{\chi^-}(C_n \circ P_m, x, y) = (mn-3)xy^2 + 2xy^3 + x^2y^3$. The Figure 2 is an example of $C_n \circ P_m$ with odd n.

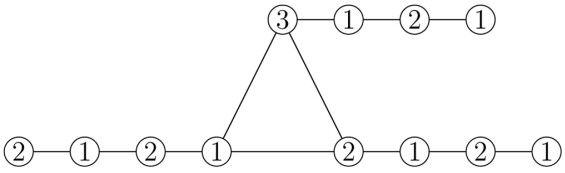

Figure 2 $C_3 \circ P_4$.

Color pairs	Number of pairs
(c_1, c_2)	$mn - 3$
(c_1, c_3)	2
(c_2, c_3)	1

Table 1 $C_n \circ P_m$.

Using the same argument above and interchanging the colors c_1 and c_3 in the Equation 2, we get the next result.

Corollary 3.4. *Let C_n be a circle on n vertices and P_m be a path on m vertices. Then,*

$$\mathcal{M}_{\chi^+}(C_n \circ P_m, x, y) = \begin{cases} mnx^3y^2, & \text{if } n \text{ is even;} \\ (mn-3)x^3y^2 + 2x^3y + x^2y, & \text{if } n \text{ is odd.} \end{cases}$$

Now, we change the order of the product. Then,

Proposition 3.5. *Let P_m be a path on m vertices and C_n be a circle on n vertices. Thus,*

$$\mathcal{M}_{\chi^-}(P_m \circ C_n, x, y) = \begin{cases} mnxy^2, & \text{if } n \text{ is even;} \\ ((n-1)m-1)xy^2 + mxy^3 + mx^2y^3, & \text{if } n \text{ is odd.} \end{cases} \quad (3)$$

Proof. Let P_m be a path on m vertices and C_n be a circle on n vertices. Then, the rooted product $P_m \circ C_n$ is a graph on mn vertices with $(n+1)m-1$ edges. To find the chromatic M-polynomial of $P_m \circ C_n$, we have to consider two cases:

Case 1: Let n be even. Then, the chromatic number of $P_m \circ C_n$ is 2. Hence, again by Theorem 2.3, $\mathcal{M}_{\chi^-}(P_m \circ C_n, x, y) = mnxy^2$.

Case 2: Let n be odd. Then, the chromatic number of $P_m \circ C_n$ is 3. The possible color pairs and their frequencies are given in Table 2. Thus, we get, $\mathcal{M}_{\chi^-}(C_n \circ P_m, x, y) = ((n-1)m-1)xy^2 + mxy^3 + mx^2y^3$. □

Color pairs	Number of pairs
(c_1, c_2)	$(n-1)m-1$
(c_1, c_3)	m
(c_2, c_3)	m

Table 2 $P_m \circ C_n$; n *is odd.*

Interchanging the colors c_1 and c_3 in the Equation 3, we get,

Corollary 3.6. *Let P_m be a path on m vertices and C_n be a circle on n vertices. Thus,*

$$\mathcal{M}_{\chi^+}(P_m \circ C_n, x, y) = \begin{cases} mnx^3y^2, & \text{if } n \text{ is even;} \\ ((n-1)m-1)x^3y^2 + mx^3y + mx^2y, & \text{if } n \text{ is odd.} \end{cases}$$

Next, we consider the chromatic M-polynomial of the rooted product of two cycles.

Proposition 3.7. *Let C_n and C_m be two cycles on n and m vertices respectively. Then,*

$$\mathcal{M}_{\chi^-}(C_n \circ C_m, x, y) = \begin{cases} (m+1)nxy^2, & \text{if } n, m \text{ are even;} \\ (m-1)nxy^2 + nxy^3 + nx^2y^3, & \text{if } n \text{ is even and } m \text{ is odd;} \\ ((m+1)n-4)xy^2 + 3xy^3 + x^2y^3, & \text{if } n \text{ is odd and } m \text{ is even;} \\ ((m-1)n-2)xy^2 + (n+1)xy^3 + (n+1)x^2y^3, & \text{if } n, m \text{ are odd.} \end{cases} \tag{4}$$

Proof. Let C_n and C_m be two cycles on n and m vertices respectively. Then, $C_n \circ C_m$ consists of mn vertices and $(m+1)n$ edges. We have to consider the following cases:

Case 1: Let both n and m be even. Then, the chromatic number of $C_n \circ C_m$ is 2. Hence, by Theorem 2.3, $\mathcal{M}_{\chi^-}(C_n \circ C_m, x, y) = (m+1)nxy^2$.

Case 2: Let n be even and m be odd. Then, the chromatic number of $C_n \circ C_m$ is 3. The possible color pairs and their frequencies are given in Table 3. Thus, we get, $\mathcal{M}_{\chi^-}(C_n \circ C_m, x, y) = (m-1)nxy^2 + nxy^3 + nx^2y^3$. The Figure 3 is an example of $C_n \circ C_m$ with n is even and m is odd.

Color pairs	Number of pairs
(c_1, c_2)	$(m-1)n$
(c_1, c_3)	n
(c_2, c_3)	n

Table 3 *$C_n \circ C_m$; n is even and m is odd.*

Case 3: Let n be odd and m be even. Here, the chromatic number is 3. The possible color pairs and their frequencies are given in Table 4. Thus, we get, $\mathcal{M}_{\chi^-}(C_n \circ C_m, x, y) = ((m+1)n-4)xy^2 + 3xy^3 + x^2y^3$.

Case 4: Let both n and m be odd. Here too, the chromatic number is 3. The possible color pairs and their frequencies are given in Table 5. Thus, we get, $\mathcal{M}_{\chi^-}(C_n \circ C_m, x, y) = ((m-1)n-2)xy^2 + (n+1)xy^3 + (n+1)x^2y^3$.

□

Interchanging the colors c_1 and c_3 in Equation 4, we get,

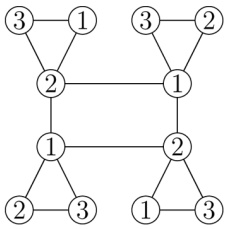

Figure 3 $C_4 \circ C_3$.

Color pairs	Number of pairs
(c_1, c_2)	$(m+1)n-4$
(c_1, c_3)	3
(c_2, c_3)	1

Table 4 $C_n \circ C_m$; *n is odd and m is even.*

Color pairs	Number of pairs
(c_1, c_2)	$(m-1)n-2$
(c_1, c_3)	$n+1$
(c_2, c_3)	$n+1$

Table 5 $C_n \circ C_m$; n, m *are odd.*

Corollary 3.8. *Let C_n and C_m be two cycles on n and m vertices respectively. Then,*

$$\mathcal{M}_{\chi^+}(C_n \circ C_m, x, y) = \begin{cases} (m+1)nx^3y^2, & \text{if } n, m \text{ are even;} \\ (m-1)nx^3y^2 + nx^3y + nx^2y, & \text{if } n \text{ is even and } m \text{ is odd;} \\ ((m+1)n-4)x^3y^2 + 3x^3y + x^2y, & \text{if } n \text{ is odd and } m \text{ is even;} \\ ((m-1)n-2)x^3y^2 + (n+1)x^3y + (n+1)x^2y, & \text{if } n, m \text{ are odd.} \end{cases}$$

4 Conclusion

In this paper, we discussed the chromatic M-polynomial of the rooted product of paths and cycles. This study can be extended to other graph classes, graph operations or graph products. Investigating new polynomials of this kind corresponding to other topological invariants of graphs can also seem to be promising.

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 ISBN: 978-93-87709-90-4

AGGREGATION AND INTERFACIAL LAYER ASPECTS IN NANOFLUID MODELLING

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ABSTRACT

This chapter discusses two salient features of nanoparticles which often are neglected from nanofluid modelling. Experimental studies have reported that the aggregation of nanoparticles augments the thermo-physical properties of a nanofluid. In the same manner, interfacial layer of nanoparticles also plays a significant role in the thermal aspects of nanofluids. Therefore, this chapter aims at discussing the models pertaining the nanofluid modelling involving these aspects which is useful to researchers for accurate nanofluid modelling.

Keywords:
Nanofluid, nanoparticle aggregation, interfacial layer, thermophysical properties.

1 Introduction

A nanofluid is an engineered colloidal mixture of a base fluid like water (H_2O), ethylene glycol ($C_2H_6O_2$), engine oil, blood, glycerin etc. and nanoparticles like Copper (Cu), Alumina (Al_2O_3), aluminium, titania (TiO_2), magnesium oxide (MgO_2) whose dimension lies between 1-100 nm. The common nanoparticles used in nanofluids are typically made up of metals, oxides, carbides, or carbon nanotubes. Nanofluids are thermal transport fluids which possess better thermo-physical properties like density (ρ), thermal conductivity (k), electrical conductivity (σ_e), specific heat capacity (c_p) and dynamic viscosity (μ) in comparison with the base fluid. The concept of using 1-100 nm sized nanoparticles to enhance heat transport in working liquids was first

established by Choi [1]. The thermo-physical properties of some common nanoparticles and base fluids are tabulated in Table 1.

Table 1: Thermophysical properties of common nanoparticles and base fluids used in various applications (see [2], [3] and [4]).

	ρ (kgm^{-3})	k $(Wm^{-1}K^{-1})$	σ_e (Sm^{-1})	c_p $(Jkg^{-1}K^{-1})$	μ $(kgm^{-1}s^{-1})$
Cu	8933	401	5.960×10^7	385	-
Al_2O_3	3970	40	3.500×10^7	765	-
TiO_2	4250	8.9538	2.380×10^6	686.2	-
MgO	3580	48.4	5.392×10^7	877	-
H_2O	997.1	0.613	5.500×10^{-6}	4179	0.00089
$C_2H_6O_2$	1114	0.252	1.070×10^{-6}	2415	0.01570

Nanofluids possess properties that make them potentially useful in many applications in heat transport including fuel cells, microelectronics, pharmaceutical processes, hybrid-powered engines, vehicle thermal management, domestic refrigerators, heat exchanger, machining and many more. An experimental study on Marangoni convective flow of a nanofluid was carried out by Gevorgyan et al. [5].

Macroscopic models for nanofluid flow and heat transport can be classified as single-phase and two-phase models. Single-phase models assume that base fluid and nanoparticles have the same temperature and velocity field. Therefore, continuity, momentum and energy equations can be solved as if the fluid were a classical Newtonian fluid by using effective properties of a nanofluid. For two-phase nanofluid models, it is assumed that the base fluid and nanoparticles can have different velocity and temperature fields. Volume of fluid (VoF), Euleriane mixture model (EMM), and Euleriane Eulerian model (EEM) are the three common two-phase models used in modeling of nanofluids.

Khanafer et al. [6] developed a single-phase model by considering a local thermal equilibrium state and no slippage between liquid and solid phases in seeking to explain enhanced heat transport of nanofluids. This model is well known as KVL (Khanafer-Vafai-Lightstone) single-phase nanofluid model. The thermophysical properties of nanofluids are determined using phenomenological laws and mixture theory. They reported an enhancement in the heat transport by increasing the nanoparticle volume fraction. Buon-

giorno [7] was of the opinion that the effect of the dispersion of suspended nanoparticles is too minute to explain the enhancement in the thermophysical properties of the fluid. Moreover, the turbulence is not affected by the presence of the nanoparticles. Hence, he proposed a new model based on the mechanics of the nanoparticle/base-fluid relative velocity. In this model he considered seven slip mechanisms: fluid drainage, inertia, Brownian diffusion, thermophoresis, diffusiophoresis, Magnus effect, and gravity settling. Eventually, he established that the Brownian diffusion and the thermophoresis are the most important slip mechanisms. Recently, analytical solutions were reported for the nanofluid flow problem by Das et al. [8] under the consideration of mixed convection and magnetism aspects. They suggested that both the fluid velocity and temperature increase with an increase in volume fraction parameter and the volume fraction parameter causes to decrease the rate of heat transport. Kuznetsov and Nield [9] studied the flow of a nanofluid past a vertical plate by incorporating the Buongiorno model in which the effects of Brownian motion and thermophoresis were studied. The reduction in the heat transport with Brownian motion and thermophoresis was reported. The modeling of the nanofluid was revised by incorporating a more realistic boundary condition (see [10]). Recently, Sheremet and Pop [11] analyzed the steady natural convection heat transport in a cubical enclosure filled with a nanofluid using the Buongiorno nanofluid model by considering the Marangoni convection due to temperature-dependent surface tension at the free surface. They reported that the Brownian diffusion parameter does not lead to a significant modification of the heat transport rate.

Modeling the thermophysical properties such that they are concurrent with the experimental data has always been a challenge to the researchers. The improvement in the thermal conductivity of nanofluids was highly underestimated by using conventional models - KVL single-phase model and Buongiorno two-phase model. Experimental studies proved that the aggregation of nanoparticles and interfacial layer aspect play a substantial role in the rheology and heat transport mechanism of nanofluids as pointed out by Chen et al. [12] and Leong et al. [13]. These aspects and their models are discussed in the subsequent sections:

2 Aggregation of nanoparticles

The formation of nanoparticles into a small group which may be due to

inter-particular forces is called aggregation (see Figure 1).

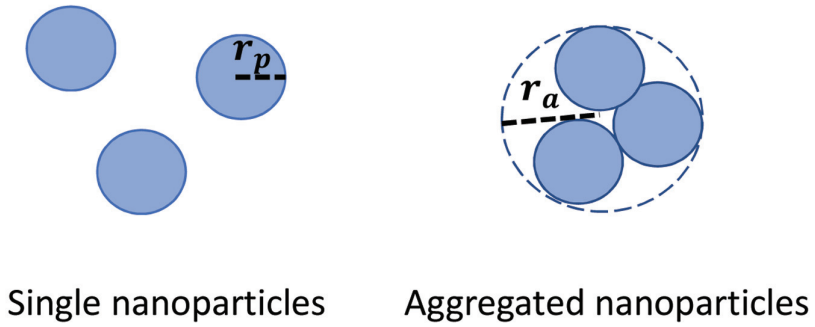

Figure 1: Illustration of nanoparticle aggregation [14].

Viscosity

Recently, researchers have suggested that aggregation of the nanoparticles is the main reason for the high viscosity of nanofluids. The conventional models like the Einstein model, Batchelor model, Brinkman model, etc. considered the effective viscosity that depended solely on the volume fraction of the nanoparticles. The modified Krieger-Dougherty model was found to be suitable to estimate the viscosity of ethylene glycol-based titania nanofluids with improved realistic accuracy by including the effects of the aggregation of nanoparticles [12]:

$$\frac{\mu_{nf}}{\mu_f} = \left(1 - \frac{\phi}{\phi_m}\left(\frac{r_a}{r_p}\right)^{3-D}\right)^{[\eta]\phi_m}, \tag{1}$$

where, ϕ is the nanoparticle volume fraction, $\frac{r_a}{r_p}$ is the ratio of radii of aggregates to the independent nanoparticle, D is the fractal index, $[\eta]$ is the Einstein's constant and ϕ_m is the maximum volume fraction of nanoparticles. Based on the diffusion-limited aggregation, the generally accepted value of D is 1.8. Assuming a spherical shape for the aggregates, the value $\frac{r_a}{r_p} = 3.34$ agreed well with the experimental values. The generally accepted value for ϕ_m is 0.605 which accounts for high rate flows. Further, for a monodisperse system, $[\eta] = 2.5$ [12].

Thermal conductivity

The conventional Maxwell model has proved to be inadequate for modeling the effective thermal conductivity of ethylene glycol-based titania nanofluids. Hence, the Maxwell model was modified by incorporating the aggregation of nanoparticles as follows [12]:

$$\frac{k_{nf}}{k_f} = \frac{(k_a + 2k_f) - 2\phi_a (k_f - k_a)}{(k_a + 2k_f) + \phi_a (k_f - k_a)}, \tag{2}$$

where k_a is the thermal conductivity of the aggregates which can be calculated by modifying the Bruggeman model as follows [12]:

$$\begin{aligned}\frac{k_a}{k_f} =& \frac{1}{4}\left((3\phi_{in} - 1)\frac{k_p}{k_f} + (3(1-\phi_{in}) - 1)\right) \\ &+ \frac{1}{4}\left(\left[\left((3\phi_{in} - 1)\frac{k_p}{k_f} + 3(1-\phi_{in}) - 1\right)^2 + 8\frac{k_p}{k_f}\right]^{0.5}\right),\end{aligned} \tag{3}$$

where, the aggregated nanoparticle volume fraction is given by $\phi_a = \phi\left(\frac{r_a}{r_p}\right)^{3-D}$ and $\phi_{in} = \left(\frac{r_a}{r_p}\right)^{D-3}$.

Other thermophysical properties

Other thermophysical properties considering the impact of nanoparticle aggregation are given below:

Effective density:

$$\frac{\rho_{nf}}{\rho_f} = (1 - \phi_a) + \phi_a \frac{\rho_p}{\rho_f}. \tag{4}$$

Effective specific heat capacity:

$$\frac{(\rho c_p)_{nf}}{(\rho c_p)_f} = (1 - \phi_a) + \phi_a \frac{(\rho c_p)_p}{(\rho c_p)_f}. \tag{5}$$

Effective electrical conductivity:

$$\frac{\sigma_{e_{nf}}}{\sigma_{e_f}} = 1 + \frac{3\left(\frac{\sigma_{e_p}}{\sigma_{e_f}} - 1\right)\phi_a}{\left(\frac{\sigma_{e_p}}{\sigma_{e_f}} + 2\right) - \left(\frac{\sigma_{e_p}}{\sigma_{e_f}} - 1\right)\phi_a}. \tag{6}$$

The fractal concept was used to model the relative viscosity of the aggregated nanoparticles as seen in the research work by Wolthers et al. [15]. Based on the shape, type and properties of the nanoparticles used, different equations have been proposed to model the thermophysical properties of nanofluids. He et al. [16] included the aspect of nanoparticle aggregation in the heat transport analysis of titania nanofluid flow through a pipe. The increase of the viscosity with aggregation kinematics was reported. The aggregation of alumina nanoparticles in the mixed convection over a wedge was explored by Ellahi et al. [17]. The aggregation effects were modeled considering the interfacial resistance. Recently, Benos et al. [18] considered the impact of aggregation on the magnetohydrodynamic flow of a carbon nanotube-water nanofluid past a shallow cavity. The effective viscosity was modeled by using the modified Maron-Pierce model and the thermal conductivity was modeled by using the Nan-Maxwell model. Further, Kolsi et al. [19] studied the impact of nanoparticle aggregation on the 3-D flow of a multi-walled carbon nanotube. The effective viscosity was modeled considering the fractal shape of the aggregates.

3 Interfacial layer

The consideration of the interfacial layer (also called nanolayer) in the modelling of nanofluids is another advancement for accurate nanofluid modelling. The narrow region between the nanoparticle and the base fluid was found to have a higher thermal conductivity when compared with the base fluid. This interfacial layer between the nanoparticle and the fluid has been considered by Leong et al. [13].
As seen in Figure 2, when a single nanoparticle dispersed in a base fluid is considered, then there are three regions:

- Nanoparticle (p) of diameter d_p.
- Interfacial layer (il) between the nanoparticle and base fluid of thickness h.
- Base fluid (f).

Due to its importance, Rana and Beg [21] explored the nanofluid flow past a plate using the model that included the effect of nanolayer and diameter. They reported that heat transport enhanced when there is a larger nanolayer.

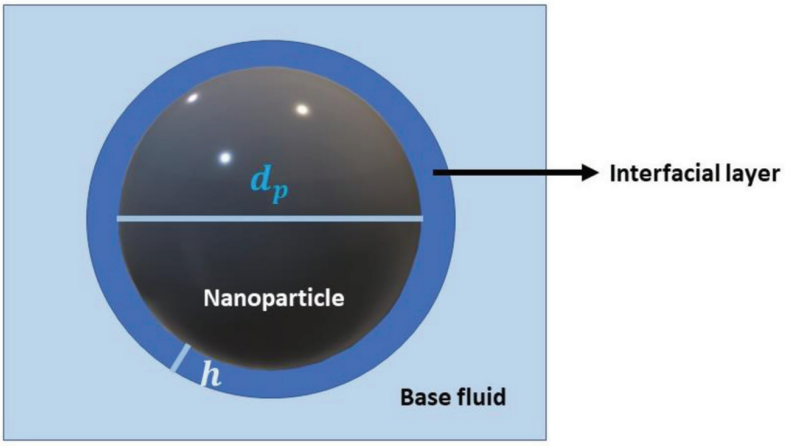

Figure 2: Interfacial layer of a spherical nanoparticle in a base fluid [20].

An improved temperature with thermal conductivity ratio of the nanolayer was reported by Tausif et al. [22]. Of late, this model was employed by Giri et al. [23] to explore the melting heat transport in a rotating channel. Similarly, Acharya [24] studied the flow of a ferrofluid past a rotating disk and reported a better heat transport rate with more nanolayer conductivity ratio.

The thermal conductivity model considering the interfacial layer is obtained by extending the Maxwell model as follows (see [13], [25]):

$$k_{nf} = \frac{(k_p - k_{il})\phi_p k_{il}[2\gamma_2^3 - \gamma_1^3 + 1] + (k_p + 2k_{il})\gamma_2^3[\phi_p\gamma_1^3(k_{il} - k_f) + k_f]}{\gamma_2^3(k_p + 2k_{il}) - (k_p - k_{il})\phi_p[\gamma_2^3 + \gamma_1^3 - 1]}, \quad (7)$$

where, the parameters $\gamma_1 = 1 + \frac{2h}{d_p}$,$\gamma_2 = 1 + \frac{h}{d_p}$. The interfacial layer thickness (h) and thermal conductivity (k_{il}) was chosen based on experimental verifications as follows $k_{il} = 2k_f$ and $h = 1$nm.

4 Conclusion

Nanofluids have improved the efficiency of various thermal applications due to their superior thermophysical properties. But the accurate modelling of nanofluids that captures all aspects of the fluid is a research area which needs special care. The inclusion of various aspects like interfacial layer and

nanoparticle aggregation kinematics can make the modelling more realistic. The models reviewed in this chapter can be used for accurate modelling of the nanofluids as they have a good correspondence with experimental values.

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 ISBN: 978-93-87709-90-4

A DFT STUDY ON THE EFFECT OF ELECTRON DONOR AND ACCEPTOR SUBSTITUTION ON QUINOLINE RING

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ABSTRACT

Computational chemistry is a branch of chemistry that uses computer simulations to assist in solving chemical problems. It uses methods of theoretical chemistry, incorporated into efficient computer programs, to calculate the structures and properties of molecules and solids. These are also called molecular modeling, is a set of technique for investigating chemical problems using a computer or application of computational methods and algorithms in chemistry.

In this thesis The geometry optimization of the title compounds were carried out using DFT using B3LYP/SDD. The frontier molecular orbital (FMO) energies of the compounds were calculated by using the DFT/B3LYP/SDD level. The Molecular electrostatic potential of the compound were found. The donor and acceptor substitution effect on the vibrational spectra of the compounds were also studied.

Introduction

Computational studies are used to find a starting point for a laboratory synthesis or to assist in understanding experimental data, such as the position and source of spectroscopic peaks. Branch of chemistry that uses computer simulation to assist in solving chemical problems. Two broad areas within computational chemistry: molecular mechanics and electronic structure theory. Two different aspects of computational chemistry used to find a starting point for a laboratory synthesis and used to predict possibility of so far entirely unknown molecules. Density functional theory is a quantum-mechanical method used in chemistry and physics to calculate electronic structure of atoms, molecules and solids. In DFT, one doesn't attempt to calculate molecular wave function. Instead one works with the electron probability density.

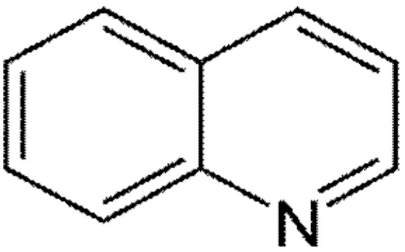
The ground state energy can be obtained by minimization of the energy functional E[n].

$$E=E[n(r)$$

Using this theory, properties of a many –electron system can be determined by using functionals. These are functionals of the spatially dependent electron density. Computational costs are relatively low. DFT is in the framework of the two Hohenberg –Kohn theorems. DFT has increased computational accuracy without additional increase in computing time. By focusing on electron density it is possible to derive an effective one-electron type Schrodinger equation. It's advantages include less demanding computational effortless computer time, and in some cases better agreement with the experimental values than is obtained from Hartree- Fock procedures. Phenomenally successful approach to finding solutions to fundamental equation for quantum behaviour of atoms and molecules.

Literature Review

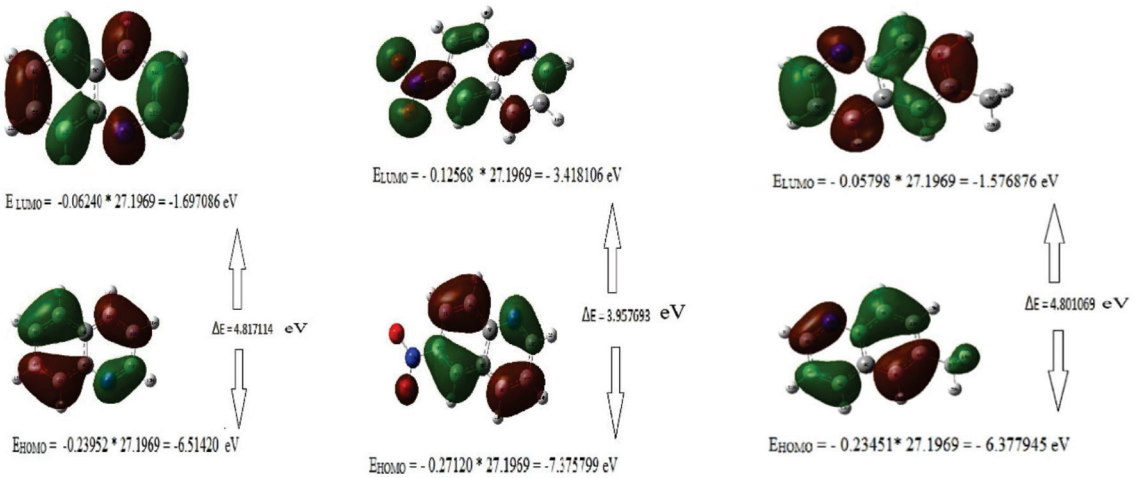
Quinoline is a heterocyclic aromatic organic compound with the chemical formula C9H7N. It is a colorless hygroscopic liquid with a strong odor. Aged samples, especially if exposed to light, become yellow and later brown. Quinoline is only slightly soluble in cold water but dissolves readily in hot water and most organic solvents. Quinoline itself has few applications, but many of its derivatives are useful in diverse applications. A prominent example is quinine, an alkaloid found in plants. Over 200 biologically active quinoline and quinazoline alkaloids are identified.



Quinoline

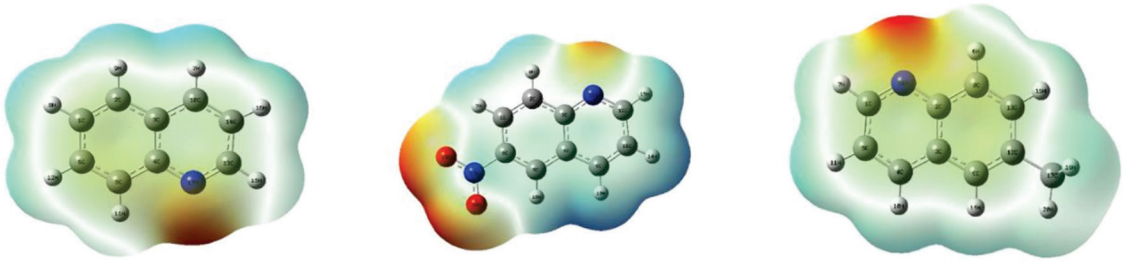
Result and Discussion

Frontier Molecular Orbitals



- The lowest energy gap observed At 3.9577 eV for 6-Nitro quinoline compound while the largest value was theoretically found to be 4.817 eV for the Quinoline compound.
- It is obvious that the substitution of donor group to the Quinoline does not change the Energy gap much but the substitution of a strong acceptor group has lessened the Energy gap.

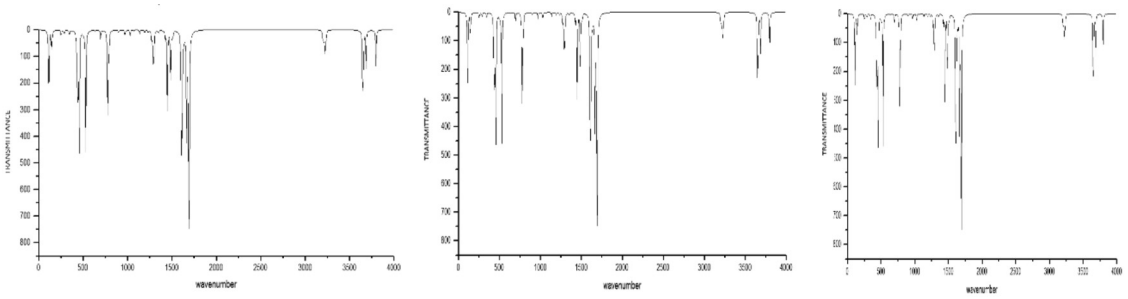
Molecular Electrostatic Potential



QUINOLINE | 6-NITRO QUINOLINE | 6-METHYL QUINOLINE

- From the MEP it is evident that the negative charge covers the 17 th Nitrogen group and the positive region is over the Hydrogen group for Quinoline compound.
- For 6- Nitro quinoline compound electronegative region is over NO_2 and 16th Nitrogen and electropositive region is over Hydrogen.
- For the 6- Methyl quinoline compound the negative electrostatic potential is over 16th Nitrogen and positive electrostatic potential is over CH_3

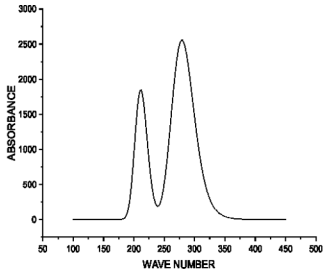
IR Spectrum



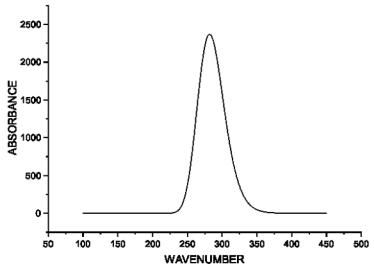
QUINOLINE | 6-NITRO QUINOLINE | 6-METHYL QUINOLINE

- Using IR spectroscopy the different vibrational frequencies of the compounds are determined.
- Also the bond length and bond angles are determined.

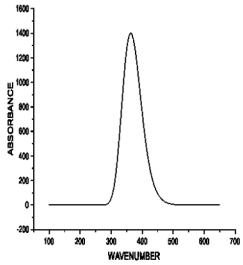
UV Spectrum



QUINOLINE



6-NITRO QUINOLINE



6-METHYL QUINOLINE

- Quinoline shows two absorption bands at 279.9832 and 212.09778.
- The substitution of Nitro group resulted in the shift of the absorption peak to 366.1721.
- whereas the substitution of Methyl group resulted in a peak at 282.61596.

Dipole Moment And First Hyper Polarizibility

- The dipole moment of a molecule signifies the deviation from symmetry of a molecule.
- The Quinoline molecule has a dipole moment of 2.5468 D, 6-Methyl Quinoline has 2.792 D and 6-Nitro quinoline has 5.264 D.
- In the case of Quinoline, the $\hat{a}_0$ was calculated to be 1.4×10^{-30} esu. With the substitution of Methyl group the value was decreased to 1.12×10^{-30} esu and there was a ten times increase in the value with the substitution of Nitro group in the same position as that of the Methyl group.

Conclusion

- The donor and acceptor substitution effect on the vibrational spectra of the compounds were studied.
- The change in the geometrical parameters with substitution also were studied.
- The HOMO-LUMO energy gap and the UV-VIS spectral studies on the compound proves these compounds have potential to be used in OLED devices, as they show absorption in the UV region.
- As the â value is related to the second order susceptibility the calculated dipole moment and first hyperpolarizability values shows these compounds could be used in NLO de-

vices particularly for second harmonic generation.

- The molecular electrostatic potential plot of these molecules shows the electronegative and electropositive sites , which is crucial for substrate binding.

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 ISBN: 978-93-87709-90-4

C. LITERATURE

COEXISTENCE AND COMPETENCE IN THE DEEP WATERS: A DEEP ECOLOGICAL READING OF HERMAN MELVILLE'S *MOBY DICK*

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Assistant Professor in English

ABSTRACT

***The sea is deemed to be a vast space hidden in mysteries with mighty and awe-inspiring aquatic beings and unpredictable inclement weather. The sea was also a historical battlefield where horrendous wars were fought between nations of enmity. Identical with the disastrous wars fought in this watery world, Herman Melville scripted a novel which etched out the saga of a monomaniac captain fighting an unsuccessful battle against a dump brute. This mythical war between Captain Ahab and Moby Dick takes a mythical and historical development of whale hunting by stressing the transition from a deep ecological to shallow ecological standpoint. This paper takes a look into this transition from deep ecological to shallow ecological perspective of marine environment in the popular American nautical fiction* Moby Dick**

Key words: Deep ecology, shallow ecology, anthropocentric, zoomorphic

About 172 Summers ago Herman Melville, one of the notable American nautical wordsmiths and a Transcendentalist writer who deemed that "A whale ship was my Yale College and my Harward", sketched an allegory of a monomaniac captain in a whaling ship who takes revenge upon a white whale which in turn devastates the entire crew except the narrator to recount the story. The sea and the creatures in it are the marvelous entities in nautical fiction. While some people marvel the sea as an invincible part of the earth, some people deem it to be a space to prove their mettle and exploit it for fun or freedom as Alfred Lord Tennyson's Ulysses deems it to be.

Herman Melville, who predominantly set the locale of his fiction in the sea and in esoteric islands, through Ahab, the monomaniac protagonist in *Moby Dick* gazed at the sea with awe and the master of the deep sea, the white whale with enmity. Ishmael at the very outset reminds the readers of his sea lust as he generalizes, "almost all men in their degree, some time or other, cherish very nearly the same feelings towards the ocean with

me" (Melville 3). The sea is a pivotal flat character ever pervasive in nautical fictions. In the writings of Herman Melville too, the sea occupies a herculean role. When Herman Melville concludes *Moby Dick*, he allegorically mentions, " a sullen white surf beat against its steep sides; then all collapsed, and the great shroud of the sea rolled on as it rolled five thousand years ago" (469). It is suggestive of the everlasting presence of the sea in influencing the life of people across the pole.

The sea has archetypal significance in the writings of nautical writers like Herman Melville and Earnest Hemingway. In the parlance of archetype, the sea which is delineated as "older than Abraham" (397) assumes multifarious roles as the mother of all life, death and rebirth and eternity. When Ishmail in *Moby Dick* describes the Pacific Ocean in the chapter named Pacific with characteristics akin to human beings and geographical locations, he infuses anthropomorphic traits in this archetypal phenomenon. He portrays the Pacific Ocean as:

And meet it is, that over these sea-pastures, wide-rolling watery prairies and Potters' Fields of all four continents, the waves should rise and fall, and ebb and flow unceasingly; for here, millions of mixed shades and shadows, drowned dreams, somnambulisms, reveries; all that we call lives and souls, lie dreaming, dreaming, still; (397)

Moby Dick is an epoch making novel, though published in 1851in England, which reverberates its ripples of ecological, political and religious questions which annoy the humanity in the twenty first century. Venturesome life in the sea and in the esoteric islands is the centrifugal thread which arranges his majour works like *Moby Dick*, Typee*, Omoo*, etc. The modern history of whaling takes us to an American island, namely Nantucket which figures in *Moby Dick* as the central locale of whaling station. The fourteenth chapter of *Moby Dick* with the title 'Nantucket' rightly illustrates the place of Nantucket in the development of whaling. Along with narrating how Nantucket became the whaling capital of the world, this chapter incorporates the traits of the sea as an invincible enemy and the . Melville remarks in *Moby Dick*, " And thus have these naked Nantucketers, these sea hermits, issuing from their ant-hill in the sea, overrun and conquered the watery world like so many Alexanders; parceling out among them the Atlantic, Pacific, and Indian oceans…"(54).

In the surface of *Moby Dick*, it forgrounds the tale of revenge: the revenge between Ahab and the White whale. In other words, the revenge between human beings and nature. With the white whale sinking the ship in the sea along with the crew and their leader Ahab, the writer connotes the invincible stature of the nature. Herman Melville who spent a sizeable part of his life in the sea as a whaler feels at home in the sea and either he or his characters identifies the animals on land with the marine creatures and the crew in the ship. Ahab identifies the harpooners as leopards, Stubb as shark and Ahab is often identified as tiger. Ahab's crew is also identified with tigers. This nomenclature sheds light on the predatory nature of humans

and other creatures. To Ahab the sea which forms two third of the earth is the darker side of the earth. Thus he declares eternal vengeance with the sea.

The sailors set sail to the faraway places and islands from where they brought home stories of adventurous escapades and strange tribes which often fascinated the Nantucketers. The prequels to *Moby Dick* namely *Typee* and *Omoo* are narratives of that vogue which fascinated the people. *Typee* narrates the protagonist and his companions being captured and imprisoned by a set of cannibals and *Omoo* narrates his wandering across the islands after his flight from the Typees. When he attempts to pen down the narratives of whaling and expeditions to far-flung islands, Melville pieces together the ecological practices of the locale, which often are associated with the religious exercises.

The archetype of battle between good and evil is again apparent in the works of Herman Melville. The sea and the surroundings form a battlefield for testing this archetypal battle. The 26th chapter of Moby Dick 'Knights and Squires' rightly portrays the crew of The *Pequod*. The chapter opens with the nativity and religious leniency of the chief mate of the Pequod, Starbuck who hails from Nantucket and he is a Quaker by descent. The author reiterates the religious label with special caution to link the environmental view of Quakers with Starbuck. Quakers believe in the dominion over nature. It is further revealed when Starbuck is described in *Moby Dick* as "For, thought Starbuck, I am here in this critical ocean to kill whales for my living, and not to be killed by them for theirs; and that hundreds of men had been so killed Starbuck well knew" (96). The assertive underpinnings of dominion over nature and the declaration of enmity with the water world is apparent in the statements of Starbuck. The news story titled 'Outrage over killing of rare whale' on *The Hindu* dated 16 July 2018 by Reykjavik echoes the above mentioned declaration by Starbuck in the 21st century.

The sea also offers another possibility of exploitation through sea routes. Ishmael notes, "they not a little correspond to the central gate way opening into some vast walled empire: and considering the inexhaustible wealth of spices, and silks, and jewels, and gold, and ivory with which the thousand islands of that oriental sea are enriched" (314) .It has a flourishing existence in world literature. The horizon of human imagination found invincible creatures in this unfathomable mass of water as Leviathen in the Bible, Craken in Norse mythology and the white whale in *Moby Dick*. In classical works the sea often forms a background in which one proves ones prowess and masculinity.

The sea is a majour ecological entity which was relegated to oblivion in a couple of centuries ago in the parlance of ecological treatments. But to Herman Melville and Alfred Lord Tennyson, the sea is an entity which prunes an individual through challenges and perils. In 'Ulysses' Alfred Lord Tennyson hankers as:

Death closes all: but something ere the end,
Some work of noble note, may yet be done,
Not unbecoming men that strove with

Gods.
The lights begin to twinkle from the rocks:
The long day wanes: the slow moon climbs:
The deep moans round with many voices.
Come, my friends,
'T is not too late to seek a newer world."
(Tennyson 3).

He rightly concludes his poem as "To strive, to seek, to find, and not to yield" (3). Captain Ahab is a prototype of Ulysses who urges his crew to set sail to seek newer world to conquer it and not to be conquered. If 'Ulysses' underpins the imperialist tone of Victorian England, Captain Ahab and chief mate Starbuck are the paragons of American expansionism in the guise of capitalism.

The locale of Melville's stories is either sea or islands surrounded by the sea. Of numerous nautical writers, D.H Lawrence found certain distinctiveness in Melville, as he comments in his essay titled 'Herman Melville's *Typee* and *Omoo*' as:

The greatest seer and poet of the sea for me is Melville. His vision is more real than Swinburne's, because he doesn't personify the sea, and far sounder than Joseph Conrad's, because Melville doesn't sentimentalize the ocean and the sea's unfortunes…. He was half a water animal, like those terrible yellow-bearded Vikings who broke out of the waves in beaked ships. (Lawrence 11)

It is this watery world which is a realm of insecurity. When Ahab introspects in the eighty seventh chapter of *Moby Dick* titled 'The Grand Armada' he visualizes it as, "and when he glanced upon the green walls of the watery defile in which the ship was then sailing, and bethought him that through the gate lay the route to his vengeance, and beheld, how that through that same gate he was now both chasing and being chased to his deadly end;" (317). Ahab imagines his end through these lines. It is this world in which the position of the subject and object may flip at any moment. The ideology of the mastery of nature over culture is reiterated towards the end of *Moby Dick* as he concludes the rolling of the same sea which did so five thousand years ago.

The Book of Job in the Old Testament abounds in rhetorical questions posed to Job by God to remind him of the ineffable Universe which he resides in and the invincibility of the same Universe. The following queries shot at Job by God at the moment of Job's pride when he questions God.

[7] Can you fill its hide with harpoons
or its head with fishing spears?

[8] If you lay a hand on it,
you will remember the struggle and never do it again!

[9] Any hope of subduing it is false;
the mere sight of it is overpowering.
(The Holy Bible. Job 41: 7-9)

What God asks Job is attempted in *Moby Dick* by Captain Ahab in his monomaniac pursuit for the white whale. The leviathan in the Bible is deemed to be the mightiest creature of God's creation. The rhetorical questions magnify the might of the animal. In the sphere of ecology the leviathan is analogical to the environment which persists to be

incomprehensible to human mind. In a similar fashion *Moby Dick* is diminished to a parable of a monomaniac hero's pursuit to conquer the indefinite world with the definite means which culminates in the destruction of the captain and the crew. Pequod, the ship in which they set sail for the three-year expedition is named after the Native American Pequot people who became extinct in the unfurling of centuries. It definitely foreshadows the inevitable extinction of the crew who go in search of the white whale. It also alludes with the extinction of various non human entities which were doomed in the anthropocentric world.

When determined to capture the white whale, the sea becomes a battlefield. Melville is an adept in using analogies to vivify the chase and the catch. He describes, " The compact material columns in which they had been hitherto rapidly and steadily swimming, were now broken up in one measureless rout; and like King Porus' elephants in the Indian battle with Alexander," (318). Captain Ahab, the captain who is "madness maddened" alludes to the Israelite king who led his kingdom to its doom by idolatry and wickedness, navigates the ship *Pequod* and the crew to its peril by the same wickedness and self-centeredness. Regardless of the consideration of others and their opinions, he assumes the role of a dictator who is indisputably obeyed by every member of the crew. Captain Ahab, who has been a harpooner for forty years on whaling ships, killed the first whale at the age of eighteen; left his young wife like a widow soon after the marriage is now wedded to the white whale and is fascinated by the call of the sea.

The chapter titled as 'The Shark Massacre' in *Moby Dick* rightly points to the transformation of the sea as a macabre battle field and the effort of the harpooners to protect the catch from the scavengers of the ocean-sharks. A similar narrative component is roped in *The Old Man and the Sea* in which the old man struggles to protect his catch from the sharks. Melville brings in the analogy of the advancing sharks as, " to be sure, any man unaccustomed to such sights, to have looked over her side that night, would have almost thought the whole round sea was one huge cheese, and those sharks the maggots in it" (251) . Again when Ishmail remarks at looking at the charging sharks as, "A sort of generic or Pantheistic vitality seemed to lurk in the very joints and bones" (252) Melville's magnanimity in construing the sharks and other predators in the ocean as the creative manifestations of the presence of God in the nature is perceptible.

Ahab construes the white whale in *Moby Dick* as:

All that most maddens and torments; all that stirs up the lees of things; all truth with malice in it; all that cracks the sinews and cakes the brain; all the subtle demonisms of life and thought ; all evil, to crazy Ahab, were visibly personified, and made practically assailable in Moby Dick. He piled up on the whale's white hump the sum of the general rage and hate felt by his whole race from Adam down (153)

The biblical enmity between man and nature is transferred from generation to generations. Again when Cain, son of Adam, killed his

brother Abel, God cursed him, "When you till the ground, it will no longer yield to its strength; you will be a fugitive and a wanderer on the earth." (The Holy Bible .Genesis 4: 12). Melville's *Omoo* blatantly foregrounds this wandering in which the protagonist wanders from one island to the other.

The dichotomy of nature/culture is pervasive in the books of Herman Melville as the major characters in *Moby Dick* declare a hue of antagonism with nature where nature is to be backgrounded to foreground culture. The aggravation of the nature/culture dichotomy is partially a result of their representations by human beings. Graham Huggan in his ecological text *Postcolonial Ecocriticism* comments on the role of representation as, "While cruelty, death or extinction are not necessary results of the human representation of animals- many such representations are sympathetic or benign- it is difficult for animals to escape anthropocentrism because they exist in modern cultures much more in representation than in 'the real'.(Huggan 139). It is anthropocentrism which turns into the hinge pin of representation which often relegates the ecocentrism into the oblivion. The dominant representation always sways the minor observations as it happens in *Moby Dick* where the enmity of Ahab with the white whale sways the representation of the white whale as a compendium of malice on earth.

Mere exploitation of nature is possible only when the notion of externality is strongly rooted in one. It is this externality which separates 'us' from 'them'; humans from animals. But Herman Melville pieces together the dichotomies of anthropomorphic and zoomorphic traits in the nature. The question of 'externality' where the subject stands outside the sphere of the object transfers the freedom to the exploiter. The whaler vessels mercilessly slaughter the whales more than its necessity. But the greed for wealth unbridles the whalers to kill more and recreate a macabre in the sea. Andrew Bennett and Nicholas Royle coin the externality as, "'Externality' is the idea that there is an environment elsewhere, outside of our immediate habitat available for exploitation- another village, town or region, another country, or best of all, another continent or even another planet." (Bennet 164)

Herman Melville purportedly included pagan characters among the crew, for he was a lover of Paganism. Pagan ecology is parallel to deep ecology which is eco-centric. The eco-centric world view assumes the role to human beings as only one of the strands in the web of beings on earth. It is unlike the Old Testament observation of human beings as the stewards of nature. The eco system in which one lives is respected in all the possible ways in pagan culture. The European binary pair nature and culture which is operational as the yardstick to differentiate people and practices from one another really jeopardized the world view and social practices as natural and cultural.

The word 'pagan' was a derogatory term for the Europeans as it states a person who believes in false gods. It also connotes the notion that a pagan is the one who cherishes a divine view designed by oneself which may include nature worship. Graham Harvey, the popular critic of paganism observes in his

essay titled 'The Roots of Pagan Ecology' that:

It is not that pagans do not care about such beliefs or that they have not thought them through. Many pagans hold passionately to their chosen view of divinity. However, paganism lays great stress on experience. Asked more about their divinities than their number, pagans relate primarily to immanent rather transcendent divinities, to those involved with the here and now rather than to distant creators. (Harvey 38)

The sea is so intricate with our life and language so much so that a number of phrases and idioms entered English language which is ever active as the swirling waves in the ocean. Idioms like: a big fish, a drop in the ocean, a loan shark, a whale of a time, plain sailing, the coast is clear, tip of the iceberg, to make waves and to run a tight ship are a few to reckon the presence of the sea in our language. In the writings of Herman Melville, he meticulously suggests the slogans which he voiced forth in the life throbbing pages of his nautical fiction and it is the life that he witnessed in his days of sea lust.

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 ISBN: 978-93-87709-90-4

POST HUMANISM AND SOME CONCERNS: AN INTROSPECTION INTO THE FILM *AVATAR*

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ABSTRACT:

Twenty first century is marked as the post human face. We all are caught up in a technological bubble. The losing prominence of man as an autonomous entity has become an everyday scenario. Man has turned out to be highly depended on technology. James Cameroons* Avatar *serves as one of the best examples of a critic of post humanism. The protagonist of the story Jake uses machine to give his intelligence to another man made creature. He heavily depends on the machine for survival. The machines and artificial intelligence use human beings as tools. They dominate the living forms. In the movie also the protagonist is kept in a machine and the other creature gets life only when Jake is in machine. The moment jake comes out of the machine, that creature remains dead. The movie also shows the unavoidable part machines play in the life of human beings. The intelligence of human beings is the only thing required to machines. Avatar took us to a post human turn of the millenia. The interesting part of the movie is that the post human creature created by the scientists, ultimately turned out to be the terminator. The movie explicitly can be a read as a critic of the post human turn. The sophisticated creation of the scientist eventually destroys the creators and machines associated with them. Human beings are reduced to small existence who always have a questionable existence in the absence of technology. The film demystifies the concept of a powerful, unbeatable human being to a vulnerable being in the absence of machine. The film also looks forward to a possible evolution that can happen to human beings in this era of advancing technology. The changing colors and long hairs of the avatars can be a possible image of a new evolved human form.

Keywords: Evolution, Machines, Post Human, Artificial intelligence

Critical post humanism vehemently questions the idea of human beings as sovereign souls. They regard human beings as entities depend on other machines for survival. The non human elements play a significant role in completing the concept of being human. So post humanism is also supposed to bring an evolutionary face of human beings. It actually questions the idea of uniqueness as presented in humanism. Post humanism tries to bring a

homogeneity to all human beings. They regard human being s as an evolved species highly dependent on other living forms and machines for survival. Post humanism deconstruct the centrality of human beings and rather defines it as one among the lineages. It believes that the essential qualities of human beings including his rationality, feeling and emotion can be enhanced with the help of technology. Critical post humanism rejects the centrality of human beings , his uniqueness and his ability to have control over the emotions. Human beings are described as an evolving species with the ecosystems and its existence depends on technology. Everything in the environment are dependent and co evolving. Critical post humanism sees human body as as embodiment. It exists in the environment of plants, animals and machines. In the post humanist world there is no distinction on the basis of caste, creed, religion etc.

Avatar as a movie was produced by David Cameroon in 2009. It is an American science fiction film. The movie is set in the mid 22 nd century when human beings colonize the place called Pandora, another place in a a moon of Alpha centauri star system to obtain the unobtanium. The greediness of human beings leads to the ultimate destruction of the habitat of humanoids, an indigenous species belonging to Pandora. The film shows how a genetically engineered Navi body was operated by the brain of a remotely located human beings to establish a coordial relation with the natives of Pandora. *Avatar* was nominated for nine Academy awards including Best Picture and Best Director. It also won three wards for Best Artd Direction, Best Cinematography and Best Visual Effects. Following the film's success, Cameron signed with 20 th century Fox to produce four sequelsof Avatar. Avatar: The WAy of Water and Avatar 3 have completed principal filming, and are scheduled to be released on December 16, 2022, and December 20, 2024, respectively. Other sequels are scheduled to be released on December 18, 2026, and December 22, 2028.

Avatar by David Camerron explicitly speaks about the post human tendencies. The human beings created an evolved version of human beings with the help of machines. It cannot exist independently. It depends on machines for its survival. The intelligence of human beings is controlled by machines. The film takes us to a post human phase where we can see an evolved version of human beings who depends on nature for their existence. On the other hand we can see modern man who is using the machines to control his own avatar. The greed of man is the main crux of the story. The scientists are sending the other newly developed species to establish a bond between the people of that race and to destroy them. But the intelligence and emotions of Jack, whom the RDA scientists choose ultimately changes the course of the film . the newly developed Navi, a twelve feet blue coloured human beings with long hairs and powerful eyes establishes a love relation with Neythri, a women belonging to the indigenous population of Pandora. But the avatar of Jack eventually becomes the saviour of the Navi community.

The film avatar is portraying some pessi-

mistic views of the post human being because it vehemently criticizes the greediness of human beings and also looks into the over dependence of human beings on machines. The author is asking some fundamental questions regarding the existence of post human elements. Like are they real or are they part of an indigenous population? It shows how the RDA scientists try to destroy the machines which assist Jack, when they came to know that the avatar created by them is turning against them. It vehemently portrays the insatiable quest for man to achieve more and thereby his desire to destroy the earth. It's a fatal fall. The film criticizes the humans over-dependence on machines and says that these kinds of post human developments can be detrimental to the progress of the country.

It also shows us that in the post human world its only the human intelligence that matters. When Jack Sully is disconnected from the machine the navi created from him becomes motionless. It is the brain of Jack that is giving emotions and intelligence to the navi. The newly created humanoid species from Jack develops a love relationship with Neythri. The humanoids depicted in Pandora can be seen as an evolved version of human beings. Also the film takes place in 2154 when all the minerals are depleted from the earth. In the 22nd century we can also notice a return to nature. The people in Pandora wants to live in close connection with nature. They live in a sustainable ecosystem in a cordial relation with the plants, birds and animals surviving there. Even the navi developed by human scientists and operated by the brain of jack sully finally develops a loyalty to the Pandora community. He becomes their saviour and protects the other humanoid species.

The film also tries to deeply interrogate whether the post human turn is good or bad? It vehemently criticizes the destroying tendency of human beings. Though the human beings got evolved as humanoids, it was impossible for the normal human beings to accept them. The humans in the film are the one who heavily depend on technology for their survival. They cant think of an independent existence. It is the technologically advanced machines which is protecting the human beings. The film belongs to a post human phase. The migration from earth to another planet is envisioned in the film. The greediness of man remains the reasons for all their scientific discoveries and conquest of all other planets.

The avatars are actually the embodied beings from our own bodies. They are the next generation human beings. They have more advanced physical features which mainly includes their ability to fly and interact with other living beings. This relationship is questioned here. It is interesting to note that in the end Jack Sully undergoes a rebirth as he completely becomes an avatar among other humanoids. So this transition from a genetically modified being to a completely developed independent humanoid is a very interesting aspect of the film. The movie presents before us the link between the nature, man , women and that of technology. In the beginning of the movie jack is portrayed as a handicapped man, an incomplete other. It was the intervention of technology that removed

his physical disability in its avatar form. Pandora is considered as a land which has to be exploited. *Avatar* is a movie which criticizes the capitalist tendencies, the exploitation and imperialist tendencies of the dominant section of the society. It also shows hows innocent people like Jake Sully are used in the war front by offering them money and better health facilities. In the movie he was told that his paralyse d legs will be replaced, if he participates in the experiment. Thus Jake Sully was compelled to join the warfare . it was the RDA (Research Development Authority who initiates the mission to loot the unobtain from planet Pandora to earth. It was this selfish thought which provoked in them to adopt many violent ways to get the power in Pandora. But their entire plan was sabotaged by the humanitarian invasion of jack sully and his avatar.

So as to conclude avatar is a movie which looks upon the evolutionary phase of twentieth century human beings. The film also gives an anti war message and advocates for peace. It also shows us the technological advancements that can happen. It envisions a world where machines determine the existence of human beings. The post-human turn can be make a significant change in the perception of humanity if we can use this fast growing technology for the advancement of human goodness. It would be really wonderful if men can inhabit new planets and develop ways to protect the indigenous population. So instead of destroying the nature and humanoids, the world will become really wonderful and beautiful if human beings can decentralize themselves, use their intelligence and incorporate machines to build a more sustainable and peaceful tomorrow.

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 ISBN: 978-93-87709-90-4

CYBERDRAMA: THE FUTURE OF POPULAR LITERATURE

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ABSTRACT:

In this digital age, the story world in digital video games has become the most glorified form of popular literature. The giants of the popular literature market, like Netflix and Amazon, have declared that they will increase their investment in narrative-based video games. Though video games are entirely digital, they create literary spaces shaped by the player's decisions. The study of video games as a major literary form brings more scope to the area of narratology. Today, the very structure of video games can be seen as conscious attempts to mark the change with downloadable content. The gaming industry have its own set of stars who act as marketing icons for video games, similar to those in movies. No other literary form can claim such a politically progressive possibility to experience the same story as the identity we want. In the future, the technology of video games will be modified to look as close as possible to real-world situations instead of animated graphic visuals.

Keywords: Video games, digital age, popular literature, identity, graphic visuals, visual interactive narrative

Video games occupy a similar place in society due to the often-constructed media narratives. The tendency to blame video games comes mostly from literary-intellect circles. This may be why video games are not studied academically for their literariness. But the time has come for video games to be recognized as a literary form. Video games are a form of literature not only because they are used to express stories, but also in light of the emergence. It is true that narratives can be driven by the decisions of the person playing the video game. But the more sobering fact is that video games, like other forms of literature, are facilitated by communities that read them with interest and sincerity. The study of literary forms in virtual worlds assesses 'literary enjoyment communities' as playing a central role in the popularization of video games.

Even so, very little academic writing is produced by these communities of gamers who enjoy reading video games. Such communities do not, in fact, enjoy the same level of "respect" as those that prioritise other literary genres. The reason for the apparent discrimination given to the video games is because the lack of seriousness we give to video games as a literary form. Those who approach video games with a preconceived notion of 'child's play', the tendency to dismiss the possibility that they can be a literary form is quite natural. Therefore, only by approaching video games as 'Visualised and conducting academic readings', it is possible to understand what are the extraordinary possibilities that video games put forward and how video games evolve into a form of popular literature in the future through them.

Video games are a major literary form of the future, as they create literary spaces shaped by the player's decisions. This digital form is the first possibility when studying the future of video games. The unique characteristics of video games as a literary medium pave the way for such future possibilities.

The 'popularity' of a product is defined as the existing market potential. Inexhaustible but useful future prospects determine the value of a property in the market. When considering video games, the first possibility is their digital form. With the world market eyeing the digital age, there is no doubt that video games, which are purely digital in their primary form of origin, will soon become the most beloved form of literature. The 'popularity' of a product is determined by its existing market potential. When considering video games, the first possibility is their digital form. With the world market eyeing the digital age, video games are expected to become the most beloved form of literature. Netflix and Amazon are investing in video games, such as *Black Mirror: Bandersnatch*, which is interactive. It is structured with an interesting feature where the audience can make decisions for the main character using a remote. Despite not achieving the expected audience popularity, Netflix has announced that it will produce more interactives video games.

Video games have a lot of potential for both market potential and political and social potential. Films are the market's favorite literary form due to their ability to be localized as many times as needed, but this can be a disadvantage for filmmakers because it is not possible to edit them once they are made. However, video games can be made necessary changes to them as downloadable updates even after they are sold. This feature has been used to fix technical issues in games like *Assassin's Creed: Origins and Cyberpunk 2077*, but allowing it to go beyond technicalities to literary corrections and reconstructions could lead to revolutionary changes. Developers may be able to correct a politically incorrect message through downloadable content, such as a hero who is criticized for toxic masculinity, righting the wrongs.

Video games are used as stimulators in pre-primary schools to help children acquire education. For example, *Forca Horizon 2* and *Dr. Driving* are recommended as part of driving courses, and *Assassin's Creed:*

Unity and Syndicate accurately mark the architecture and history of their settings. The potential of video games to construct, understand, and comprehensively study different historical periods, narrative worlds, and make them a better experience is unparalleled and academic spaces must take advantage of it.

Video games are structural in that progress is made through choices made by the player, which are shaped by the individual's conscious and unconscious potential. In the game *Grant theft Auto V*, the player records the crimes committed and gives a psychiatric report. This allows for broader psychological studies of video games. *In Red Dead Redemption 2* and *Spiderman: Game of Shadows*, moral choices are accurately marked and analyzed, which can be used to develop a psychological and moral foundation.

Video games have become increasingly literary, with conscious attempts to mark the literary in the structure of the game. However, academic studies of the literature of games as visualized interactive literature are rare. Video games are interactive through the choices the player makes in different situations, placing the physical experience of literature above that of films.

The player's choices in video games can be read as metaphors that question the validity of reality. Netflix's interactive created by Netflix challenges the idea of one reality by giving the audience only a short amount of time to make their choice and AI making the decision. This reveals the futility of the time it takes for individuals to make choices. In *Batman: Arkham City*, players are trapped in a level where the main character, Batman, is briefly trapped by Catwoman. The game gives two options to the players who continue as Catwoman: save Batman and continue as Batman for the rest of the game, or leave Batman to die in the trap and end the game. Regardless of which path is chosen, the game ends with the end-credits, meaning that both endings are equally important. This realization can cause confusion and disquiet in those playing with the concepts of the One-Reality and the One-Right.

Having multiple endings to a story has been tried in many literary forms, but video games stand out from these as a literary form where the same literary text can have different endings, but only one of them can be fully enjoyed. *Resident Evil 7: Biohazard* is part of the same experiments in different worlds, where players must choose between letting the main character's wife die or saving them and staying as the character longer.

Video games such as *Saints Row 3, 4,* and *Cyberpunk 2077* offer the player the freedom to decide the identity, race, color, and sexuality of the main characters. No other literary form can claim such a politically progressive possibility that the same story can be experienced as an identity of our choice, and all invite the reader to glimpses of constructed identity. *Metal Gear Solid V: The Phantom Pain* allows players to form the identity of the main character who undergoes plastic surgery at the beginning of the game, but remains in the original form and identity afterwards. It is a powerful satire on the place of choices in this world,

and thus on other games. In one of its missions, the main character Solid Snake attacks the villain Psycho Manris, but Psycho Manris escapes by reading Solid Snake's mind. Camp Bell then instructs the player to move the controller in his hand to port 2, reminding them that this is a game

Kojima's latest video game, *Death Stranding*, features a scene similar to the famous 'Fourth Wall breaking' in Deadpool Comics. Video games such as *Last of Us 2* and Watchdogs: Legion have introduced a mode to make the experience more realistic, 'perma-death', which denies the character a second chance to continue the game after they die. Video games use metafictional spaces to create a realistic experience by placing the character within a video game to play another video game. Examples include *Grand Theft Auto: San Andreas, Uncharted 4: A Thief's End, and Crash Bandicoot.* These spaces convince the player that the character's world is not a game.

Video games will become the most popular form of literature in the not too distant future due to the digital market and its literary features. The technology of video games will be modified to look as close as possible to real-world situations, and Hollywood stars will act as marketing icons for video games, similar to the films that are celebrated as a popular art form today.

The price of gaming consoles currently limits the gaming experience to less than half of the population, but in the future these limitations will be overcome through console lending shops and low cost consoles. Video game libraries will be launched under the auspices of movements and governments, branching out from technical genres like Battle Royale into different literary genres and anthologies. Video game producers will continue to use this form for more literary purposes, focusing their production on more literary purposes. Finally, all this means that the literary form that will rule the world in the near future will be that of video games.

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 ISBN: 978-93-87709-90-4

MECHANISM AND ETIQUETTES IN HANDLING TURNITIN PLAGIARISM SOFTWARE

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ABSTRACT:

Research in contemporary times is undergoing a paradigmatic shift, traversing the unexplored territories in the literary paradigms. In the current literary discourses, Research Research undergoes many ramifications, and the outcome is that literature has become interdisciplinary and multidisciplinary. Documentation of facts and also citation plays a vital role in the ResearchResearch. Usage of Plagiarism Software has become the order of the day in all educational institutions and research centres all over the country. Turnitin is a renowned plagiarism Software which has got databases of millions. The academic circle considers the Turnitin Software a threat because it has got more databases, and also, at the same time, this Software checks every document word by word. Every plagiarism software has an interesting mechanism to be followed, and the academic fraternity fails to master that; owing to this, they blame the Software. Turnitin Software has a unique mechanism, and people need help understanding it. This research article, on the whole, talks about the mechanism of Turnitin Software and also makes the academic fraternity understand that Turnitin Software is user-friendly Software and also makes the academic community excel in their research pursuits.

Keywords: Paradigmatic Shift, Literary Paradigms, Plagiarism Software, Mechanism, Databases.

Research in the Heyman world of Post Modernism has become a predominant factor in the academic discourse. Also, at the same time, it strengthens the faculty profile in terms of their professional endeavours. Research Aptitude has become an essential trait in the current academic ambience, and also it showcases the need for research integrity, which encompasses the uniqueness of a researcher. Terms like Research Gap, Review of Literature, and Scope for Further Research play a predominant role in social science research, and the term 'paradigm' plays a vital role in the social sciences. The term 'paradigm' was coined by Thomas Kuhn. In the initial stage, it was associated with

ResearchResearch from the science stream, and after the advent of cultural studies, literature has become interdisciplinary and multidisciplinary. Literary texts have gained the status of Autotelic. Also, it makes the researchers traverse the unheard and unexplored territories in a text, enabling the newness and literariness of a text.

Research Integrity is an essential trait that every academician should possess by default. Also, they should be aware of the mechanisms of specific research resources to make their work easier. The researcher is supposed to have sound knowledge towards their research forte. Also, at the same time, they are supposed to equip themselves with the resources which enlighten their research quest so that their ResearchResearch gets momentum in the academic discourse. In the current scenario, academicians are preoccupied with particular terminologies like 'Etiquette', 'Do's' and 'Do not' while writing a research article. Also, statements like secondary sources should be appropriately acknowledged. Plagiarism is Zero Tolerance has become the watchword of contemporary educational institutes which emphasise ResearchResearch to a greater extent.

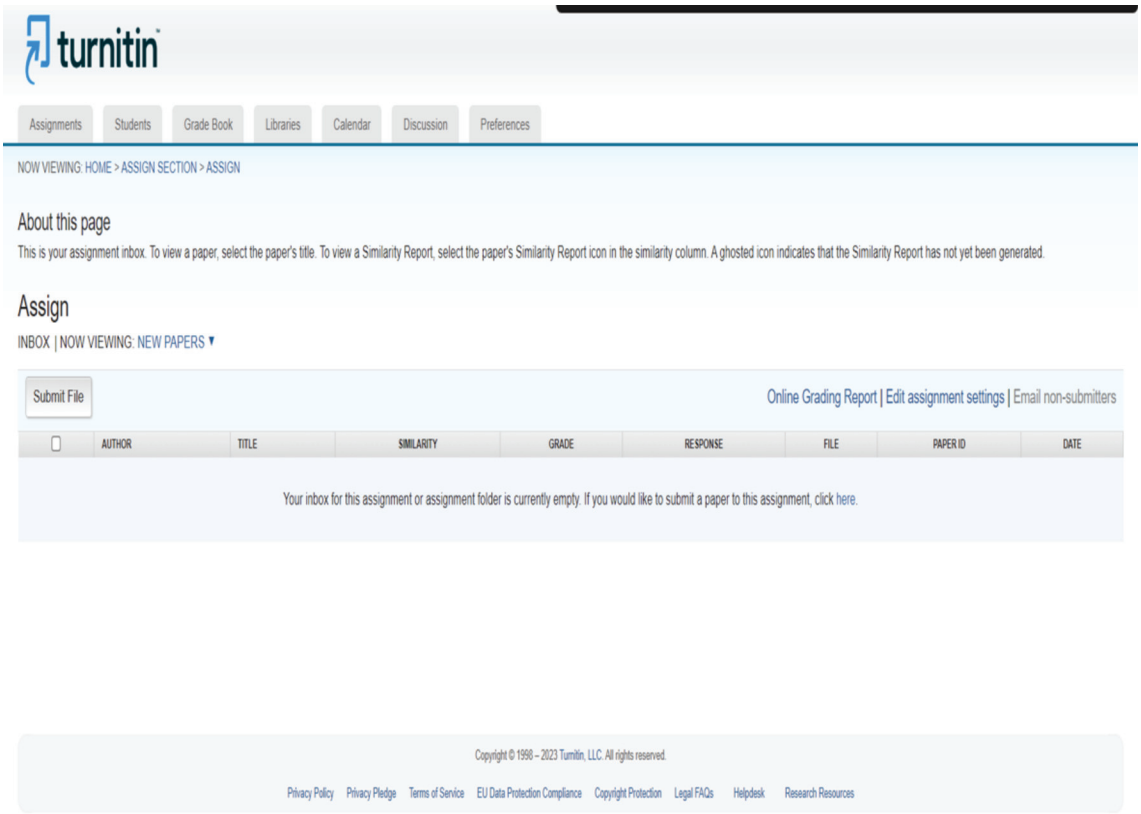
Researchers from Social Science, with particular emphasis on the researchers of English Literature, find it challenging to eliminate Plagiarism Software. Literary Research Scholars who have a deep knowledge of their subject area are being screwed when it comes to a plagiarism check of their thesis/ research article. Supreme Irony is that the academic community misguides literary scholars by foregrounding that their article or thesis mainly dwells on Quotations. At the same time, the critical interpretations determine their work's literariness and research ability. The truth is that when it comes to literary Research Research, it is only through the critical pinnings of a renowned literary critic that the ResearchResearch is built. The mainstream academic community needs to help understand it. Some people indulge in academic misconduct by paraphrasing quotes and some. At the same time, they go for a plagiarism check, remove the quotations from their article /thesis, and send for a plagiarism check.

Misconduct in Research is not supposed to happen, even unconsciously. Also, at the same time, it is the bound duty of the researcher to adhere to the guidelines for ethicality in ResearchResearch. The saddest truth is that in contemporary times violation of research ethics happens consciously to get rid of Plagiarism. Academia fails to understand that plagiarism software has few inbuilt features, and they neglect to learn that what happened, at last, was that they indulged in the misconduct of ResearchResearch. They also blamed plagiarism software.

Plagiarism Software is said to be an eye-opener, and also, at the same time, they act as a threat to the people who indulge in academic theft. Plagiarism Software like Turnitin has many built-in features, paving the way for meaningful ResearchResearch. At the same time, it has repositories and databases in numbers, and the Central Institutes in India go for Turnitin. Academia believes in a myth that if a document (research article/thesis) is uploaded in the plagiarism

software once means, it will be autosaved. If a document is uploaded for the second time, the plagiarism count will increase since the document was autosaved. This research article throws light on these aspects, and also, at the same time, it envisions everyone understanding the mechanism of Turnitin Software.

Plagiarism is said to be the biggest curse in the academic circle, and academia is of the misconception that whatever plagiarism software detects as Plagiarism is considered plagiarised. In contrast, even if they fail to acknowledge sources, that is also considered Plagiarism. Researchers in contemporary times need help understanding the meaning of Plagiarism. At the same time, they believe that whatever output the Software gives is the final version of Plagiarism. Machine-oriented findings have made human folks forget Research's rudiments of Research Research.



The above image indicates the Turnitin page, which denotes the procedures involved before submitting a manuscript. If a researcher/ academician clicks the button Submit File, he/she can upload the manuscript. The rest is as follows:

Submit: Single File Upload

Author

Non-enrolled student

First name

Last name

Submission title

The file you are submitting will not be added to any repository.

What can I submit?

Choose the file you want to upload to Turnitin:

Choose from this computer

Choose from Dropbox

Choose from Google Drive

In the above image, the submission is explained. Researchers and academicians often have a misconception by saying that once they upload a document in the Turnitin database, it will be autosaved, and if the researcher/academician wants to recheck their File for Plagiarism, means the plagiarism % will increase, and it completely false. In the image before what can I submit, there is a line displaying that the File you are submitting will not be added to any repository. Thus it clearly states that a file can be rechecked so many times.

Plagiarism Software like Turnitin has this feature, and the academia fails to learn it, and they consider Turnitin a threat. A Good researcher in contemporary times is expected to have a sound knowledge of plagiarism software, making them produce more quality research than quantitative Research Research. A phenomenon which is supposed to be enjoyed by every individual in their daily walk of life, and also, at the same, it showcases the necessity. That necessity makes them feel a Eureka moment, and that phenomenon is said to be Research Research.

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 ISBN: 978-93-87709-90-4

ദേശം, കാലം, സാമൂഹികത: കഥ ജീവിതത്തെ എഴുതുമ്പോൾ

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അതാതുകാലത്തെ ജീവിതത്തെ സാഹിത്യം എന്നും അടയാളപ്പെടുത്തിയിട്ടുണ്ട്. നമുക്ക് പരിചിതമല്ലാത്ത ജീവിതങ്ങൾ അല്ലെങ്കിൽ നാം അനുഭവിക്കുന്ന ജീവിതപരിസരത്തിനപ്പുറമുള്ള യാഥാർഥ്യങ്ങളെ സാഹിത്യകൃതികളിലൂടെ കണ്ടെടുക്കാൻ കഴിയുന്നു. ഒരുതരത്തിൽ പറഞ്ഞാൽ വൈവിധ്യമാർന്ന സാമൂഹിക ജീവിതത്തിന്റെ ചരിത്രത്തെ അടയാളപ്പെടുത്തുകയാണ് സാഹിത്യം ചെയ്തുകൊണ്ടിരിക്കുന്നത്. അതിൽ ദേശവും കാലവും ജീവിതവും എന്നു തുടങ്ങി പാരിസ്ഥിതികവും രാഷ്ട്രീയവുമായ വിവിധ തലങ്ങൾ ഉള്ളടങ്ങുന്നു. സാഹിത്യം വായിക്കുക എന്നാൽ മനുഷ്യചരിത്രം വായിക്കുക അല്ലെങ്കിൽ മനുഷ്യരെ വായിക്കുകയാണ്. നോവലുകളിലാണ് വിശാലമായ അർത്ഥത്തിൽ ഇതു കാണാനാവുന്നത് എങ്കിലും, ചെറിയ സംഭവങ്ങളെയും ചുരുക്കം കഥാപാത്രങ്ങളെയും ആധാരമാക്കിയോ ഏതെങ്കിലും വൈകാരികാവസ്ഥയെ അടിസ്ഥാനമാക്കിയോ ചെറുകഥകളും അതാതു കാലഘട്ടങ്ങളിലെ മനുഷ്യജീവിതവും അതിന്റെ പ്രത്യേകതകളും ദേശവും കാലവുമെല്ലാം അടയാളപ്പെടുത്താൻ ശ്രമിക്കുന്നു. പുതുകഥകളിലെ സാമൂഹികജീവിതത്തെയും അതിന്റെ വിവിധ മാനങ്ങളെയും മജീദ് സെയ്ദ് എഴുതിയ 'നായക്കളി', രാഹുൽ മണപ്പാട്ട് എഴുതിയ 'കായൽക്കറ' എന്നീ കഥകളെ മുൻനിർത്തി വിശകലനം ചെയ്യാനാണ് പ്രബന്ധം ശ്രമിക്കുന്നത്.

കീലപദങ്ങൾ: മസ്തിഷ്കജ്ഞാനം, ലിംഗബോധം, സാമൂഹികത.

നായക്കളി: എഴുത്തും ജീവിതവും

വിവരസാങ്കേതികവിദ്യയുടെയും മുതലാളിത്തത്തിന്റെയും ലോകത്തു ജീവിക്കുന്ന 'ആധുനിക മനുഷ്യർ'ക്ക്, ഇന്ന് ഏതൊരറിവിലേക്കും എത്തിച്ചേരാൻ അനായാസം കഴിയുന്നു. ദേശരാഷ്ട്രങ്ങളെയും കാലദേദങ്ങളെയും മറികടന്നുകൊണ്ട് അറിവിന്റെ ലോകം വ്യക്തികൾക്കു ചുറ്റും പടർന്നു കിടക്കുന്നു. ഇവിടെ അനുഭവങ്ങളും അറിവും തമ്മിലുള്ള ദൂരം വലുതാണ്; അല്ലെങ്കിൽ വലുതായിക്കൊണ്ടിരിക്കുന്നു. സ്വയം ആർജ്ജിച്ചെടുക്കുന്ന അറിവിനേക്കാൾ അറിവിന്റെ ശേഖരത്തെ പ്രയോജനപ്പെടുത്തുന്ന കൂട്ടമാണിന്നുള്ളത്. ഇത്തരത്തിൽ അറിവിന്റെ ശേഖരമുപയോഗിച്ചു ജീവിക്കുന്ന പുതിയ മനുഷ്യർക്ക് തങ്ങൾക്കു

ചുറ്റുമുള്ള ലോകത്തെയും മനുഷ്യരെയും തിരിച്ചറിയാൻ പലപ്പോഴും കഴിഞ്ഞെന്നു വരില്ല. താൻ തന്നെ ഭാഗമാകുന്ന ലോകത്തേക്ക് ഇറങ്ങിച്ചെല്ലുന്നതിലൂടെയും ചുറ്റുപാടുമുള്ള ജൈവലോകത്തെ തിരിച്ചറിയാൻ ശ്രമിക്കുന്നതിലൂടെയുമാണ് അടിസ്ഥാനജ്ഞാനം ആർജ്ജിക്കുന്നത്. അല്ലാത്തിടത്തോളം ലഭ്യമായ ദ്വിതീയ അറിവുകളുപയോഗിച്ച് പുതിയ കാര്യങ്ങളെ മനസ്സിലാക്കേണ്ടിവരുന്നു. ഇത് കടന്നുപോയ തലമുറകൾ പലപ്പോഴായി ആർജ്ജിച്ച അറിവുകളുടെ ഉപഭോഗത്തിലൂടെ സാധ്യമാകുന്ന ഒന്നാണ്. ഇതിനെ പൂർണമായും ഒഴിവാക്കിക്കൊണ്ടോ; അല്ലെങ്കിൽ ഉപേക്ഷിക്കണമെന്നോ അല്ല ഇവിടെ അർത്ഥമാക്കുന്നത്. സാമൂഹികസാഹചര്യങ്ങൾക്കനുസരിച്ചും ജീവിതചുറ്റുപാടുകൾ മാറുന്നതിനൊപ്പവും കാഴ്ചപ്പാടുകളും ലോകവീക്ഷണങ്ങളും മാറേണ്ടതുണ്ട്; അല്ലെങ്കിൽ മാറുന്നുണ്ട്. ഇത് അനുഭവങ്ങളുടെ വൈവിധ്യത്തിലേക്കാണു വിരൽച്ചൂണ്ടുന്നത്. വിരൽത്തുമ്പിലൂടെ ലഭിക്കുന്നതും മുതലാളിത്ത പ്രത്യയശാസ്ത്രങ്ങൾ നൽകുന്നതുമായ അറിവുകൾക്കും അനുഭവങ്ങൾക്കും പലപ്പോഴും ഇതു നൽകാൻ കഴിഞ്ഞെന്നു വരില്ല. ഉപഭോഗത്തിന്റെയും സാങ്കേതികവിദ്യകളുടെയും തിരക്കിന്റെ ലോകത്തു ജീവിക്കുന്ന ഏതൊരു വ്യക്തിയുടെയും ജീവിതത്തിൽ സംഭവിച്ചേക്കാവുന്ന, ചില പരസ്പരധാരണകളുടെ അഭാവവും, തിരിച്ചറിയാനാവാതെ പോകുന്ന ബന്ധങ്ങളെക്കുറിച്ചും അതിന്റെ വൈകാരികതകളെക്കുറിച്ചും വ്യക്തമാക്കുന്ന കഥയാണ് മജീദ് സെയ്തിന്റെ 'നായക്കളി'. മജീദ് സെയ്ദ് ഈ കഥയിലൂടെ ഉമ്മച്ചിയും ബാപ്പയും രണ്ടുമക്കളുമടങ്ങുന്ന ഒരു കുടുംബത്തെ മുൻനിർത്തി പുതിയ ലോകത്തിനു നഷ്ടപ്പെട്ടുകൊണ്ടിരിക്കുന്ന അടിസ്ഥാനജീവിത ബോധ്യങ്ങളെക്കുറിച്ചാണ് ഓർമ്മിപ്പിക്കാൻ ശ്രമിക്കുന്നത്. അതിനുവേണ്ടി ലളിതമായ ഭാഷയും ശക്തമായ ആഖ്യാനസാധ്യതകളും പ്രയോജനപ്പെടുത്തുന്നു.

ഇല്ലാതാകുന്നതോടുകൂടി ഉണ്ടായിരുന്നതിന്റെ മൂല്യം മനസ്സിലാക്കുകയും, ഇല്ലായ്മയിലൂടെ അല്ലെങ്കിൽ മാറ്റിവെയ്ക്കലിലൂടെ ഉണ്ടായിരുന്നതിനെ അനുഭവിച്ചറിയാൻ ശ്രമിക്കുകയും എന്നത് മനുഷ്യരെ സംബന്ധിച്ചിടത്തോളം പ്രധാനമാണ്. ആഖ്യാതാവായ പെൺകുട്ടിയുടെ ഓർമ്മയിലൂടെയാണ് ഇവിടെ കഥ പറയുന്നത്. കഥയിൽ ഓർമ്മ എന്നത് പ്രധാന ഘടകമായി വരുന്നു. മനുഷ്യരെ സംബന്ധിച്ചിടത്തോളം ബുദ്ധിയുടെ ലക്ഷണമാണ് ഓർമ്മ. ചരിത്രത്തെക്കുറിച്ചും കഴിഞ്ഞുപോയ അനുഭവങ്ങളെക്കുറിച്ചുമുള്ള ധൈഷണികവ്യാപാരമാണ് ഓർമ്മ. മരിച്ചുപോയ തന്റെ ഉമ്മച്ചിയെക്കുറിച്ചും അതിലൂടെ തങ്ങളുടെ ജീവിതത്തെക്കുറിച്ചും അവൾ ഓർത്തെടുക്കുന്നു. ഇത് മുൻപു സൂചിപ്പിച്ച അറിവുകളുടെ ശേഖരത്തിൽ നിന്നു ചികഞ്ഞെടുക്കുന്നതിൽനിന്നും ഭിന്നമായി തന്റെ ചുറ്റുപാടുകളിലൂടെ സ്വയം അനുഭവിച്ചറിയുകയാണ് ചെയ്യുന്നത്. തന്റെ ഉമ്മച്ചിയുടെ മരണത്തെ അവൾ അറിയുന്നതും, അത് വായനക്കാരിലേക്കെത്തിക്കുന്നതും ഇന്ദ്രിയജ്ഞാനത്തിന്റെ സഹായത്തോടുകൂടിയാണ്. അതിലൂടെ അവളുടെ ഉമ്മച്ചിയെത്തന്നെയാണ് വീണ്ടെടുക്കുന്നതെന്ന് കാണാം.

ഉമ്മച്ചിയുടെ മരണശേഷം അടച്ചിട്ടിരിക്കുന്ന മുറി തുറന്ന് അകത്തുകയറുന്ന അവൾ തന്റെ പഞ്ചേന്ദ്രിയങ്ങളിലൂടെ അനുഭവിച്ചറിയുന്ന മരണമെന്ന യാഥാർത്ഥ്യത്തെ കഥ വായനക്കാർക്കു പറഞ്ഞുതരുന്നു. അത് ആ മുറിയിൽ അപ്പോഴും കെട്ടിക്കിടക്കുന്ന ഗന്ധത്തിലൂടെയും, ഇരുട്ടിൽ നടന്നുനീങ്ങുമ്പോൾ തന്റെ കാൽ തട്ടി കിലുങ്ങുന്ന ഉമ്മച്ചിയെ പൂട്ടിയിട്ടിരുന്ന ചങ്ങലയുടെ ശബ്ദവും, ജനൽ തുറക്കുമ്പോൾ അകത്തു കടന്നുവരുന്ന വെളിച്ചം നൽകുന്ന കാഴ്ചകളുടെ അറിവും, പിൻവശത്തെ പാചകപ്പുരയിൽ തയ്യാറാക്കിക്കൊണ്ടിരിക്കുന്ന ഭക്ഷണത്തിന്റെ രുചിയുമെല്ലാം ചേർന്നാണ്. ഉമ്മച്ചിയും ബാപ്പയും സഹോദരനുമടങ്ങുന്ന അവളുടെ കുടുംബത്തിലൂടെ രണ്ടു തലമുറക

ളെയും, അവർ തമ്മിലുള്ള ബന്ധത്തിന്റെ വൈകാരികവൈചിത്ര്യങ്ങളെയുമാണ് കഥാകൃത്ത് എഴുത്തിലേക്കു കൊണ്ടുവരുന്നത്. കഥാപാത്രങ്ങളുടെ ജീവിതത്തിലും പെരുമാറ്റത്തിലും സംഭാഷണത്തിലുമെല്ലാം സൂക്ഷ്മമായി ഇതു വായിച്ചെടുക്കാനും കഴിയുന്നു. മരണമെന്ന യാഥാർത്ഥ്യത്തെ അവൾ അനുഭവിച്ചറിയുന്നതോടുകൂടി തന്റെ ചുറ്റുപാടുകളെയും അതിലൂടെ ഉമ്മച്ചിയെയും അവൾ അനുഭവിച്ചറിയുന്നു. അവിടെ നിന്നാണ് ഉമ്മച്ചിയുടെ ഉന്മാദത്തിലേക്കു കടക്കുന്നത്. ബാപ്പയ്ക്കു നേരേ വെട്ടുകത്തി വീശുന്ന ഉമ്മച്ചിയുടെ മാനസികാവസ്ഥയും അതിനെച്ചുറ്റിപ്പറ്റി നടക്കുന്ന സംഭവവികാസങ്ങളുമാണു കഥയെന്നു പറയാം.

ഇവിടെ കഥയുടെ അച്ചുതണ്ടായി നിൽക്കുന്നത് സ്നേഹമാണ്. ഒരു കുടുംബത്തിലെ നാലുപേർ എന്ന നിലയിൽ ഇവരുടെ പരസ്പരസ്നേഹബന്ധങ്ങൾ വളരെക്കുറച്ചേ കഥയിൽ കടന്നുവരുന്നുള്ളൂ. എന്നാൽ സ്നേഹം തിരിച്ചറിയാനാവാതെ പോകുന്നതോ മറ്റൊരാൾക്ക് അനുഭവയോഗ്യമാക്കിക്കൊടുക്കാൻ കഴിയാത്തതുമായ സന്ദർഭങ്ങളാണ് അധികവും കാണാനാവുന്നത്. ഇതിന് പല കാരണങ്ങളും അവ സൃഷ്ടിക്കുന്ന സാഹചര്യങ്ങളുമാണുള്ളത്. അവർ ജീവിക്കുന്ന ലോകത്തിന്റെ പ്രത്യേകതകൾ ഇവിടെ പ്രധാനമായി വരുന്നു. അവളുടെ ഉമ്മച്ചിയുടെ ഉന്മാദത്തിലേക്കെത്തുമ്പോൾ; ഉമ്മച്ചിയും ബാപ്പയും തമ്മിലുള്ള ബന്ധത്തിന്റെ സങ്കീർണ്ണതകളിൽ നിന്നും അവർക്ക് അയാളിലുണ്ടാകുന്ന പലതരം സംശയങ്ങളെക്കുറിച്ചും അവ കണ്ടെത്താൻ ഉമ്മച്ചി നടത്തുന്ന ശ്രമങ്ങളെക്കുറിച്ചും സൂചിപ്പിക്കുന്നു. എന്നാൽ ഇവിടെ ശ്രദ്ധേയമായ വസ്തുത, ഉമ്മച്ചിക്ക് ഉന്മാദമായിരുന്നു എന്ന് അവൾ കരുതുന്നില്ല എന്നതാണ്. ഒരു ഉന്മാദിനിയുടെ ചേഷ്ടകളായിരുന്നു എന്നാണ് ആദ്യമേ അവൾ വ്യക്തമാക്കുന്നത്. പിന്നീടാണ് ഇതിനു പിന്നിലെ കാരണങ്ങളിലേക്കും ആദ്യാവസാനമുള്ള പ്രധാന സംഭവങ്ങളിലേക്കും കടക്കുന്നത്. ഉമ്മച്ചിക്ക് അവരുടെ ഭർത്താവിൽ എപ്പഴൊക്കെയോ രൂപപ്പെട്ടു വന്ന സംശയങ്ങളിൽനിന്നുമാണ് ഇങ്ങനെയൊരവസ്ഥ ഉടലെടുക്കുന്നത്. അതായത്, ബാപ്പയുടെ അന്യസ്ത്രീകളുമായുള്ള, ഊഹത്തിൽ അധിഷ്ഠിതമായ ബന്ധമാണ് ഉമ്മയുടെ ഉന്മാദത്തിനു കാരണമായിത്തീരുന്നത്. ഇത് വളരെ പെട്ടെന്നുണ്ടായ ഒന്നായും കാണാൻ കഴിയില്ല. അയാൾക്ക് തന്നോടുള്ള പരിഗണനക്കുറവിന്റെ കൂടി പ്രതിഷേധമായി രൂപപ്പെടുന്ന അവരുടെ ഉന്മാദം രാത്രികാലങ്ങളിൽ മാത്രമാണു പുറത്തുവരുന്നത്. പകൽ സമയങ്ങളിൽ സ്വാഭാവിക ജീവിതം ജീവിക്കാൻ അവർക്കു കഴിയുകയും ചെയ്യുന്നുണ്ട്. പുരുഷാധിപത്യപരമായ ഒരു ലോകക്രമത്തിൽ ജീവിക്കുന്ന ഒരു സ്ത്രീയുടെ പ്രതിഷേധമായി കഥയിൽ കടന്നുവരുന്ന ഉന്മാദത്തെ ഫ്രോയിഡിന്റെയും മറ്റും സങ്കൽപ്പങ്ങളുപയോഗിച്ച് വിശകലനം ചെയ്യാവുന്നതാണ്. ഒരു സ്ത്രീയെന്ന നിലയിൽ തന്റെ പങ്കാളിയിൽനിന്നും ലഭിക്കേണ്ടതു പലതും ലഭിക്കാതെ വരികയും, തുടർന്ന് അതിന്റെ കാരണങ്ങളന്വേഷിച്ചു പോകുമ്പോഴുണ്ടാകുന്ന സംശയങ്ങളുമാണ് അവരെ അലട്ടിയിരുന്നത്. രാത്രിയിൽ അവരുടെ മുറിയിലുണ്ടാകുന്ന ബഹളം കേട്ടുകൊണ്ട് മക്കൾ കയറിച്ചെല്ലുമ്പോഴാണ് ബാപ്പയും തന്റെ നിസ്സഹായാവസ്ഥ അല്ലെങ്കിൽ പ്രതികരണം അറിയിച്ചിരുന്നത് എന്നതും ശ്രദ്ധിക്കേണ്ടതുണ്ട്.

രാത്രികാലങ്ങളിലുള്ള അവരുടെ 'ഭ്രാന്തി'ന്റെ പേരിൽ മകൻ അവരെ ചങ്ങലയ്ക്കിടുകയാണു ചെയ്യുന്നത്. ഇവിടെ മക്കൾ മനസ്സിലാക്കിയെടുക്കുന്നതുപോലല്ല അവരുടെ ബാപ്പ കാര്യങ്ങൾ മനസ്സിലാക്കുന്നത്. അയാളിൽ അവരുടെ ഉന്മാദാവസ്ഥ അസ്വസ്ഥതകൾ ജനിപ്പിക്കുന്നില്ല എന്നു മാത്രമല്ല അത് സ്നേഹമാണ് എന്നയാൾ തിരിച്ചറിയുകയും ചെയ്യുന്നു. എന്നാൽ ബാപ്പയുടെ വാക്കുകളെ മുഖവിലയ്ക്കെടുക്കാതെ മകൻ ഉമ്മച്ചിയെ

ചങ്ങലയ്ക്കിട്ടുകയും ഭ്രാന്തു മാറാൻ ചികിത്സിക്കുകയും ചെയ്യുന്നു. ചങ്ങലയ്ക്കിടുന്ന ഇതേ മകൻ തന്നെയാണ് തന്റെ സഹോദരിക്ക് മറ്റൊരു ചെറുപ്പക്കാരനുമായുള്ള ബന്ധത്തിന്റെ പേരിൽ ഇതേ വെട്ടുകത്തിയുമെടുത്ത് അക്രമാസക്തനായി പുരയിടത്തിലെ വാഴകൾ വെട്ടിനിരത്തുന്നത്. സ്ത്രീജീവിതത്തിൽ ഇടപെടുന്ന അല്ലെങ്കിൽ സ്ത്രീസ്വാതന്ത്ര്യത്തിന് അതിരുകൾ കൽപിക്കുന്ന പുരുഷവ്യവസ്ഥയിലാണ് ഇതു നടക്കുന്നത്. 'ചങ്ങല'യിൽ കിടക്കുന്നവരേക്കാൾ കുഴപ്പക്കാരും ഭയക്കേണ്ടവരും 'ചങ്ങല'യില്ലാതെ നടക്കുന്നവരാണെന്നു വ്യക്തം. ഉമ്മച്ചിയെ മനസ്സിലാക്കാൻ കഴിയാത്ത അയാൾക്ക് തന്റെ സഹോദരിയുടെ ബന്ധവും ഉൾക്കൊള്ളാൻ കഴിയാതെ പോകുന്നത് സ്വാഭാവികം മാത്രമാണ്.

കഥയിലെ പെൺകുട്ടിയുടെ ജീവിതം പരിശോധിക്കുമ്പോഴും, അവൾ താനുമായി ബന്ധപ്പെട്ടു നിൽക്കുന്ന ചെറുപ്പക്കാരനെ പൂർണ്ണമായി മനസ്സിലാക്കുകയോ; അവരുടെ ബന്ധത്തിന്റെ അനുഭൂതി തിരിച്ചറിയുകയോ ചെയ്യുന്നില്ല. അവൾ ആ ബന്ധത്തെ അറിയുകയും അനുഭവിക്കുകയും ചെയ്യുന്നത് വിരൽത്തുമ്പിലൂടെ ചിത്രങ്ങളും ഇമോജികളുമടങ്ങുന്ന ചാറ്റിങ്ങിലൂടെ മാത്രമാണ്. ഇങ്ങനെ മൊബൈൽഫോണിലൂടെ ലഭിക്കുന്നതിനപ്പുറത്തുള്ള ഒരു വൈകാരികബന്ധം അവൾക്കും ഉണ്ടാകുന്നില്ല. ഉമ്മയുടെ മരണം വരെ അതവൾ ആഗ്രഹിക്കുന്നുമില്ല എന്നുകാണാം. ഡിജിറ്റൽ ലോകത്തിലൂടെ പ്രണയിക്കുകയും, എന്നാൽ അതിനോടുപോലും നീതിപുലർത്താനാവാത്ത തന്റെ മകളോട് ഉമ്മയ്ക്കു പറയാനുള്ളത് 'പരിഗണിക്കാൻ കഴിയില്ലെങ്കിൽ ഒരാളെയും സ്നേഹിക്കാതിരിക്കുകയാണ് നല്ലത്' എന്നാണ്. തന്റെ ജീവിതത്തിൽനിന്നും നേടിയെടുത്ത അറിവാണിത്. ഇത് അവരുടെ ഭർത്താവിനോടു കൂടിയുള്ള മറുപടിയാണെന്നു കാണാം. കാരണം സ്നേഹിക്കാൻ മാത്രമറിയാവുന്ന ഒരു സ്ത്രീയെ ചങ്ങലയ്ക്കിടുകയും ഒപ്പം സ്നേഹമെന്തെന്നറിയാൻ കഴിയാതെ; അല്ലെങ്കിൽ മനസ്സിലാക്കാനാവാത്ത ലോകക്രമത്തു ജീവിക്കുന്ന മനുഷ്യരാണ് അവർക്കു ചുറ്റുമുള്ളത്. അവരുടെ വൈകാരികതകളെ തൃപ്തിപ്പെടുത്താനോ അവരുടെ സംശയങ്ങളെ ഇല്ലാതാക്കാനോ അയാൾക്കുപോലും കഴിയുന്നില്ല.

മനുഷ്യർ ആദ്യമായി ഇണക്കിയെടുത്തതും; മനുഷ്യരുമായി ഏറ്റവും കൂടുതൽ ഇണങ്ങുകയും ചെയ്യുന്ന ഒരു ജീവിയാണ് നായ. പക്ഷേ, നായ്ക്കളെ പൂട്ടിയിട്ടാണ് വളർത്തുക. ഇവിടെ സ്ത്രീ എന്ന നിലയിൽ അവൾക്കുമേൽ വീഴുന്ന പല തരത്തിലുള്ള പൂട്ടുകളെക്കുറിച്ചും കഥാഗതിയിലുടനീളം വ്യക്തമാക്കുന്നുണ്ട്. ആഖ്യാതാവായ പെൺകുട്ടിയെ നിയന്ത്രിക്കുന്ന സഹോദരന്റെ പെരുമാറ്റങ്ങളും നിയന്ത്രണങ്ങളും ഇതിനുദാഹരണമാണ്. പണ്ട് തന്റെ ഉമ്മച്ചിയെ രഹസ്യമായി നിരീക്ഷിച്ചിരുന്ന കാലത്ത് അവർ ഒരു നായുടെ ഭാവപ്രകടനങ്ങളോടെ ബാപ്പയുടെ വസ്തുവകകൾ പരിശോധിക്കുന്നത് അവൾ കാണുന്നുണ്ട്. കഥാവസാനം ഇതിനു സമാനമായ അവസ്ഥകളിലേക്ക് അവളും പരിവർത്തനം ചെയ്യുന്നത് കഥ വ്യക്തമാക്കുന്നുണ്ട്. 'കളി' എന്ന പദവും കേവലം വിനോദം എന്ന വിവക്ഷയിലല്ല ഇവിടെ കാണേണ്ടത്. കളിയെ നിയന്ത്രിക്കുന്നവരും കളി കാണുന്നവരും ഇതിനു പുറത്തുനില്ക്കുന്നു. അവരുടെ നിർദ്ദേശങ്ങളും നിയന്ത്രണങ്ങളും പാലിച്ചുകൊണ്ടേ കളിക്കാൻ കഴിയുന്നുള്ളൂ എന്നതാണു യാഥാർത്ഥ്യം. ഇത്തരത്തിലുള്ള ജീവിതത്തിൽ നിന്നും ലോകബോധത്തിൽ നിന്നും പുറത്തുകടക്കുകയാണ് വാസ്തവത്തിൽ ഉന്മാദത്തിലൂടെ അവളുടെ ഉമ്മച്ചി ചെയ്തിരുന്നതെന്നു പറയാം. അതായത് ഉന്മാദം എന്നത് അവരുടെ പ്രതിഷേധവും പ്രതിരോധവുമായി മാറുന്നു. ഭ്രാന്ത് എന്നാൽ ഭാവനയും സ്വപ്നങ്ങളുടെ കൂടിച്ചേരലുകളുമാണ്. ഇതുതന്നെയാണ് ഉമ്മച്ചിയെ നയിക്കുന്നത്. തിരക്കുകൾക്കിടയിൽ ജീവിക്കുന്നവർക്കിത് പലപ്പോഴും നഷ്ടപ്പെടുന്നു.

ലാഭനഷ്ടങ്ങളുടെ ലോകത്തായിരിക്കും എപ്പോഴു മവർ ഉണ്ടാവുക. അവിടെ അന്യമാകുന്നത് സ്വപ്നം കാണാനുള്ള സമയവും സന്ദർഭവുമാണ്. ഭാവന യുടെ ലോകത്തു വിഹരിക്കാൻ ഇക്കൂട്ടർക്ക് പല പ്പോഴും സാധിക്കുന്നില്ല. സാമൂഹികസാഹചര്യ ങ്ങളിൽ നിന്നുമുള്ള പുറത്തുചാടലാണ് കഥയിലെ ഉന്മാദം. അതുകൊണ്ടുതന്നെയാണ് തന്നെ അപാ യപ്പെടുത്താൻ അവൾക്കു കഴിയില്ല എന്ന ഉത്തമ ബോധ്യത്തോടെ മക്കൾ ഒളിപ്പിച്ചുവെക്കുന്ന വെട്ടു കത്തി കണ്ടുപിടിച്ച് ബാപ്പതന്നെ, തന്റെ ഭാര്യയ്ക്കു നൽകുന്നത്. തന്റെ മരണശേഷം അവളെ ചങ്ങല യിൽ പൂട്ടിയിടരുത് എന്ന് മകനോടായി അയാൾ പറയുന്നുമുണ്ട്.

ഒടുവിൽ ഉമ്മച്ചിയുടെ മരണശേഷം വീട്ടിൽ തനി ച്ചാകുന്ന അവൾ ചുറ്റുപാടുകളെ തിരിച്ചറിയാൻ തുടങ്ങുകയും; അതിലൂടെ പുതിയ ബോധ്യങ്ങൾ രൂപപ്പെടുന്നതോടുകൂടി ഉമ്മച്ചിയിലെ ശരികളെ തിരിച്ചറിയുന്നു. കഥയുടെ അവസാനം അവൾ ഉമ്മച്ചിയുമായി താതാത്മ്യം പ്രാപിക്കുന്നതു ശ്രദ്ധേ യമാണ്. ഒരിക്കലും കിട്ടത്തില്ലാത്ത ഉത്തരങ്ങളുടെ പിന്നാലെ അതിന്റെ രഹസ്യങ്ങൾ അന്വേഷിച്ചു പോകുന്ന തന്റെ ഉമ്മച്ചിയുടെ പ്രവൃത്തികൾ സാമൂ ഹികസാഹചര്യങ്ങളോടുള്ള പ്രതിഷേധമോ പൊരു ത്തപ്പെടലുകളോ ആയി അവളും തിരിച്ചറിയുന്നു. കഥയിലെ മാറ്റിവെക്കലുകളുടെയും അവയുടെ കണ്ടെത്തലുകളെക്കുറിച്ചുമുള്ള കളി ജീവിത ബോധ്യങ്ങളുടേതാകുന്നു. ബാപ്പയുടെ മരണ ശേഷവും ഉമ്മച്ചി അയാളെ സ്നേഹിച്ചിരുന്നു എന്ന് അവൾക്കറിയാം.

ഭാഷാപരമായും ആഖ്യാനത്തിലും നിരവധി സവി ശേഷതകൾ പ്രകടിപ്പിക്കുന്ന കഥതന്നെയാണ് 'നായക്കളി'. കഥയുടെ ആരംഭത്തിൽ ഇന്ദ്രിയങ്ങ ളിലൂടെ മരണത്തെ, അല്ലെങ്കിൽ മരണാനന്തരം ഒരു വ്യക്തിയുടെ സാന്നിധ്യത്തെ അവതരിപ്പിച്ചതിനെ ക്കുറിച്ചു സൂചിപ്പിച്ചു. ഉപമയുൾപ്പെടെയുള്ള അലങ്കാരങ്ങൾ പലയിടത്തും ഭംഗിയായി അവതരി പ്പിക്കുന്നുണ്ട്. എന്നാൽ അവളുടെ ഉമ്മച്ചിയുടെ മരണശേഷമുള്ള ഒരു രംഗം എഴുത്തുകാരൻ അവതരിപ്പിച്ചിരിക്കുന്നത് ഇങ്ങനെയാണ്: "അധിക മാരെയും കാക്കാതെ ഉച്ചയ്ക്കുമുന്നേ മയ്യിത്ത് എടുത്തിരുന്നു. മുറ്റത്ത് മഴ തോർന്നിരുന്നെങ്കിലും കാരമരത്തിന്റെ ഇലകൾ ഇപ്പോഴും പെയ്യുന്നുണ്ട്. ബാപ്പവെച്ചതാണ്. ഉമ്മച്ചിയ്ക്ക് ഉപ്പിലിട്ട കാരപ്പഴ ങ്ങൾ വലിയ ഇഷ്ടമായിരുന്നു." ഈയൊരൊറ്റ കാര്യത്തിലൂടെ തന്നെ അവളുടെ ഉമ്മച്ചിയും ബാപ്പയും തമ്മിലുണ്ടായിരുന്ന ബന്ധത്തിന്റെ വൈകാരികത വ്യക്തമാക്കിത്തരാൻ കഴിയുന്നു. ഇവിടെ ഭാഷ അനുഭവത്തിന്റെ രൂപമാകുന്നു. എഴുത്തിന്റെ ഈയൊരു സവിശേഷത തന്നെയാണ് കഥയെ മുന്നോട്ടു നയിക്കുന്നത്. സെക്കന്ററി അറിവുകളുടെയും അതു നൽകുന്ന അനുഭൂതി കളിലൂടെയും ജീവിതം മനസ്സിലാക്കിയെടുത്ത എഴുത്തുകാരനല്ല മജീദ് സെയ്ദ് എന്നു വ്യക്ത മാണ്. ഇവിടെ എഴുത്തുകാരൻ പച്ചമണ്ണിൽ കാലു റപ്പിച്ചുനിന്ന് താൻ കണ്ട ചുറ്റുപാടുമുള്ള സാധാ രണ മനുഷ്യരുടെ കഥപറയുകയാണ്. അതുകൊ ണ്ടുതന്നെ ഇത്തരം കഥകളിൽ ജീവിതമുണ്ട്; മനു ഷ്യന്റെ അടിസ്ഥാന ഭാവങ്ങളെക്കുറിച്ചും വൈകാ രിക നിമിഷങ്ങളെക്കുറിച്ചുമുള്ള വിചാരങ്ങളുണ്ട്; ഒരു കാലഘത്തിലെ ദേശത്തിന്റെ അടയാളപ്പെടു ത്തലുണ്ട്. കച്ചവടവൽക്കരിക്കുന്ന അറിവുകളും അനുഭൂതികളും ഉപയോഗിച്ചു ജീവിക്കുകയും ലോകത്തെ മനസ്സിലാക്കുകയും ചെയ്യുന്നവർക്ക് അന്യമായിപ്പോകുന്ന ജീവിതം കാണിച്ചു തരുക യാണ് കഥ ചെയ്യുന്നത്. പുതിയ സാങ്കേതികവിദ്യ കളും തിരക്കിന്റെ ലോകവും ചേർന്ന് ജൈവിക മായി മനുഷ്യരെ അന്യവൽക്കരിക്കുകയും യാന്ത്രി കമായ ലോകക്രമത്തിലെത്തിക്കുകയും ചെയ്തു കൊണ്ടിരിക്കുന്ന കാലത്തെ കഥയിലൂടെ വരച്ചി ടുന്നു. ഇവിടെ ജീവിക്കുന്നു എന്നുപറയുമ്പോഴും എന്താണു ജീവിതം എന്ന ചോദ്യം പ്രസക്തമായി

ത്തീരുന്നു. തന്നെത്തന്നെയും തനിക്കുചുറ്റുപാടുള്ളതിനെയും അറിയാതെയും അനുഭവിക്കാതെയുമുള്ള ജീവിതം അന്യമാക്കുന്നത് വിവിധ മാനുഷിക ഭാവങ്ങളാണ്; അനുഭൂതികളാണ്. ഈയൊരു ഓർമ്മപ്പെടുത്തലും കൂടി കഥ പങ്കുവെയ്ക്കുന്നു.

'കായൽക്കര'യിലെ ഇടങ്ങൾ

സമകാലിക മലയാളസാഹിത്യത്തെ സംബന്ധിച്ചിടത്തോളം, അരികുവൽക്കരിക്കപ്പെട്ട ജീവിതങ്ങളും അവരുടെ ദൈനംദിനത്വം, പ്രാദേശികത, ഭാഷ എന്നിങ്ങനെയുള്ള നിരവധി വിഷയങ്ങളും അപരിചിതമല്ല. ഇത്തരം പല വിഷയങ്ങളെ മുഖ്യധാരയിലേക്കു കൊണ്ടുവരുന്നതോടൊപ്പം തന്നെ വരേണ്യതാൽപ്പര്യങ്ങളെയും പക്ഷപാതനിലപാടുകളെയും അത് ശക്തമായെതിർക്കുകയും ചെയ്യുന്നു. മനുഷ്യകേന്ദ്രീകൃതമായ ആധുനിക ചിന്താരീതികളെ ഒരു പരിധിവരെ നിഷേധിക്കുന്നതോടൊപ്പം പുതിയ ഇടങ്ങളെ സാഹിത്യത്തിൽ സൃഷ്ടിക്കാനും ഇത് ശ്രമിക്കുന്നു. ഒരുവശത്ത് സാഹിത്യം ഇത്തരം വിഷയങ്ങളെക്കുറിച്ചു സംസാരിച്ചുകൊണ്ടിരിക്കുമ്പോഴും ബഹുഭൂരിപക്ഷം വരുന്ന മറ്റൊരു വിഭാഗം ഇതിനനുകൂലമായ ചിന്തകളോടു മുഖംതിരിഞ്ഞുനിൽക്കുന്നതായി കാണാം. ഭൂതകാലത്തു നിന്നും പാരമ്പര്യചിന്താരീതികളിൽ നിന്നും വിടുതി നേടാൻ ശ്രമിക്കാത്ത യാഥാസ്ഥിതിക സമൂഹത്തോടുള്ള കലഹമാണ് ഇത്തരം സാഹിത്യരചനകളിലൂടെ നടത്താനുള്ളത്. അടിച്ചമർത്തപ്പെട്ടവരുടെ ഉയർത്തെഴുന്നേൽപ്പിനോടൊപ്പം വ്യവസ്ഥിതിക്കെതിരെയുള്ള കലഹങ്ങളായിട്ടുകൂടിവേണം ഇത്തരം കൃതികളെ പരിഗണിക്കേണ്ടതെന്നു തോന്നുന്നു. നിലവിലുള്ളത്, അല്ലെങ്കിൽ പൊതുസ്വീകാര്യത നേടി മുഖ്യധാരയുടെ ഭാഗമെന്നു പറയാവുന്ന പാരമ്പര്യാധിഷ്ഠിത ചിന്താപദ്ധതികൾക്ക് ഇളക്കം തട്ടുന്ന തരത്തിലുള്ള രചനയാണ് രാഹുൽ മണപ്പാട്ടിന്റെ 'കായൽക്കര'യെന്ന ചെറുകഥ. സാമൂഹികഘടന, ജീവിതരീതി, സംസ്കാരവിശേഷങ്ങൾ, പ്രകൃതി എന്നിങ്ങനെയുള്ള നിരവധി ഘടകങ്ങൾ അനുദിനം മാറിക്കൊണ്ടിരിക്കുകയാണ്. വ്യക്തികളിൽപ്പോലും ഈമാറ്റം സംഭവിച്ചുകൊണ്ടേയിരിക്കുന്നു. സാമൂഹികപരിണാമത്തോടും സാങ്കേതികവിദ്യകളുടെയും മറ്റും വളർച്ചയോടും കലഹിച്ചുനിൽക്കാൻ ശ്രമിക്കുന്ന വ്യക്തിയും സമൂഹവും അതിന്റെ ഉൽപ്പന്നങ്ങളും അതിവേഗം പുറന്തള്ളപ്പെടും എന്ന കാര്യം വ്യക്തമാണ്.

'കായൽക്കര' എന്ന കഥയിലൂടെ ലൈംഗികത, സദാചാരം, കുടുംബസങ്കൽപ്പം എന്നിങ്ങനെയുള്ള പാരമ്പര്യചിന്താധാരകളെ വിചാരണ ചെയ്യാനും, ഈ മേഖലകളിൽ സ്വതന്ത്രമായ ഇടപെടൽ നടത്താനും രാഹുൽ ശ്രമിക്കുന്നു. തന്റെ അമ്മച്ചിയുടെ കാമുകനായ ഹെൽവിസിനെക്കുറിച്ചുള്ള ഡിന്നുവിന്റെ ഓർമ്മകളിലൂടെയാണ് കഥ ആരംഭിക്കുന്നത്. ഡിന്നുവും ഹെൽവിസും തമ്മിലുള്ള മാനസികമായ അടുപ്പത്തെക്കുറിച്ചും അവർ തമ്മിലുള്ള ശാരീരികബന്ധത്തെക്കുറിച്ചും തുടർന്ന് കഥ വ്യക്തമാക്കിത്തരുന്നു. അപ്പനില്ലാത്ത നേരങ്ങളിൽ ഹെൽവിസിനെ വീട്ടിലേക്കു പറഞ്ഞുവിട്ട്, വീടതിരിലെ കൈതക്കാട്ടിൽ കാവലിരിക്കുന്ന ഡിന്നു ഒരു കാര്യമെ പറയുന്നുള്ളു. അത് അമ്മച്ചിയൊരു പെണ്ണാണെന്നാണ്. സാമൂഹികമായ നിർമ്മിതികൾക്കുമപ്പുറം വ്യക്തി എന്ന നിലയിൽ പരസ്പരം മനസ്സിലാക്കുകയും അതിനെ മനുഷ്യപ്രകൃതിയുമായിച്ചേർത്ത് അവതരിപ്പിക്കാനും ഇവിടെ കഥാകൃത്തു ശ്രമിക്കുന്നു. ഏതൊരു ജീവിയെ സംബന്ധിച്ചും അടിസ്ഥാന ചോദനകളെ തൃപ്തിപ്പെടുത്താതെയുള്ള ജീവിതം അസ്വസ്ഥതകൾ നിറഞ്ഞതാവും. ശരീരത്തിന്റെ ആവശ്യങ്ങൾ തിരിച്ചറിഞ്ഞ് അവയെ പൂർത്തീകരിക്കേണ്ടത് അത്യാവശ്യമാണ്. ലൈംഗികത എന്ന ശാരീരികാവശ്യത്തെ പ്രധാന വിഷയമാക്കി അവതരിപ്പിക്കുന്ന കഥയിൽ പലതരം ലൈംഗികതകളെക്കുറിച്ച് സംസാരിക്കുന്നു. സ്ത്രീപുരുഷ ദ്വന്ദ്വങ്ങളിൽ മാത്രം നിന്നുകൊണ്ടു ചിന്തിക്കുന്നവരെ സംബന്ധിച്ചിടത്തോളം

ഇത് അസ്വസ്തതകൾ സൃഷ്ടിക്കും എന്നുറപ്പാണ്.

സ്വവർഗ്ഗലൈംഗികതയും മലയാളസാഹിത്യത്തെ സംബന്ധിച്ചിടത്തോളം പുതുമയുള്ള വിഷയമല്ല. പക്ഷേ പുതിയകാലത്തും സാമൂഹികാവസ്ഥകൾക്കൊത്ത് മാനസികമായി പരുവപ്പെടാത്ത പൊതുബോധത്തെയാണ് കഥയിലൂടെ പ്രശ്നവൽക്കരിക്കുന്നത്. ഇവിടെയാണ് ഇന്ത്യയിലെ ഒരു ഗ്രാമത്തിലിരിക്കുന്ന സാധാരണക്കാരായ വ്യക്തികളുടെ ലോകബോധത്തെ വിശാലമായ ഒരു പരിപ്രേക്ഷ്യത്തിൽനിന്നുകൊണ്ടു വിശകലനവിധേയമാക്കേണ്ടിവരിക. ഈ കഥയിലെ കഥാപാത്രങ്ങൾ തമ്മിലുള്ള ബന്ധങ്ങളെ കൂട്ടിമുട്ടിക്കുന്ന രേഖകളെയും അതിനിടയിലുള്ള സംഘർഷങ്ങളെയും പലതരത്തിൽ വ്യാഖ്യാനിക്കാൻ കഴിഞ്ഞേക്കാം. പക്ഷേ കഥയിലൂടെ പുതിയൊരു ഇടത്തെ നിർമ്മിക്കാനും അവിടെനിന്നുകൊണ്ട് സ്ത്രീപുരുഷദ്വന്ദ്വ ബന്ധങ്ങളെക്കുറിച്ചുള്ള സങ്കൽപ്പങ്ങളെ പൊളിച്ചെഴുതിയാനും കഥ ശ്രമിക്കുന്നു.

ഡിന്നുവിന്റെ അമ്മച്ചിയെ സംബന്ധിച്ചിടത്തോളം അവരുടെ ശാരീരികാവശ്യങ്ങളോടു നീതിപുലർത്താൻ കഴിയാതെ വരുമ്പോഴാണ് ഭർത്താവിനെ ഉപേക്ഷിച്ച് കാമുകനെത്തേടി പോകേണ്ടിവരുന്നത്. ഇത് ഡിന്നുവിന്റെ സഹായത്തോടു കൂടിയാണ് എന്നത് ശ്രദ്ധേയമാണ്. ഇവരുടെ ബന്ധത്തെക്കുറിച്ച് ഡിന്നു പറയുന്നത്, അമ്മച്ചിക്ക് എപ്പോഴും സ്നേഹം വേണമായിരുന്നു. അപ്പനാകട്ടെ വലയെറിഞ്ഞ് വലയെറിഞ്ഞ് കായലിന്റെ മടിക്കുത്തേൽ രാത്രികളും പകലും ചെലവഴിച്ചു. കായൽവെള്ളം കരിമ്പിച്ച അപ്പൻ അമ്മച്ചിയെ മറന്നു എന്നാണ്. അയാളിലേക്കു ചെരിഞ്ഞ് അവർ കിടക്കുമ്പോഴെല്ലാം കൂർക്കംവലിച്ചുറങ്ങിയിരുന്ന അപ്പനെക്കുറിച്ചും കഥയിൽ പറയുന്നു. ഇത്തരത്തിൽ സ്നേഹം കിട്ടാതെ ചുരുങ്ങിപ്പോയ അമ്മച്ചിയുടെ അടുത്തേക്കാണ് അവൻ ഹെൽവിസിനെ പറഞ്ഞയക്കുന്നത്. എന്നാൽ ഇതേ ആവശ്യത്തിന്റെ പേരിൽ സ്വന്തം ഇണയെ കണ്ടെത്തിയ മകനെ ഉൾക്കൊള്ളാൻ അവർക്കു കഴിയാതെ പോകുന്നു എന്നത് ശ്രദ്ധേയമാണ്. ഇവിടെ മറ്റു ശരീരങ്ങളെ മനസ്സിലാക്കുന്നതിൽ അവർ പരാജയപ്പെടുന്നു. സ്വന്തം താൽപര്യങ്ങൾ തിരിച്ചറിഞ്ഞ് തന്റെ ലൈംഗിക സ്വാതന്ത്ര്യം നിർണ്ണയിക്കുന്ന മകന്റെ ജീവിതത്തെ ഗതിമാറ്റിവിടാൻ അവർ ശ്രമിക്കുന്നു. അതായത്, സ്വന്തം ലൈംഗികതാൽപര്യങ്ങൾ ആഘോഷിക്കുമ്പോഴും മറ്റുള്ളവരുടെ സ്വാതന്ത്ര്യത്തിനുമേൽ നിയന്ത്രണരേഖകൾ വരയ്ക്കുന്നു. പരമ്പരാഗത സ്ത്രീപുരുഷ ബന്ധങ്ങൾക്കപ്പുറത്തേക്കു ചിന്തിക്കാനോ അവയെ ഉൾക്കൊള്ളാനോ അവർക്കു കഴിയാതെ പോകുന്നു. കഥയുടെ അവസാനം അവർ ഉപയോഗിക്കുന്ന ഇരുമ്പു ടോർച്ചിനെ അവരുടെ മാനസികാവസ്ഥയുമായി ചേർത്തു നിർത്തി, ഒരു രൂപകമായി വായിക്കേണ്ടതുണ്ട്. ഇവിടെയാണ് നിലനിൽക്കുന്ന ശാരീരികബന്ധങ്ങളെക്കുറിച്ചും അവ സൃഷ്ടിക്കുന്ന മാനസികാനുഭവങ്ങളെയും അതിലൂടെ രൂപപ്പെടുത്തിയെടുക്കുന്ന പ്രകൃത്യബോധത്തെയും കഥ പുതുക്കി നിർണ്ണയിക്കുന്നുത്. ഉപാധികളില്ലാതെ ഓരോ സ്വത്വത്തെയും മനസ്സിലാക്കേണ്ടതിലേക്ക് കഥ വിരൽച്ചൂണ്ടുന്നു.

സാമൂഹിക ശാരീരികബന്ധങ്ങളെ കഥയിൽ, കുടുംബത്തിന്റെയും വീട് എന്ന സ്ഥലനിർമ്മിതിയുടെയും പശ്ചാത്തലത്തിലൂടെയല്ല നോക്കിക്കാണുന്നത് എന്നത് പ്രധാനപ്പെട്ട വസ്തുതയാണ്. ഡിന്നുവും അപ്പനും തമ്മിലുള്ളതും ഡിന്നുവും അമ്മച്ചിയും തമ്മിലുള്ളതുമായ പ്രധാനപ്പെട്ട മുഹൂർത്തങ്ങളെല്ലാം വീട് എന്ന സ്ഥാപനത്തിനു പുറത്താണു നടക്കുന്നത്. ഈ സന്ദർഭങ്ങളിലൂടെയാണ് കഥയിലെ വ്യക്തികളെക്കുറിച്ചും അവർ തമ്മിലുള്ള വൈകാരികതകളെക്കുറിച്ചും വ്യക്തമായ ധാരണ വായനക്കാർക്കു ലഭിക്കുന്നത്. ഇവിടെയാണ് ഡിന്നു, അമ്മച്ചി, ഹെൽവിസ്, അപ്പൻ, അമ്മച്ചി, മാർത്ത എന്നിങ്ങനെയുള്ള ത്രികോണബ

ന്ധങ്ങളുടെ ജീവിതത്തെക്കുറിച്ചും അതിലെ വൈരുധ്യങ്ങളെക്കുറിച്ചും ആഖ്യാനം ചെയ്യുന്നത്. വിരുദ്ധധ്രുവങ്ങളിലേക്കു നില്ക്കുന്ന ഈ രണ്ടു ത്രികോണങ്ങൾക്കൂടിച്ചേർന്ന് കഥ ഒരു കുഞ്ഞുന ക്ഷത്രമായി മാറുന്നു.

പന്ത്രാലയെന്ന തുരുത്തിൽ മീൻപിടിച്ചും, പണം പലിശയ്ക്കെടുത്തും കഴിഞ്ഞിരുന്ന ഇവർ പരസ്പരം മനസ്സുതുറക്കുന്നത് കായൽക്കരയിൽ വെച്ചാണ്. അപ്പനെക്കുറിച്ചും തന്റെ നഷ്ടപ്പെട്ട സ്വപ്നങ്ങളെക്കുറിച്ചും അമ്മച്ചിയും; അമ്മച്ചിയെ ക്കുറിച്ചും മാർത്തയെക്കുറിച്ചും, സ്വന്തം ജീവിത ത്തെക്കുറിച്ചുമുള്ള രഹസ്യങ്ങൾ അപ്പനും ഡിന്നു വിനോട് സംസാരിക്കുന്നത് ഈ കായൽക്കരയി ലാണ്. ഡിന്നുവും ഹെൽവിസും തമ്മിലുള്ള ബന്ധം നടക്കുന്നതും മറ്റൊരു തോട്ടിൻകരയിലാണ്. വെള്ളത്താൽ ചുറ്റപ്പെട്ട തുരുത്തിൽ കഴിയുന്ന ഇവർ തമ്മിലുള്ള ബന്ധങ്ങൾക്ക് കായൽക്കരയു ടെയോ തോട്ടിൻകരയുടേയോ പശ്ചാത്തലമില്ലാതെ കഴിയില്ലയെന്നു തിരിച്ചറിയുന്നു. കഥയിലെ നിർണ്ണായക മുഹൂർത്തങ്ങളെല്ലാം വീടിനു പുറ ത്താകുമ്പോൾ അവിടെയെല്ലാം കടന്നുവരുന്ന ജലത്തിന്റെ സാന്നിധ്യം പ്രധാനമാണ്. കേരളത്തി ന്റെ സാംസ്കാരികാവസ്ഥയിൽ ജലത്തിനുള്ള പ്രാധാന്യത്തെ കഥ പൂർണമായും ഉൾക്കൊള്ളു ന്നുമുണ്ട്. കഥയിലുടനീളം പല തരത്തിലുള്ള ജലസാന്നിധ്യം കാണാം. ജലത്താൽ ചുറ്റപ്പെട്ട തുരുത്ത് എന്ന സ്ഥലനിർമ്മിതിയിലൂടെ പുതി യൊരു ആസ്വാദനതലം സൃഷ്ടിക്കുകയാണിവിടെ എഴുത്തുകാരൻ. കഥാമുഹൂർത്തങ്ങൾ എന്നതു പോലെ കഥാപാത്രങ്ങളും ഈ പാരിസ്ഥിതികാ വസ്ഥകളോടും, പ്രത്യേകിച്ച് ജലം എന്ന പദാർത്ഥ ത്തോടും ഇഴുകിച്ചേർന്നാണുള്ളത്. പഠിക്കുന്ന കാലത്ത് നീന്തൽ താരമായിരുന്ന ഡിന്നുവിന്റെ അമ്മച്ചി ആഴങ്ങൾ കണ്ടതിനെക്കുറിച്ചുള്ള സൂചന കൾ കഥയിലുണ്ട്. അവന്റെ അപ്പനും കായലും തമ്മിലുള്ള ബന്ധത്തിന്റെ ആഴവും, അതിനുപിന്നി ലുള്ള രഹസ്യങ്ങളെക്കുറിച്ചും കഥ വ്യക്തമാക്കു മ്പോൾ, അവിടെ മാർത്തയെന്ന അയാളുടെ കാമു കിയും കായലും തമ്മിലുള്ള അടുപ്പവും കടന്നു വരുന്നു. കായലിൽ കക്ക വാരിയിരുന്ന മാർത്ത യുടെ തീണ്ടാരി രക്തം കായലിൽത്തീർക്കുന്ന കറയും, അതിനെച്ചുറ്റിപ്പറ്റി നിൽക്കുന്ന ഗന്ധവും കാഴ്ചയും ഓർമ്മകളുമാണ് അയാളുടെ ജീവിത ത്തിന്റെ ഗതിയെ നിർണയിച്ചത്.

കഥയുടെ മറ്റൊരു പ്രത്യേകത, സ്ഥലം എന്നത് ഒരു സാംസ്കാരികാനുഭൂതിയായി കഥയിൽ നിറഞ്ഞു നിൽക്കുന്നു എന്നതാണ്. കഥയിലെ സ്ഥലം എന്നതിലൂടെ രാഹുൽ മുന്നോട്ടുവെയ്ക്കുന്നത് പ്രമേയത്തെയും അതിന്റെ ദർശനത്തെയും കൂടിയാണ് നിർണ്ണയിക്കുന്നത്. സ്ഥലം മാറുന്നതി ലൂടെ പ്രമേയവും കാഴ്ചപ്പാടുകളും മാറുന്നുണ്ട്. കഥയുടെ സ്ഥലസങ്കൽപ്പത്തിലൂടെ പരമ്പരാഗത വ്യവസ്ഥിതികളെ വെല്ലുവിളിക്കാൻ രാഹുൽ ശ്രമിക്കുന്നുണ്ട്. ഭൂമിശാസ്ത്രപരമായി വീട് എന്ന സ്ഥലസങ്കൽപ്പത്തിൽ നിന്നും പ്രകൃതി എന്നതിലേ ക്കുള്ള മാറ്റം സൂചിപ്പിച്ചു. പക്ഷേ ഇത് 'പ്രകൃതി യിലേക്കു മടങ്ങുക' എന്ന ആഹ്വാനത്തിന്റെ ഭാഗമായിട്ടുള്ളതല്ല. മനുഷ്യർ പ്രകൃതി എന്നീ ദ്വന്ദ്വങ്ങളെ ഇല്ലാതാക്കിക്കൊണ്ട് ഇവ തമ്മിലുള്ള പാരസ്പര്യത്തെ ഉൾക്കൊള്ളുന്നതാണിത്. സ്ഥല ത്തോടൊപ്പം തന്നെ പരിഗണിക്കേണ്ട മറ്റൊരു വസ്തുതയാണ് കഥയിലെ ഇടം. സ്ഥലത്തിൽ നിന്നും ഭിന്നമായി ഇടമെന്നത് സാംസ്കാരിക സാമൂഹിക സൂചനകളാണെന്നു നമുക്കറിയാം. വെള്ളത്താൽ ചുറ്റപ്പെട്ട തുരുത്തിൽ ജീവിക്കുന്ന ചില ജീവിതങ്ങളിലൂടെ പുതിയ ഇടങ്ങളെക്കു റിച്ചുള്ള ചിന്തകൾക്കൂടിയാണ് കഥ മുന്നോട്ടു വെക്കുന്നത്. തുരുത്തിലെ ജീവിതത്തിലൂടെ ഉണ്ടാക്കിയെടുക്കുന്ന ലൈംഗികതയെക്കുറിച്ചും സദാചാരത്തെക്കുറിച്ചും കുടുംബസങ്കൽപ്പങ്ങളെ ക്കുറിച്ചുമുള്ള പുതിയ ഇടങ്ങളാണ് കഥയിൽ കാണുന്നത്. സമൂഹത്തിന്റെ ഭാഗമായിത്തന്നെ

പരിഗണിക്കേണ്ട ഇടങ്ങളാണിവ. മുഖ്യധാരയുടെ ഭാഗമല്ലാത്ത ഇടങ്ങളിലേക്ക് കഥയിലൂടെ കൂട്ടിക്കൊണ്ടുപോകുമ്പോൾ ഒറ്റപ്പെട്ടു കിടക്കുന്ന തുരുത്തും പലതരം രൂപകങ്ങളായിമാറി പ്രമേയത്തിലേക്കു വിരൽച്ചൂണ്ടുന്നു. അങ്ങനെ, ലൈംഗികതയുടെയും ശരീരബോധ്യങ്ങളുടെയും ഇടം കഥയിലൂടെ പുതുക്കിപ്പണിയുന്നു. ഒപ്പംതന്നെ വരേണ്യമായിട്ടുള്ള പല ധാരണകളെയും ഭാഷയിലൂടെയും അപനിർമ്മിച്ചുകൊണ്ട് പ്രാദേശികമായ ഒരു ഭൂമികയും അതിന്റെ സംസ്കാരത്തിലുമാണ് രാഹുൽ മണപ്പാട്ട് തന്റെ കഥ പറയാൻ ശ്രമിച്ചിട്ടുള്ളത്.

ഇത്തരത്തിൽ പ്രമേയത്തിലും ആഖ്യാനത്തിലും പുതുമ സ്വീകരിച്ചുകൊണ്ട് കാലഘട്ടത്തോടു നീതി പുലർത്തുന്നതിൽ മലയാള ചെറുകഥ ജാഗ്രത പുലർത്തുന്നു എന്നു വ്യക്തമാണ്. ചരിത്രരചനകൾക്കു കഴിയാതെപോകുന്നതും, സമൂഹത്തിലെ ചെറുതുകളെയും മാറ്റിനിർത്തിയിരിക്കുന്നവയെയും മുഖ്യധാരയുടെ ഭാഗമാക്കുന്നതിനോ, അവയെ അടയാളപ്പെടുത്തുന്നതിനോ, ചർച്ചചെയ്യുവാനുള്ള ഇടമാക്കി മാറ്റുന്നതിനോ കഥകൾ ശ്രമിക്കുന്നു. ഒരു ദേശത്തെയും അതാതു കാലത്തെയും അവിടെയുള്ള ജീവിതത്തെയും കഥകൾ വ്യക്തമായി അടയാളപ്പെടുത്തുകയാണു ചെയ്യുന്നത്.

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 ISBN: 978-93-87709-90-4

मन्नू भंडारी की कहानियों में दाम्पत्य

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मन्नू भंडारी स्वातंत्र्योत्तर हिन्दी कथा साहित्य की ख्याति प्राप्त लेखिका है। स्वातंत्र्योत्तर कालीन नवीन परिस्थितियों की गहरी छाप उनकी रचनाओं में दृष्टिगोचर है। नये युग की नयी कहानीकारों में मन्नू भंडारी का अपना अलग ही स्थान है।मन्नू जी का अधिकतर लेखन स्त्री के संघर्षों, स्वप्नों,आकांक्षाओं और पुरुषवादी समाज व्यवस्था में स्त्री की स्वतंत्रता की मांग का लेखन है।मन्नू जी की कहानियाँ जीवन से जुडी हुई है।

आधुनिक भारतीय जीवन की विसंगतियों का चित्रण मन्नू भंडारी की रचनाओं की एक प्रमुख विशेषता है।तेजस्वी विचार, रूढिमुक्त साहस और घरेलू आत्मीयता की सहजता ही मन्नू जी की सबसे बडी शक्ति है।डॉ ज्ञान आस्थाना के मतानुसार, "मन्नू भंडारी की कहानियों में भारतीय जीवन की स्वाभाविकता के बीच उत्पन्न नये संदर्भों की गहरी पकड है।अनुभव की प्रामाणिकता और आज के इन्जान को उसके परिवेश सहित चित्रित करना ही नई कहनी का आग्रह रहा है।इस दृष्टि से विराट जिन्दगी के जीते जगते टुकडे को लेखनीय तटस्थता का स्पर्श देकर चित्रण करने में मन्नू भंडारी बडी ही कुशल है।"(1)उनकी कहानियों में पारिवारिक

जीवन,पति-पत्नी के बनते-बिगडते संबन्ध एवं उन्मुक्त प्रेम आदि का चित्रण सूक्ष्मता से हुआ है।

विवाह सामाजिक संरचना की बुनियादी इकाई है।विवाह का मूल उद्देश्य परिवार को स्थायी रूप देना,कर्तव्यों का पालन,स्त्री पुरुष की यौन संबन्धी आवश्यकताओं की पूर्ति,संतानोत्पत्ति आदि है।जैनेन्द्र के मतानुसार, "विवाह के द्वरा प्रकृत काम को हमने सुसंस्कृत पुरुषार्थ में परिणत करने का उपाय निकाला है।दाम्पत्य संबन्ध कामुकता की पूर्ति मात्र के अर्थ में नहीं है,उसमें सामाजिक दायित्व का भी सन्निवेश है।"(2)युगपरिवर्तन के साथ-साथ विवाह के स्वरूप में भी आज बदलाव दृष्टिगोचर है।

अर्थ मानव जीवन का एक महत्वपूर्ण अंग है।घर की आवश्यकताओं की पूर्ति केलिए धन की जरूरत है।दाम्पत्य जीवन की रिक्तता का आज एक बडा कारण आर्थिक भी है।मन्नू भंडारी की 'शायद' शीर्षक कहानी में रखाल को आजीविका हेतु घर से दूर किसी स्थान पर जाना पडता है।वह पत्नी केलिए भावात्म स्तर पर तो उपस्थित होता है,परन्तु सशरीर नहीं ।तीन साल बाद लौट आए रखाल पत्नी माला के हाथ पकडते समय महसूस करता है कि, "उसके हाथ में कोई प्रतिक्रिया,कोई हरकत नहीं हुई,रखाल को माला का हाथ बडा सर्द और निर्जीव-सा लगता।"(3)यहाँ आर्थिक कठिनाई को दूर करनेकेलिए प्रयास करनेवेले पति को पत्नी के साथ आत्मीय संबन्ध स्थापित नहीं कर पाता। है।मन्नू भंडारी की 'कील और कसक' शीर्षक कहानी में भी अर्थाभाव के कारण दाम्पत्य संबन्धों में आए मनमुटाव दर्शनीय है।खुशी से भरपूर जीवन जीने केलिए अर्थ की जरूरत है।

शराब व्यक्ति को मृग से नीच बना देती है।शराब पीनेवाले व्यक्ति केवल अपने सुख के बारे में सोचते है।मन्नू जी की 'नशा' शीर्षक कहानी में सत्यनाश शराब

की नशे में पत्नी तथा बच्चों के साथ क्रुद्ध हो जाते है।शराबी पति के अमानवीय व्यवहार से आनंदी मुक्त होने केलिए छटपटाती है।पति की मारपीट से विवश होकर आनंदी पुत्र से कहती है, "मुझे यहाँ से ले चल,किषनू..... यहाँ से ले चल।मैं अब एक दिन भी इस घर में रहना नहीं चाहती।मैं ने बहुत सहा है,अब और नहीं सहा जाता,मुझे यहाँ से ले चल आज ही।"(4)शरीबी पति समाज और परिवार की पूरी व्यवस्था को नष्ट कर देता है और दाम्पत्य जीवन में अशान्ति का वातावरण पैदा कर देता है।

विवाहपूर्व तथा विवाहेतर संबन्ध के कारण तनावपूर्ण हो जानेवाले दाम्पत्य जीवन का चित्रण मन्नू जी की चंद कहानियों में दर्शनीय है।'ऊँचाई' शीर्षक कहानी में शिशिर-शिवानी पति पत्नी है।दोनों का वैवाहिक जीवन अच्छी तरह बीत ही रहा था तभी शिवानी का विवाहपूर्व प्रेमी अतुल उसके जीवन में आ जाता है।शिवानी पुराने प्रेम में खो जाती है।शिवानी एक ऐसी नारी है जो एक ही समय पत्नी और प्रेमिका अदा करती है।परिणामतः अपने पति शिशिर से वह धीरे-धीरे दूर होने लगती है। आजकल विवाहपूर्व तथा विवाहेतर संबन्ध विवाह संस्था की एक बहुत बडी समस्या है। मन्नू भंडारी की 'नई नौकरी','नकली हीरे', 'बाँहों का घेरा', 'घुटन' आदि कहानियों में दाम्पत्य जीवन में पति अपनी आकांक्षाओं और स्वार्थ का पूरा करने केलिए पत्नी की भावनाओं की उपेक्षा करने का दृश्य दृष्टिगोचर है।जब घर में इसप्रकार की स्थिति उत्पन्न हो जाती है,तब परिवार का सुख और शांति तिरोहित हो जाती है।

आजकल मानवीय संबन्धों में सबसे अधिक बदलाव दाम्पत्य जीवन में नजर आते हैं। मन्नू जी ने समाज मे आए परिवर्तन के साथ दाम्पत्य संबन्धों में आए बदलावों का सर्वांगीण चित्रण अपनी कहानियों में किया है। दाम्पत्य जीवन में

आए कटुता तथा नीरसता को सहजता और सरलता से प्रस्तुत करने की क्षमता रखनेवाली महिला लेखिकाओं में मन्नू जी का स्थान सर्वोपरी है।

संदर्भ ग्रंथ सूची

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ISBN 978-93-87709-90-4

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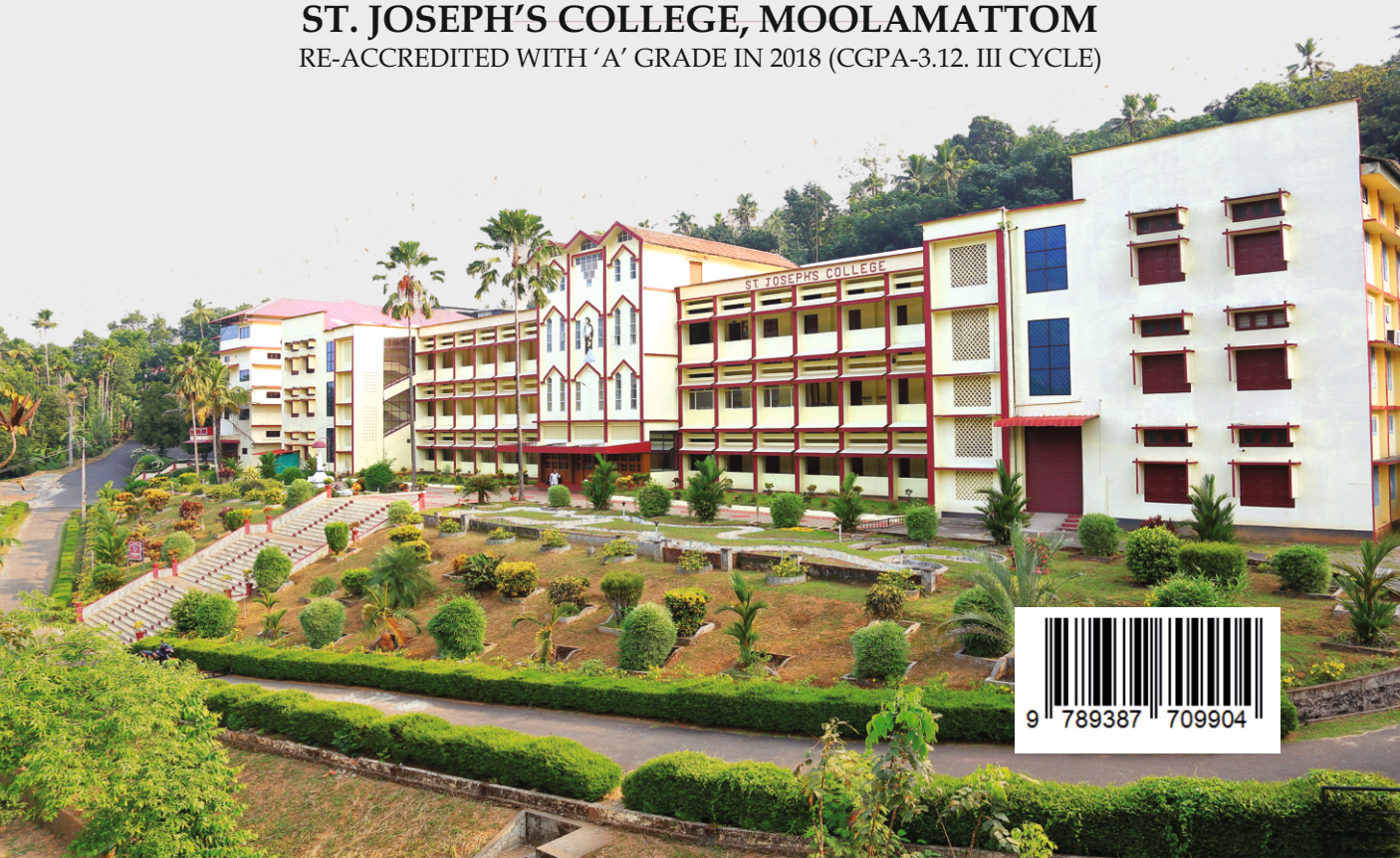

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