Research Journal Vol. 19, No. (2), 2023 ISSN 0974 - 0317 Research Journal

Research Journal

Half Yearly Double Blind Peer Reviewed Journal of Science, Home science & Home Science Technology

RESEARCH DEVELOPMENT CELL

WOMEN'S EDUCATION SOCIETY'S

LADY AMRITBAI DAGA COLLEGE FOR WOMEN OF ARTS, COMMERCE & SCIENCE AND SMT. RATNIDEVI PUROHIT COLLEGE OF HOME SCIENCE & HOME SCIENCE TECHNOLOGY

NAAC - Re-accrediated 'A' Grade

Estd. 1932

Research Journal Vol. 19, No. (2), 2023 ISSN 0974 - 0317 Research Journal

Research Journal

Half Yearly Double Blind Peer Reviewed Journal of Science, Home science & Home Science Technology

RESEARCH DEVELOPMENT CELL

Estd. 1932

WOMEN'S EDUCATION SOCIETY'S

LADY AMRITBAI DAGA COLLEGE FOR WOMEN OF ARTS, COMMERCE & SCIENCE AND SMT. RATNIDEVI PUROHIT COLLEGE OF HOME SCIENCE & HOME SCIENCE TECHNOLOGY

NAAC - Re-accrediated 'A' Grade

Research Journal

Half Yearly Double Blind Peer Reviewed Journal of Science,
Home science & Home Science Technology

Editorial Office

Research Development Cenber
L.A.D. & Smt. R. P. College for Women,
Shankarnagar, Nagpur - 440 010.
Phone: 0712-2247192, 2246623
Email: ladcollege@yahoo.co.uk
Url:ladcollage.ac.in/reseach/

Publishers

Swaprakashan Publication Cell
L.A.D. and Smt. R. P. College for Women, Nagpur.

Printer

Shyam Brothers
S. T. Stand Road, Ganeshpeth, Nagpur.

Subscription Rates

Institutional: Rs. 2000/- (per annum two issues)
Individual: Rs. 1000/-

EDITORIAL

Welcome to the vol. 19 2023

Dear Readers

On behalf of the Research Board of the Research Journal L.A.D. College and my team, I am happy to present Volume 19, Issue 2 of the journal. The journal established in September 2006 has now published 38 issues; two issues in a year. The journal is now trying for indexing in UGC care listed Journals and also in Directory of Open Access Journals and different academic forums. It is also now digitized on our college website wherein not only current but previous issues are available to the interested readers. Plans to follow the download rate per article are on the anvil. We hope to reach this stage through the constant support of college management, the research Board Members and intellectual generosity of the readers and contributors (authors and reviewers). The Journal is multidisciplinary in nature and has a variety of scholars and faculty as its contributors. The current issue has research articles and papers from the field of Home science, Chemistry, Physics, Electronics, Hotel Management and Cosmetology.

The first paper by Dr Shraddha Bansod delves into the environmental impact of biomass combustion and the resulting generation of fly ash discussing the latest findings in the extraction of silica from RHA and BA along with researched applications for the engineered silica. It covers challenges and future scope of the research work and aims to contribute to the development of eco-friendly practices by promoting the successful utilization of biomass fly ash in a sustainable manner.

The second paper By Sakalani and Bade focuses on edge extraction and application of techniques called "Edge Detection". The paper uses Python and compares other techniques which qualify as edge detection techniques currently prevalent In academic and other research organizations. The third paper titled 'Impact of Gender Discrimination on Women in Hotel Industry' by Ms. Rashmi Koche uses a survey method with an large sample collected for the findings. The findings using the interview technique has elicited insights which sheds light on remuneration , gender bias , impact on Productivity and stress generated due to biases.

LED technology was a welcome green technological development and innovation when it was introduced to the world and came to be used in lighting gadgets and accessories used in the workplaces commonly. But it has evoked the interests of many researchers to investigate and prove its efficiencies in various ways . In the fourth paper Dr Shinde and Dr Beldar has attempted to analyze the fundamental aspects of LED lights to evaluate the performance , efficiency, lifetime; color rendering index (CRI), Internationaledel' Eclairage (CIE) Coordinates and correlated color temperature (CCT) of LEDs. Their findings endorse that improved stability, intense luminous efficiency, low power consumption, thermal resistance, environmentally friendly manufacturing process, and appealing appearance is more in LED technology and hence a viable technology.

“ Activated Charcoal In Cosmetics: A Study”, the fifth paper by Dr. Pandhare ,investigates the antibacterial properties which also assist in maintaining oral hygiene. It establishes that activated charcoal offers promising advantages and is crucial while considering formulation concentrations, potential skin sensitivity, and long-term effects. However they do acknowledge that more research is needed to understand mechanisms behind cosmetic benefits as well as to establish standardized guidelines for its safe and effective uses in cosmetic industry.

Dr S. Gharad in her review paper titled, “ Recent Advances and Challenges in Plastic Waste Recycling: A Review” aims to guide stakeholders toward effective strategies for reducing plastic waste and promoting a sustainable future. The paper highlights breakthroughs in mechanical, chemical, and biological methods, including advanced sorting, novel chemical processes, and enzymatic biocatalysis Critically examining challenges such as contamination, cost constraints and infrastructure gaps along with the environmental impacts of recycling methods, energy use and emission the review summarizes recent progress and could help provide a deeper insight on plastic

waste reduction.

The seventh paper by Dr. T. Choudhary aims to study the role of rural women in the field of agriculture and how the kitchen garden and women connect and can be a tool to their empowerment within current rural communities. Using the survey method and a sizeable sample the paper concludes that women in rural areas are gaining economic benefits, are becoming contributors to household incomes and are having self-satisfaction by saving money and are thus empowered.

Dr Thacker and Dr Rathi , in their paper focusing on adolescent street Vendors assess the emotional maturity and self-concept along with other general variables. Administering the Standardized psychological test– Emotional Maturity Scale and Self-concept Questionnaire in addition to a questionnaire designed for data generation . the study finds that sizeable sample studied had above average self-concept and a large percent of adolescent street vendors revealed unstable emotional status. The Ninth paper featured in this volume by Ms Jain and Dr Dhabekar is on Tea tree oil, native to Australia's subtropical coastal regions but is toxic. This paper augments ongoing research and aims to better understand and tries to examine the TTO's efficacy and mechanisms in treating various conditions.

In the paper "Navigating Cosmetic Choices: Avoid Adverse Effect", Paliwal and Dhote examine what are the driving decisions for choosing products in the cosmetic industry by consumers. The paper observed that the allure of branding, packaging, and advertising can overshadow the careful selection of products increasing the risk of unwanted side effects. Thus, inferring that awareness is key to safer usage by probable customers.

The last Paper included in this treatise by Dr N. Sapra deals with the collection of information by Travelers and their being impacted by the different online sources and the social media. Using a structured survey and purposive sampling technique the study concludes that the social media plays a vital role in influencing travellers' decision making process to visit a tourist destination is ever increasing.

Dr. Surashmie Kalmegh
Editor-in-Chief
Research Journal Volume 19 No. (2), 2023

Advisory Board

Research Journal

Vol. **19**, No. **(2) 2023**

Contents Page No.

1. Biomass Fly Ash as a Source of Silica A Comprehensive : Review..... 1
Dr. Shraddha Bansod (Pande), Dr. Aatish S. Daryapurkar Dr. Sushil Y. Pande

2. Edge Detection through Image Processing using Ant and Bee Colony Optimization..... 9
Nikita Saklani, Kanchan Bade

3. Impact of Gender Discrimination on Women in Hotel Industry..... 15
Ms. Rashmi Kochey

4. ECO Friendly LED Lighting For Organizations”.....20
Nita Shinde, Anil G. Beldar

5. Activated Charcoal in Cosmetics : A Study.....25
Dr. S. Pandhare, P. Maithy

6. Recent Advances and Challenges in Plastic Waste Recycling : A Review..... 29
Spruha A. Gharad

7. Empowerment of Rural Women through Kitchen Garden..... 37
Dr. Tehseen R. Choudhary

8. Adolescent Street Vendors – A Comparative Assessment..... 42
Thacker S., Rathi N., Balapurwala A.

9. Tea Tree Oil: A Potential Antimicrobial Agent..... 50
Ishani Jain, Dr. Sonal Dhabekar

10. Navigating Cosmetic Choices: Avoid Adverse Effect..... 56
Muskan Paliwal, Sakshi Dhote, Nibha Bajpai

11. Impact of Social Media on Travellers..... 61
Dr. Nandita Sapra

Research Journal Vol. 19, No. (2), 2023 ISSN 0974 - 0317 Research Journal

Research Journal

Half Yearly Double Blind Peer Reviewed Journal of Science, Home science & Home Science Technology

Biomass fly ash as a source of silica A Comprehensive review

Dr. Shraddha Bansod(Pande)[a], Dr. Aatish S. Daryapurkar[b] Dr.Sushil Y.Pande [c]

[a] Department of Physics L.A.D & Smt R.P.College for Women, Nagpur.
smabnsod@gmail.com, Contact No. 9637793898.
[b] Department of Basic Sciences, Indian Institute of Information Technology, Nagpur.
asdaryapurkar@iiitn.ac.in, Contact No. 9867245331
[c] Department of Skin, NKP Salve Institute of Medical Sciences and Research Centre and Lata Mangeshkar Hospital Nagpur
drsushilpande@gmai.com, Contact No. 9323511245

Abstract

Biomass fly ash is a considered renewable source that is abundantly available in nature. It is obtained after burning the heterogeneous composition of agricultural biomass. Large quantities of agricultural wastes such as rice husk and sugar cane are found in India, which has a large possibility of being employed as renewable source of energy in thermal power plants and silica (SiO_2). Biomass fly ash contains oxides of metals like iron, aluminium, silicon, magnesium, titanium, etc. Silica and alumina are the major constituents that enhance the applicability of fly ash in the making of floor tiles, compound sheets, bricks and glass composite. Extensive research has been carried out to extract silica from Rice Husk Ash (RHA) and Sugarcane Bagasse Ash (BA), as silica is useful raw material for industrial applications as well as in biomedical, energy, food, and personal care products. This paper presents a comprehensive review of the different methods of extraction of silica from rice husk ash and sugarcane bagasse ash such as the physical method, chemical method, hydrothermal method, biogenic synthesis and Sol-gel method. The study delves into the environmental impact of biomass combustion and the resulting generation of fly ash. Also, it discusses the latest findings in the extraction of silica from RHA and BA along with researched applications for the engineered silica. Finally, it covers the challenges and future scope of the research work. The research aims to contribute to the development of eco-friendly practices by promoting the successful utilization of biomass fly ash in a sustainable manner.

Key words: Agricultural wastes, Biomass fly ash, Rice Husk Ash, Sugarcane Bagasse Ash, Silica

1. Introduction

India is a land of agriculture and its economy is known as agrarian economy. It is the second largest producer of wheat and rice. On the other hand, the production of all this food also results in more and more agricultural waste. Agricultural waste is considered to be an environmental hazardous. The most promising way to solve the agricultural waste problem is to synthesis of nanomaterials and production of biomass from agricultural waste. Biomass has been used as an important energy source in India. Statistics show that about 30% of the total primary energy use in the country is still deduced from biomass and 70% of the country's population depends upon conventional forms of energy for energy requirement [1]. Although biomass meets a major part of the total energy condition, it does not find an applicable place in the overall energy balance of India, presumably due to the versatility and diversity of biomass sources [2].

Presently, biomass fly ash from rice husk and sugar cane as a source of silica has attracted the attention of the research community. Rice husk ash market size is forecasted to reach US$2.6 billion, after growing at a Compound annual growth rate (CAGR) of 5.2% during the forecast period of 2022-2027. Asia-Pacific dominates the rice husk ash market, owing to the increasing construction and transportation industries in the region. Figure 1 exhibits the Asia-Pacific Rice Husk Ash Market Revenue, 2021-2027 (US$ Billion) [3].

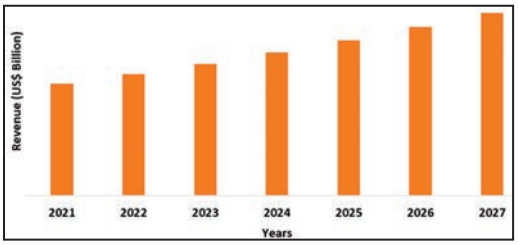


Figure 1: Asia-Pacific Rice Husk Ash Market Revenue, 2021-2027 (US$ Billion) [3]

The United Nations Food and Agriculture Organization (FAO) estimated sugarcane production to annually yield 1.89 billion metric tons in 2020; countries with the highest-produced sugarcane crop include Brazil, India, and China. Bagasse production is estimated to generate millions of tons per year, which is estimated to produce 279 million metric tons, which can amount to a large amount of waste annually [4].

Thus, biomass fly ash in the form of sugarcane bagasse ash and rice husk ash is abundantly available. Both forms of biomass fly ash contain silica as a major constituent. Presently, biomass fly ash from rice husk and sugar cane as a source of silica has attracted the attention of the research community. Various government initiatives are encouraging the production of green energy substitutes for fossil fuels and the extraction of silica from agricultural waste. In-depth research has been carried out to discover various approaches to extracting silica from biomass fly ash from rice husk and sugar cane.

This paper presents a comprehensive review of the different methods of extraction of silica from Rice Husk Ash (RHA) and Sugarcane Bagasse Ash (BA). Also, it discusses the latest findings in extraction of silica from RHA and BA along with researched applications for the engineered silica. Finally, it covers the challenges and future scope of the research work.

2. Material and Methods

The extraction of silica from agro-waste like sugarcane bagasse ash and rice husk ash has been acknowledged by various researchers. Silica as a raw material attracts various fields, including industries. It is having a wide range of applications in the fields of glass, ceramics and in biomedical fields. Some studies reveal that 80-90% of silica is present in rice husk cultivated across the world [5]. Rice husk ash is an economical source of silica, which has a wide market and also takes care of ash disposal [6].

Silica is a polymorphous compound that commonly exists in crystalline and amorphous forms. The quartz and cristobalite are crystalline forms of silica having distinct crystallographic arrangements [7] whereas fused silica is amorphous silica. Formation of quartz and crystobalite is depend of combustion condition. Combustion of RHA and BA at temperature range from 700-950^{0}C leads to formation of quartz. The quartz having highly ordered hexagonal structure. Crystobalite is another polymorph of silica extracted from biomass fly ash. The atomic arrangement of crystobalite is same as that of quartz but, with different crystal structure. Formation of crystobalite can be achieved at high temperature range at 800-1000^{0}C. Both the polymorph of silica extracted from biomass ash depend on combustion condition and chemical composition [8-9].

Crystalline silica is the most abundant material in the earth's crust, However, the direct applications of crystalline silica are limited because of its low reactivity. On the other hand, amorphous silica with high surface area is of high interest to many key chemical applications, such as absorbents, thermal insulators, and catalyst supports [10-11]. Amorphous form of silica abaduountly available in extracted silica from biomass ash. The Lechatelerite, opal, and fussed silica are the forms of amorphous silica Formation of amporphous polymorph of silica can be achieved at temperature ranges from 550-750 ^{o}C [12] . Study of special forms of silica such as fumed silica, colloidal silica, high-purity silica, silica gel and precipitated silica imparting special material properties [13]. Figure 2 shows

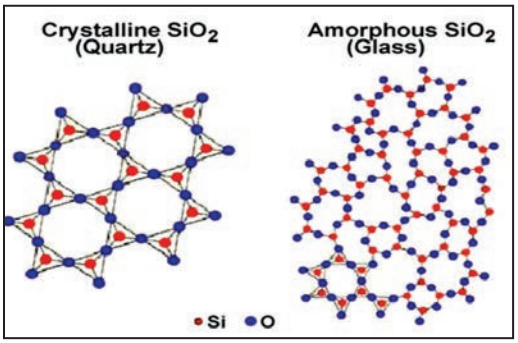


Figure 2: Crystalline and amorphous form of Silica [14].

the polymorphous form of silica as crystalline and amorphous [14].

The characterization of sugarcane bagasse ash shows the presence of crystobalite along with quartz form of silica. The part of silica present in sugarcane bagasse ash that is in the form of elongated spheres [15]. The extraction of silica from sugarcane bagasse ash and rice husk ash is the cheapest method to obtain silica for industrial purposes.

2.1 Extraction of silica from sugarcane bagasse ash and rice husk ash

The extraction of silica from raw materials includes the removal of impurities and other metals present in traces. There are different methods of silica extraction which include the physical method, chemical method, and hydrothermal method, Biogenic synthesis, sol-gel methods [16]. Sugarcane bagasse ash has a high total content of silica and alumina and could therefore serve as reinforcement in composites. Silica is present in rice husk ash and sugar cane bagasse ash can be extracted by using various methods.

2.1.1 Physical method or direct method

The physical method is an oldest method of extraction of Silica. Silica can be extracted from biomass ash by thermal treatment which includes calcination and pyrolysis. In physical method biomass undergoes direct combustion in furnace at controlled temperature or in a boiler. The complete combustion of biomass is required to get desired form of silica such as amorphous silica or crystalline silica [17]. Amorphous form of silica is obtained at controlled temperature range 500-600 ^{o}C [18] and crystalline silica is obtained at higher temperature range greater than 800 ^{o}C. In direct combustion method about 80% silica is obtained with low crystallanity. In direct method along with silica flue gas is also produced. Thus, in physical method, emission controlled system is required to controlled unwanted emission of gas. Thus physical or direct method of combustion of biomass fly ash can remove most of the organic components. As the combustion temperature rises, the physical properties of silica also undergo alterations. For example, research by Soltani et al. compared the physical attributes of rice husk ashes synthesized at 700 °C and 900 °C [18]. They noted that higher temperatures resulted in decreased levels of metal impurities, possibly due to the formation of more volatile and less stable phases released into the gas phase. Additionally, alkali earth metal oxides become more resistant to heat at elevated temperatures. Properties of extracted silica vary with the increase in combustion temperature [19].

Thus silica extraction by physical method or direct method depends on combustion temperature, chemical composition and pretreatment methods.

2.1.2 Chemical Method

The chemical method includes leaching process in which biomass ash washed with HCl, HNO_3, H_2SO_4, and H_3PO_4 solution to remove minerals such as extractive minerals and iron composite [20]. Silica yield is more in case of combustion than the leaching process. Biomass ash sample was reacted with NaOH to prepare sodium silicate solution with constant stirring for 1 hr. at temperature range 500 ^{o}C. The ash then was washed with 1 mol/L HCl solution to remove minerals such as extractive mineral and iron composition. Leaching process is useful for extraction of highly pure silica. High purity silica extracted from biomass fly ash has wide range of

applications [21]. Chemical synthesis of silica includes high energy tetrahydral orthosilicate (TEOS) and sodium silicate [22-23]. Synthesis of silica using TEOS is very expensive due to its high price. Using chemical method of silica extraction by acid, high purity silica can be obtained. Therefore, many researchers have employed various chemical techniques to create nano-silica of high purity. Rice husk and sugarcane ash comprises a range of substances including cellulose, hemicellulose, lignin, and inorganic materials, which can be separated by using chemical method. The alteration of rice husk substances can be noted [24]. The following chemical reaction gives silica from biomass fly ash. Amorphous silica has been obtained in this reaction [25].

$$2NaOH_{(aq)} + SiO_{2(s)} \longrightarrow Na_2SiO_{3(aq)} + H_2O_{(l)}$$

$$Na_2SiO_{3(aq)} + Hcl_{aq} \longrightarrow SiO_{2(s)} \longrightarrow 2NaCl_{(aq)} + H_2O_{(l)}$$

Zulkifli et. al. explained the extraction of silica using above chemical reaction. In this reaction biomass fly ash reacted with HCl initially for 4 hrs to remove metallic impurity. The biomass fly ash sample was then treated with NaOH to prepare sodium silicate. Sodium silicate solution then treated with ethanol and wash with water to obtained silica from sodium silicate [26]. The comparative study of effect of HCl, HNO_3 and H_2SO_4 in different concentration on removal of metallic impurities was done by Gubrani et al.[27] Among all acids, HCl seems to be more efficient in removal of metallic impurities form rice husk ash and sugarcane bagasse ash. Thus chemical methods like acid leaching, and alkaline extraction are important for extraction of silica.

2.1.3 Biogenic synthesis

Biogenic synthesis extracts silica from biomass and agro-waste materials. Biogenic synthesis is cost effective and uses low energy as compared to chemical method. It includes breaking of biomass into gaseous or liquid fuel and giving thermal treatment to biomass [28]. The thermal treatment breaks the chemical bond of biomass. It includes enzymatic hydrolysis of biomass before thermal treatment. Silica produced from biogenic synthesis is having same characteristics as that of silica Xerogel. This is the easiest method for silica extraction from biomass ash [29].

2.1.4 Hydrothermal method

The hydrothermal method of silica extraction is economical as well as eco-friendly process. Hydrothermal process includes alkaline treatment, acid leaching and filtration. Alkaline treatment involves mixing of biomass ash with sodium hydroxide with heating at 100 ^{o}C for several hours. Acid leaching is done by adding HCl to biomass ash and heating it upto100 ^{o}C for several hours in order to remove metal impurities from biomass ash. HCl as a leaching agent efficiently extract silica from raw material like biomass ash [30]. The filtration involve the separation of silica from liquid phase using filter paper or membrane [31]. In hydrothermal method, as temperature increases, color of ash changes from black to grey and white who indicates that the carbon content present in the samples were reasonably reduced. High purity silica is produced after filtration depending on the parameters of filtration [32].

2.1.5 Sol-gel Method

Sol-gel Method of silica extraction, is low temperature synthesis method happened under controlled reactions. This technique involves condensation and hydrolysis of metal oxide. KOH is used as an agent for in sol-gel method. Silica extraction from biomass fly ash is economical due to its large volume. Higher the value of KOH more will be the silica extracted from raw material [33]. Silica extracted from untreated biomass ash gives 80-90% silica while purity of silica increases up to 90% when row material like biomass ash is undergoes sol-gel treatment [34].

Extraction of silica is depending upon the permanent condition of biomass. Nearly 80% pure silica can be obtained from biomass like

sugar cane bagasse and rice husk ash after thermal treatment. High purity silica up-to 90% can be obtained from acid leaching. Yield of silica extraction in physical method is depends on type of furnace and boiler. Biogenic syntheses and sol-gel methods of extraction of silica are low temperature synthesis methods. Thus using any one of the method, exaction for silica can be done [35].

2.2 Applications of extracted silica

Silica can synthesize in any morphological form as powder, gel, thin film. Silica extracted from biomass is in the powder from. Silica Nano particles can be obtained from sugarcane bagasse ash and rice husk ash. Any form of extracted silica is having numerous applications in various fields.

2.2.1 Plastic and Rubber Industries

Rice husk and sugarcane derived silica, with its unique amorphous structure, acts as a reinforcing filler in plastics and rubbers. It significantly improves tensile strength, flexural modulus, and hardness. This leads to the production of more durable and wear-resistant plastic and rubber products. The incorporation of rice husk and sugarcane derived silica enhances the thermal stability of plastics and rubbers. It reduces the coefficient of thermal expansion, preventing dimensional changes in materials exposed to varying temperature conditions. This makes it especially valuable in applications where temperature fluctuations occur. This contributes to reducing the overall material cost of plastic and rubber products [36]. Biomass ash-derived silica improves the dispersion of additives and polymers, leading to smoother processing during manufacturing. This do not only enhance the process ability of plastic and rubber compounds but also reduces energy consumption in the production process.

2.2.2 Applications in Catalysis

Silica extracted from rice husk provides a high surface area, offering abundant active sites for catalytic reactions. The increased contact between reactants and catalyst enhances reaction rates. The porous structure of biomass ash derived silica improves mass transfer, accessibility of reactants to catalytic sites, and prevents the aggregation of catalyst particles. This enhances the stability and reusability of the catalyst. Biomass ash derived silica-based catalysts find applications in various reactions, including esterification, transesterification for biodiesel production, oxidation of organic compounds, and hydrogenation reactions. The tunable surface properties allow for the precise design of catalysts with improved activity, selectivity, and stability [37].

2.2.3 Bio-Applications

Organic silica obtained from biomass especially from biomass like that of plants belonging to 'cane' family such as sugarcane and from rice husk is edible and is absorbed through gastrointestinal tract. Although, it is relatively easily digestible in children, in adults its digestion is difficult. Silica forms an important part of vital skin structures like hair and skin collagen. Cartilages in human joints especially in children contains significant amount of silica is responsible for flexibility of joints. So the biomass ash driven silica is more useful in drugs related to joint pain. Biomass ash-derived silica serves as a carrier for controlled and targeted drug release. Porous structure of silica allows for high drug loading. Biomass ash derived silica can be used in biosensors to check the functionalization capabilities for detecting specific biomolecules or pathogens. Functional groups can be attached to extracted silica in RHA and BA to capture target analyses, enabling sensitive and selective bio sensing platforms for medical diagnostics [38].

2.2.4 Application in glass and ceramics

Glass is a super cooled liquid. Glass having amorphous structure whereas ceramics are the crystalline form of glass. In today's scenario glass industry acquiring more attention. Silica

acts as a network forming agent in formation of glass and ceramic. Thus silica is required on major scale for glass formation. Rice husk ash and sugarcane bagasse ash can be explored as a source of silica for glass and ceramic formation [39].

2.2.5 Electronic Industries

Silica is most demanding material in electronic industries. Silica has large energy storage capacity and can be used in lithium ion batteries. Biomass silica can be used in anode making as biomass ash like RHA and BA has unique porous structure to accommodate silicon expansion to improve anode cycling capacity in batteries. Various techniques such as carbon coting, forming composite structures are has been explored by various research to convert biomass ash driven silica into silicon based anode material [40].

2.2.6 Construction Materials

Biomass ash driven silica has cementesious property hence can be used in construction material. Biomass ash driven silica when incorporated in cementesious material enhance the concrete property. Silica Shows pozzolanic reaction when combined with calcium hydroxide and produce calcium silicate hydrate gel which enhance the durability, strength and hardness of concrete [41].

In summery biomass fly ash derived silica as a raw material has distinguish applications in the field of plastic industry, construction field, biomedical field, in making glass and ceramics, in as well as it can have role as catalyst in the field of chemical industries. Silica with its distinct properties and with ongoing research can influence scientific as well as other technological fields.

3. Challenges and future directions

Biomass fly ash can be used as a source of silica. Biomass fly ash extracted silica has numerous applications in various fields of industry and technology. But the commercialization of extracted silica has some limitations due to quality of biomass fly ash. The purity and consistency of silica changes with the change in batch of biomass used for the formation of biomass fly ash. The purification of biomass fly ash to reduced contamination may change the final product. The extraction of silica from biomass fly ash using chemical combustion methods gives rise to production of carbon dioxide with other harmful waste [42].

The limitations in extraction and use of silica from biomass fly ash increase the future scope of research in bringing this extracted silica in mainstream. The purity and consistency of silica can be obtained by adopting unique manufacturing techniques. Production of harmful gases can be reduced by using green chemicals. A close loop process that includes reuse and recycle can be adopted for the production silica from biomass fly ash.

4. Conclusions

Now a day's renewable use of waste material gained immense interest. Thus rice husk and sugarcane bagasse ash as a waste material can be used as a source of silica. There are number of extraction methods to obtained silica from biomass ash. Chemical method of extraction is most efficient method of silica extraction as compared to other methods such as physical method. But this method generates some harmful gases need to reused. This having scope of research in this field to find out economical and environment friendly extraction method. Biomass fly ash contain large amount of amorphous silica. This amorphous silica can be used in formation of glass and ceramics. Thus optimization of extraction method is needed. This review considers biomass fly ash as a source of silica and various methods of silica extraction from biomass fly ash. RHA and BA has potential to be used as a replacement of conventional silica in various filed discussed in this review. Thus

biomass fly ash can be explored as a source of silica.

References

1. Ahmaruzzaman M, A review on the utilization of fly ash, Prog Energy Combust Sci 36 (2010) 327–363.
2. http/www.indianpowersector.com
3. Rice Husk Ash Market Report – Forecast (2022-2027)", by Industry ARC
4. R. Melati, A. Schmatz, F. Pagnocca, J. Contiero and M. Brienzo, Sugarcane bagasse: Production, composition, properties, and feedstock potential, in Sugarcane: Production Systems, Uses and Economic Importance, (2017) 1–38.
5. S. Chandrasekhar, K. G. Satyanarayana, P. N Pramada,P. Raghavan, Review Processing, properties and applications of reactive silica from rice husk—an overview Journal of Materials Science 38 (2003) 3159 –3168.
6. C.P. Faizul, C. Abdullah & B. Fazlul, Review of Extraction of Silica from Agricultural Wastes using Acid Leaching Treatment, Advanced Materials Research, 626 (2013) 997-1000.
7. Siti Khadijah H., Mohd Hafiz D., A.F. Ismail, Mukhlis A. R., Juhana J., Fabrication of low cost, green silica based ceramic hollow fiber membrane prepared from waste rice husk for water filtration application, Ceramics International, Volume 44, Issue 9,2018,Pages 10498-10509.
8. Deshmukh, P., Bhatt, J., Peshwe, D.,Determination of Silica Activity Index and XRD, SEM and EDS Studies of Amorphous SiO2 Extracted from Rice Husk Ash. Trans Indian Inst Met 9(2012)65, 63–70
9. Yasushi S, Norihiko K, Quantitative Analysis of Tridymite and Cristobalite Crystallized in Rice Husk Ash by Heating, Industrial Health, 2004, Volume 42, Issue 2, Pages 277-285.
10. Hassan, A.F., Abdelghny, A.M., Elhadidy, H. Synthesis and characterization of high surface area nanosilica from rice husk ash by surfactant-free sol–gel method. J Sol-Gel Sci Technol 69, (2014) 465–472
11. Weixing Wang, Jarett C. Martin, Ning Zhang, Chao Ma, Aijie Han, Luyi Sun, Harvesting silica nanoparticles from rice husks, Journal of Nanoparticle Research, 13 (2011) 6981-6990.
12. Javed, Syed.,Naveed, Shahid, Feroze, Nadeem , Kazmi, Mohsin. Extracting silica from rice husk treated with potassium permanganate, Pak. J. Agri. Sci., Vol. 45(4), (2008),459-462.
13. Sung-Hoon Kang, Yang-Hee Kwon, Sung-Gul ,Hydrated lime activation on by products for eco-friendly production of structural mortars, Journal of Cleaner Production, 231 (2019) 1389-1398.
14. https://physicsopenlab.org/2018/02/13/crystalline-and-amorphous-solids/
15. Usman M, Raji A, Waziri N and Hassan, M.A,A Study on Silica and Alumina Potential of the Savannah Bagasse Ash, IOSR Journal of Mechanical and Civil Engineering, 11(3), (2014), 48-52.
16. Tuan Hoang A, Nižetić S,Perspective review on Municipal Solid Waste-to-energy route: Characteristics, management strategy, and role in circular economy, Journal of Cleaner Production i Volume 359, (2022), 131-151.
17. Davinder M. (1997) silica from ash, Resonance.
18. N. Soltani, A. Bahrami, M.I. Pech-Canul, L.A. González,Review on the physicochemical treatments of rice husk for production of advanced materials,Chemical Engineering Journal, 264, (2015), 899-935.
19. Chindaprasirt, P., Rattanasak, U., Eco-production of silica from sugarcane bagasse ash for use as a photochromic pigment filler,Sci.Rep.(2010)10,9890
20. Megawati P.,Fardhyanti S., Artanti Putri R., Oki Fianti, Agustin Fitrianingsi S., Afiati Estrina A., Synthesis of Silica Powder from Sugar Cane Bagasse Ash and Its Application as Adsorbent in Adsorptive-distillation of Ethanol-water Solution Engineering,MATEC Web Conf.,(2018)Volume 237.
21. Wantala K, Khongkasem E, Khlongkarnpanich N, Optimization of As (V) adsorption on Fe-RH-MCM-41-immobilized GAC using Box-Behnken,Design: effects of pH, loadings, and initial concen-trations. Appl Geochem. (2012),1027–1034.
22. Dongmin An, Yupeng Guo, Yanchao Zhu, Zichen Wang,A green route to preparation of silica powders with rice husk ash and waste gas,Chemical Engineering Journal,Volume 162, Issue 2,(2010),Pages 509-514.
23. Karunanithi, Bogeshwaran & Kalaivani, R. & Ashraf, S. & G N, Manikandan & Prabhu G. ,Production of silica from rice husk, International Journal of ChemTech Research,(2014)Vol.6, No.9, pp 4337-4345.
24. Samsudin A., Heru S.,Sugeng W., Agus P.,Ratna B., A facile method for production of high-purity silica xerogels from bagasse ash, Advanced Powder Technology 20, (2009) 468–472.
25. Norsurayaa S, Fazlenaa H , Norhasyimia R., Sugarcane Bagasse as a Renewable Source Silica to Synthesize Santa Barbara Amorphous, 4th International Conference on Process Engneering and Advanced Materials , Procedia Engineering 148,(2016),839-846.
26. Zulkifli N., Rahmann I., Mohamad D, A green sol–gel route for the synthesis of structurally controlled silica

particles from rice husk for dental composite filler. Ceramics Int. (2013),4559 - 4567.

27. Ghorbani, F., Sanati, A. M., & Maleki, M., Production of silica nanoparticles from rice husk as agricultural waste by environmental friendly technique. Environmental Studies of Persian Gulf,(2015),56-65.
28. Jaehong S., Palanivel V., Byung-Taek O., Extraction and physical characterization of amorphous silica made from corn cob ash at variable pH conditions via sol gel processing, Journal of Industrial and Engineering Chemistry,Volume 30,(2015),Pages 249-253.
29. G.Peerzada Gh Jeelani, C Ramalingam, Statistical approach to synthesise biogenic silica nanoparticles from rice husk and conjugated with Justicia adhatoda extract as green, slow-release biocide.,IET Nanobiotechnol 15(4) (2021), 391–401.
30. A. Lyle September, N. Kheswa, S Ntalane . Seroka and L.Khotseng Green Synthesis of silica and silicon from agricultural residue sugarcane bagasse ash – a mini review RSC Av., 13 (2023), 1370.
31. Ngoc, N. N., Thanh, L. X., Vinh, L. T., & Van Anh, B. T. High-purity amorphous silica from rice husk: Preparation and characterization, Vietnam Journal of Chemistry, 56(6) (2018) 730-736.
32. S. Seroka, Raymond T, & Khotseng L, Green Synthesis of Crystalline Silica from Sugarcane Bagasse Ash : Physico Chemical Properties, Nanomaterials, (2022).
33. Setyawan, N & Hoerudin, Hoerudin & Yuliani, Sri. Synthesis of silica from rice husk by sol-gel method. IOP Conference Series: Earth and Environmental Science.(2021),1-6
34. Hossain, S. S., Mathur, L., & Roy, P. K, Rice husk/rice husk ash as an alternative source of silica in ceramics: A review. Journal of Asian Ceramic Societies,(2018), 6(4), 299-313.
35. Bansod S,Ubale S,use of biomass ash in glass preparation and study its properties, July (2018), Vol.5, issue 3, 355-366.
36. Prasara-A J, & Gheewala S H. Sustainable utilization of rice husk ash from power plants: A review. J Clean Prod. (2017);167:1020–1028.
37. Embong, N.H., Hindryawati, N., Bhuyar, P.,Enhanced biodiesel production via esterification of palm fatty acid distillate (PFAD) using rice husk ash ($NiSO_4$)/SiO_2 catalyst, Appl Nanosci 13,(2021), 2241–2249.
38. J. Chun, J.H. Lee, Recent progress on the development of engineered silica particles derived from rice husk, Sustainability 12 (2020), 10683
39. Bansod S.,Ubale S,To Prepare Silica Soda Borate Glass from Biomass Fly Ash and Study its Optical Properties, International Journal of Engineering Research & Technology (6) (2017), 27-31.
40. Steven S, Restiawaty E, Bindar ,Routes for energy and bio-silica production from rice husk:A comprehensive review and emerging prospect Renewable and Sustainable Energy Reviews, 149, (2021), 111329
41. Ubale S; Bansod S; Joshi S., Fly ash - A future material, International Journal for Environmental Rehabilitation and Conservation September (2020),400 - 403.
42. Ntalane S., Raymond T., & Lindiwe K.,Extraction and Synthesis of Silicon Nanoparticles (SiNPs) from Sugarcane Bagasse Ash: A Mini-Review Appl. Sci. 12 (2022), 2310.

Edge Detection through Image Processing Using Ant And Bee Colony Optimization

Nikita Saklani, Kanchan Bade

Department of Applied Electronics &Software Technology,
L.A.D & Smt R.P. college, Nagpur.

Abstract

In a computer image analysis, the main aim is to generate the image with specified features that make them more suitable for humans and machines to observe, identify, and understand the situation. Image processing is the technique from which we can get any digital information which is stored in the form of images. Image Edges are the most important feature of image analysis and processing, for extraction of edges from the image a technique of "Edge Detection" can be applied. By applying these techniques we can get every small detail of an image, even we can remove the unwanted details so fewer data can be processed. Various evolutionary computation techniques can be used for image processing. But in this paper, we will use Ant, Bee colony optimization, and a combination of both algorithms which is an enhancement of previous algorithms. It is one of the most promising approaches to find optimal solutions. The Experimental outcomes reveal each information of edge detection with high accuracy and surpass the existing algorithm. The technique used here is Python.

Keywords: Ant Colony Optimization (ACO), Edge Detection, Hybrid algorithm for Ant and bee colony Optimization (HABCO), Bee colony optimization (BCO), Digital Image.

Introduction

The Edge Detection technique is one of the most significant techniques in any image processing technique that can be used to find the boundaries of objects within the given particular image. It functions by spotting differences in brightness, contrast, colour, texture, and other aspects of images. Notable Changes in an image are called edges. An edge in an image is a notable local change in the image intensity, usually related to a gap in either the image intensity or the first derivative of the image intensity. Discontinuities or gap in the image intensity can be either

a. Step Discontinuities, where the image intensity suddenly changes from one variable on one side of the discontinuity to a different variable in the opposite side.

b. Line Discontinuities, where the image intensity suddenly changes variable but then returns to the initial value on the opposite side.

This technique is very important to understand every detail of an image and has its persistence in image analysis and machine vision [1]. The main aim of edge detection is to remove the most noticeable pixels of the scene in an image, which are anticipated to be the boundaries of objects that influence to produce unexpected sudden changes in the intensity of the image . Most of the details of the object of the image are confined in edges. So, originally we will discover these edges will discover these edges in an image and then utilize these filters to intensify those regions of the image which consists of edges and then the sharpness of the image grows, as a result, it becomes easy to interpret. Edge detection is the most usual approach for discovering notable discontinuities in intensity values. Optimization techniques [2] can be defined as those which give the best result of a problem in any situation. It is used to solve bit difficult computational solutions. It finds out the best outcome from the given practicable solutions.

Edge detection can be defined differently based on human opinion. The Definition can be as finding edges in an image that can be used as a fundamental benefit in digital image processing. It can be used to detect the dissimilarities of grey level like some impurities considering noise which can easily be found. In image processing, Edge detection is considered as a major tool in recognizing the pattern [3], segmenting of the

image, and analyzing scenes. Certain modifications that occur in the image is the features like brightness, contrast. The interpretation of the image is very much necessary in digital computers. Segmentation of the image divides the region components and objects, dividing a digital image into multi-fold regions called as pixels. The representation of the image automatically reduces the data quantity that is to be processed only that information is retained which describes the shape of the object. In general, everyone knows the data of the image is in discrete form, so in edge detection, the gradient at local maxima is used [4].

Edges are at the center of attention in an image. If we consider an object the explicit part is edges and lines. With the aid of edges and lines, a blueprint of the object is formed. This is the main reason why the extraction of the edges is needed in extracting features and Graphics processing.

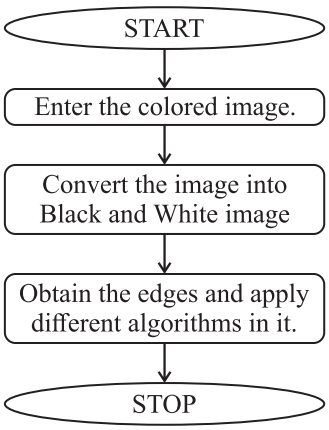


Fig 1 Flow Chart for edge detection

Ant Colony Optimization is bio-inspired ways that depend upon the natural miracle that means ants deposit pheromone on the ground to make the positive [5] and easy path that should be followed by other members of the ant colony . In ant species, an ant walking to and from a food source deposit some substance on the path called pheromone. The probability for an ant to visit a destination is concerned with the volume of pheromone that every middleman notices throughout its examination. It's a probabilistic fashion and meta- heuristic for working computational problems [6-7].

Bee Colony Optimization is a metaheuristic technique which gave a new direction in the field of swarm intelligence. Bees are represented as agents who can solve any combinatorial optimization problems [8]. Mainly there are two types of bee that exist in the beehive. They are in a hundred and thousand in numbers which work jointly. There is one Queen Bee which is present in the beehive and lay eggs. Bee colony optimization algorithm has the capability of working with both constrained and unconstrained optimization. The Bee Colony algorithm imitates the foraging behavior of a bee colony [9].

Literature survey

- Cumin Liu, Xiaojun Wang, Na Shi, and Ceiling Li, "Image Segmentation Algorithm Based on Improved Ant Colony Algorithm", International Journal of Signal Processing, Image Processing, and PatternRecognitionVol.7, No.3,pp.433-442, 2014

The columnist of this paper gives improved kind of ant colony algorithm for image segmentation with high productivity and better edge detection pathway. Some intense developments are: in the initial phase of segmentation. In the later stage, they introduced an edge searching plan to the edge of the image.

- “Ant Colony Optimization" IJCSNS International Journal of Computer Science and Network Security.VOL.8 No.6, Jun2008 In this paper, it is shown that Ant Colony Optimization is a biological process due to their analogs individual simplicity and group behaviour(8). This paper reveals the Ant Colony Optimization as a distributed algorithm that has been used to solve the Travelling salesmen problem. It shows the case study of Jordan's Seaport Motion.

• M. Dorigo, M. Birattari, and T. Stitzel, "Ant Colony Optimization Artificial Ants as a Computational Intelligence Technique, IEEE Computational intelligence magazine, November 2006 The main purpose of the paper is to manifest Ant colony optimization (ACO) that is been standardized into a procedure that is designed to find a better solution to difficult optimization problems for combinative optimization complexities by Dorigo and other writers. A metaheuristic is a set of advanced concepts that can be used to define heuristic methods speculates to a bunch of different problems.

• Ms. P.G.Gomase, Ms. N.R.Wankhade, "Advanced Digital Image Forgery Detection- A Review", IOSR Journal of Computer Science (IOSR-JCE) e-ISSN: 2278-0661, p-ISSN: 2278-8727 PP 80-83 2014 This Paper speculates how the use of digital photography has changed the era to a great extent and is creating the path to new forge images. A technique for copy-move forgery detections has been used. But this approach takes into account only the shifting of copied regions. The Planned system will cover the demerits of both the structures and can be strong to various methods of copy-move processing. All the methods indicated draws attention from different conversions to make them vigorous and to lessen the sequence of logical blocks for comparison.

Proposed Methodology

The method which is proposed in this work suggests various outcomes which deal with two optimization algorithm that is Ant Colony Optimization algorithm, Bee Colony algorithm. These algorithms deal with the foraging behavior of ants and bees. Both are swarm intelligence techniques which are nature-inspired and metaheuristic techniques which means a problem independent way which can be applied to various large scale problems.

Ant colony optimization approach (ACO)

In ant colony optimization while moving from one place to another, ant leaves a liquid-like substance known as a pheromone in its route which helps another ant to find their path [1]. The newly proposed techniques of ant colony algorithm are:

1) Initialization:

This is the first step of any algorithm, since the user cannot infer which variables should be utilised in the absence of initialization, whereas in ant colony optimization different ants are placed on any random path. In which the ending point of any image will be a starting pixel with a pheromone trail which is set to as the grayscale visibility.

2) Pixel Transition rule:

The smallest spot of light in a picture is known as a pixel. The nth ant can go to the pixels that aren't on the list by accepting the neighboring pixels.

3) Pheromone update rule:

Negative feedback is detected through the pheromone tr evaporation.

4) Stopping Criterion:

The above steps that are 2 and 3 are repeating again and again till the desired objective of the ants are attained.

Bee Colony Optimization (BCO)

Bee colony made up of scouts, observers, and working bees. There is just one bee working at each food destination. Thus, the number of bees employed equals the number of food destinations, which in turn equals the number of bees observing. Conditions at the food destination affect scout bee cases.

The proposed approach is given through the following steps:

1) Initialization:

The first step is the initialization which declares the dimensions, size of the colony, and number of employed bees. Runtime: number of times algorithm will execute.

Max Cycle: number of cycles for searching .β:

parameter to describe the threshold on the number of answers selected during runtime Limit: a solution that cannot be improvised through a number of trials is restricted.

2) The Execution of further steps is defined for “run time” and “max cycle” which is running iteratively as user aim is fulfilled.

3) The Dimension of the size of the bee colony can be determined by:

L=√P*Q----------[1]

Where L= Total number of sources

P= Rows of the image

Q= Columns of the image

4) After determining the size then we have to see that the location of the source is in employed bees

Located Source Number=T/2 ----------[2]

5) Calculation of probability

Pi=(fiti) /∑ TNn=1fitn ----------[3]

i€{1,2,3……..TN} and fiti is the fitness solution

6) Onlooker Bee Phase

Higher the fitness values there is more probability of onlooker bee to choose it.

7) Scout Bee Phase

This is the phase where a solution as a whole depends on the number of trials and then employed bee becomes a scout bee.

8) Finding Best Solution

The best and improvised solution for bee swarm can be taken from using all the steps of Bee Colony optimization

From both Ant colony Optimization and Bee colony Optimization which is been, illustrated under the section proposed methodology are the improvised version of Optimization algorithms based on their complexity, Time consumption, and various other properties.

Hybrid algorithm for Ant and bee colony Optimization (HABCO)

The algorithm for Hybrid technique is:

1) Read the image.

The first step of any of the algorithms is to get the input and read the image. The Image can be of JPEG, JPG form.

2) Get the height and width.

The second step is to get the height and width of the image so that the proposed approach can be applied to it .

3) Apply the Gaussian filter.

Gaussian filter is defined as the linear filter which can be used to blur the images, reduce noise, contrast each and every detail of the image.

4) Apply Normalized Gaussian smoothing

It is basically a convolution operator which is a combination of two mathematical functions which gives the result as a third function. The functions that are used in image processing are called kernels[4]. The kernel can be considered as a square array of a pixel.

5) Apply Normalized Horizontal Gradient. Normalized Vertical Gradient.

Applying the approach method in all prospects of the image in the X and Y-axis. Image Gradient is defined as the directional change in the intensity and the color of the image . It is one of the most important blocks of the image processing.

6) Track the Edge angle of the image.

In an image the detected edges are taken into consideration and then by edges the angle can be demonstrated.

7) Apply the Threshold.

The Threshold is used to classify the pixel values in an image. It is one of the easiest methods for the segmentation of images. The input for any thresholding option is the grayscale image or color image. The output comes as a binary image.

8) Get the edges.

The last step is the final stage where we get the edges of the image with the new algorithm.

Results

Ant Colony Optimization

Fig 2 Result of Ant colony Optimization

Bee Colony Optimization

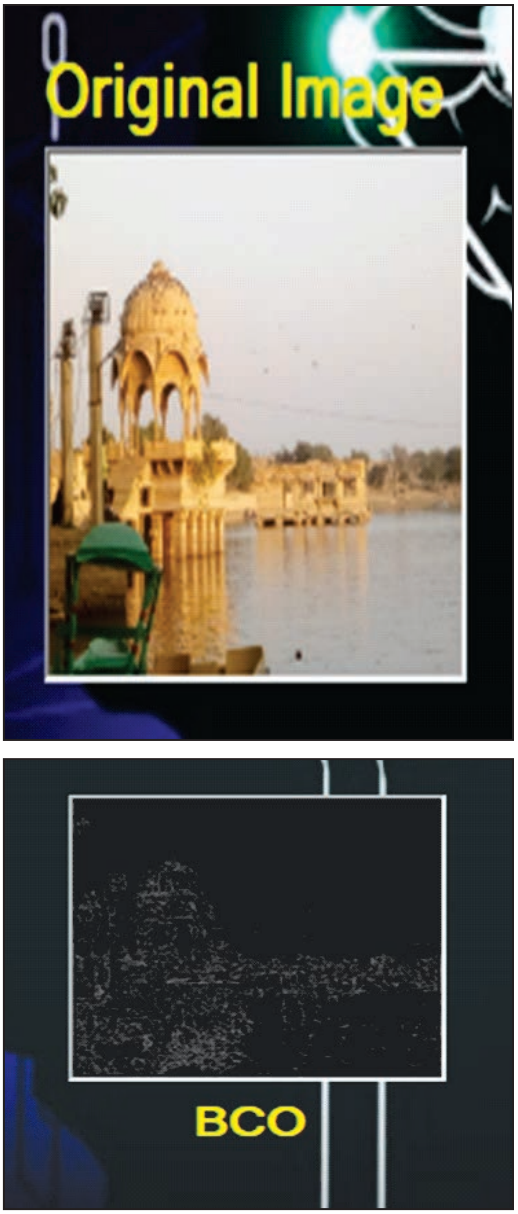


Fig 3 Result of Bee colony Optimization

Hybrid algorithm for Ant and bee colony Optimization (HABCO)

Fig 4 Result for Hybrid Ant and Bee colony Optimization

Conclusion

Edge detection is an foremost method of digital image processing. It is a complimentary method for numerous explorations in computer vision and image segmentation. Edge recognition furnishes important information for high-position processing assignments(6) like point discovery(7) etc. The favorable outgrowth of edge recognition depends on the optimal computation of threshold. In this thesis, a modified approach is used for ways that are used under mass intelligence that are Ant colony and Bee colony optimization for edge recognition of the image. It's far better than the traditional approach. The recently proposed system is grounded on the probability of fitness function, Pixel transition rule, confines of the colony, Grayscale visibility, whereas some of the fine terms similar as standard deviation, mean deviation.

References

1. An ant colony optimization algorithm for image edge detection. IEEE congress on evolutionary computation by Jing Tian, Weiyu Yu, pages 751-756,2008.
2. E. Argyle; A. Rosenfeld, "Techniques for edge detection," Proceedings of the

   IEEE, vol.59, no.2, pp. 285-287, Feb. 1971
3. A novel bacterial foraging technique for edge detection. Pattern Recognition. Letter. Verma, O.P., Hanmandlu, M., Kumar, P., Chhabra, S., Jindal, A 32(8), 1187–1196 (2011).
4. Li J, Pan Q, Xie S, Wang S (2011f) A hybrid artificial bee colony algorithm for flexible job shop schedulingproblems. Int J ComputCommun Control 6(2):286–296.
5. "Nature-Inspired Optimization Algorithms: An Insight to Image Processing Applications", International Journal of Emerging Research in Management & Technology, Volume-4, Issue-5, 2015,Manish Dixit, Sanjay Silakari and Nikita Upadhayay,
6. "Advanced Digital Image Forgery Detection- A Review", IOSR Journal of Computer Science (IOSR-JCE) e-ISSN: 2278-0661, pp 80-83 2014. Ms.P.G.Gomase, Ms. N.R.Wankhade,
7. A comparative study of Artificial Bee Colony algorithm. Applied Mathematics and Computation 214 (2009) 108-132, D. Karaboga, B. Akay.
8. Feature Selection using Supervised Fuzzy C-Means Algorithm with ant Colony Optimization. In: Proc. 3rd International Conference on Machine Vision (ICMV); 2010. p. 441−46, Mohammad S, Fardad F.
9. "Ant Colony Optimization" IJCSNS International Journal of Computer Science and Network Security.VOL.8 No.6, Jun2008

Impact of Gender Discrimination on Women in Hotel Industry

Ms. Rashmi Kochey

Assistant Professor, Department of Family Resource Management,
L. A. D. College.

Abstract

Workplace gender discrimination comes in many different forms, but generally it means that an employee or a job applicant is treated differently or less favourably because of their sex, gender identity, or sexual orientation. The discrimination may be in the form of being paid less than a person of a different gender who is similarly or less qualified, being denied a promotion, pay raise, or training opportunity, being rejected for a job, forced out on leave, or given fewer assignments because of the gender, receiving less support from supervisors based on one's gender — all of which are illegal practices. The present study "Impact of Gender Discrimination on Women in Hotel Industry" was conducted in 5 hotel of Nagpur City, covering north, south, east, west and central Nagpur region. (Hotel Dwarka from North, Hotel Arjun from South, Hotel Gomati from East, Hotel Tuli International from West and Hotel J. K. from Central Nagpur). Survey Method was used to collect data. Purposive Sampling Technique was done to select the samples. Twenty samples (Women only) from each Hotel were taken for data collection, which made up a total of 100 samples for the study. Interview Schedule was the tool used for data collection, which was further analyzed with the help of Percentage. Maximum respondents are not satisfied with their salary and do not get any extra rewards for their quality of work, they feel that they receive less opportunity as compared to men; their decisions are not taken into consideration while planning any event in the work place. Many feel that even being capable of top position they are not considered. This hampers the overall work environment and are not satisfied with their interpersonal connection and it affects their productivity. It can therefore be inferred that there is a negative and unproductive impact of gender discrimination on women in hotel industry.

Key Words: Gender Discrimination, Gender Discrimination at work place, Hotel Industry,

Introduction:-

Gender discrimination remains a major topic of concern at work place worldwide. Women disproportionally experiencing unequal treatment and limited opportunities. Discrimination can either be direct or indirect, intentional or unintentional. Inadequate accessibility, sexual harassment, harassment and instructions to discrimination are also forms of discrimination.[1] Discrimination is the unfair treatment of people and groups based on characteristics such as age, gender, race or sexual orientation.

Gender discrimination can be defined as "when someone is treated unfairly or disadvantaged based on their gender, gender identity or gender expression".[2] It is truly said from the above definition that unfair and biasness is the major problem which occurs and opportunities are not provided just because an individual belongs to a particular gender. It is always seen that women and girls are the main target of gender discrimination. Discrimination harms the productivity of people and the entire society as a whole.[3] Therefore, delay in National development and economic development.

There are a various socially constructed roles, attitude behavior normal, standards expressions and identities which are made for girls, women, boys men and gender diverse people. Gender discrimination is not a new problem, it is been seen from a very long time and there is no guarantee of it to get over soon. Women have historically been the primary victims of gender discrimination.[4] The pervasive nature of patriarchal systems across societies has led to women being systematically disadvantaged in many areas of life, including employment, education, health care, and legal rights. The consequences of this discrimination are multi-

faceted and deeply embedded in social structures.

Effects of gender discrimination:

Gender discrimination, also referred to as gender disadvantage, inequalities or disparities encompass a range of experiences and structural inequalities. These include the increased likelihood that women may hold positions of lower power in work settings and lower status in societies in which women are not protected against violence or are discouraged from pursuing an education and independent living. The negative impact of gender discrimination on physical and mental health can be compounded by its 'correlates' (e.g. poverty). These factors can cause much stress and strain on women as well as impact their opportunity to access health care.[5]

Gender discrimination impacts all aspects of a woman's life, such as limited access to employment opportunities and quality health care, which can result in poor health outcomes. This power imbalance becomes especially troubling in resource-poor areas where multiple disadvantages cluster. In addition to discrimination, women who do not conform to the socio-cultural norms of their gender can face stigma, social exclusion and violence (e.g. 'honour killings').[6] Women can hold multiple forms of minority statuses (e.g. due to their ethnicity), meaning that they can be subject to discrimination from a myriad of angles, which together leads to greater stress and worse mental health outcomes. There is growing recognition that gender-influenced isolation, social exclusion, bullying and threats all add to the burden and injustice of discrimination. Yet there is a dearth of research that explores gender disadvantage and women's mental health.[7] This discourse should not undermine resilience, fortitude and that action is taking place, but should be taken as an opportunity to raise the profile of these issues.

Gender discrimination at workplace:

When an employee or job applicant is treated unfairly or unequally based on their gender even though they are capable of the position and qualified to do it. It is said to be gender discrimination. Gender discrimination starts from the time the employee is being recruited, and continues till the time they are there in the work place. Gender discrimination is also seen at the time of training, promotion, appraisal, etc. Men are given tasks which involve physically demanding tasks, administrative task, management functions. According to a study, "The prevalence of women in underpaid and unprotected domestic work is an example of gendered job segregation. Job segregation leads to male domination in fields like engineering and construction, while women tend to fill jobs in domestic work, nursing, teaching and other "feminine" careers. Employers rarely say they only want men or women applying to certain jobs, but discrimination takes many forms." As it is seen from the above paragraph that segregation of job is done on the basis of gender.

Types of discrimination at workplace:

- Race discrimination
- Age discrimination
- Religious discrimination
- Disability discrimination
- Weight or body size discrimination
- Political discrimination
- Educational discrimination

Effects of gender discrimination at work place:

1. Economic inequality
2. Gender pay gap
3. Glass ceiling effect
4. Job segregation
5. Barrier in promotions
6. Psychological impact
7. Low self esteem
8. Increased anxiety
9. Legal consequences

10. Less turnover
11. Reduced diversity
12. Less job satisfaction

Ways to solve gender discrimination at work place:

1. Promote more women
2. Educate senior employee and employer
3. Fight biases
4. Evaluate work assignment
5. Make salaries transparent
6. Practice social inclusion
7. Evaluate the evaluators
8. Include men
9. Use skill based assessment
10. Flexible working pattern

Gender Discrimination in hotel industry:

The ultimate goal of any hotel industry is to deliver high quality services, guest experiences while maintaining profitability. The hotel industry and hospitality sector is still very traditional and male dominated in terms of values, it is segregating and discriminatory according to gender, not only horizontally but also vertically, the wage differences between men and women are critical. Traditionally, men and women occupy different roles in the hotel industry: women are more often assigned functions that are in line with their social roles and that represents an extension of their domestic tasks so that it is easier to find women in-room service or cleaning. Men, on the other hand, are more easily assigned physically demanding tasks, administrative and management functions, which requires more skills and are therefore better paid

Organizations protecting Gender discrimination at workplace:

1. National Human Rights Commission: The NHRC is responsible for promoting and protecting Human Rights in India, including workplace related rights. It can investigate cases of discrimination and human rights violation in the work place.

2. Ministry of Labour and Employment: this ministry is responsible of overseeing and regulating various labour related matters in the country. It plays a crucial role in formulating and implementing labour related laws, policies and programmes to protect the rights and interest of workers and employees.

3. State Labour Department: it oversee the matter related to labour at state level. They conduct regular inspections at work place to ensure occupational safety and health regulations and prevention of workplace discrimination.

4. Non –governmental Organisations: Numerous NGO in India work to promote human rights and equality at the workplace. They often provide support, advocacy and resources for individuals facing discrimination. These organisations work on various aspects of discrimination like racial discrimination, gender-based discrimination, discrimination against individuals with disabilities and more.

Objectives of the Study:

1. To assess gender discrimination at work place.

2. To study the problems faced by women employees in hotel industry

3. To study the impact of gender discrimination on women.

4. To study the preventive measures taken by women employees to reduce gender discrimination.

Need and Importance of the study:

Hotel industry is gaining popularity for a very long time along with tourism. There are a lot of pros and cons involved in any commercial sector. One among it is the problem of gender discrimination. It is a topic of concern in every field, be it commercial or technical, educational or corporate. Gender discrimination is increasing with the increase in science and technology and any other progress of the world.

The current study will help to find out the actual facts and figures in hotel industry with respect to gender discrimination. Ways and measures are also considered to solve this problem. There are various organizations and agencies that solve this increasing problem.

Limitation of the Study:

1. The study is limited to only Nagpur city
2. The study is limited to a few hotels only.
3. Usual limitation of time and other resources is always there.
4. The results and conclusion will not be applicable to every situation.

Hypothesis: It can be assumed that there is a negative impact of Gender discrimination on women in the hotel industry

Research Methodology:

The present study **"Impact of Gender Discrimination on Women in Hotel Industry"** was conducted in **5 hotel of Nagpur City**, covering north, south, east, west and central Nagpur region. (Hotel Dwarka from North, Hotel Arjun from South, Hotel Gomati from East, Hotel Tuli International from West and Hotel J. K. from Central Nagpur). **Survey Method** was used to collect data. **Purposive Sampling Technique** was done to select the samples. Twenty samples (Women only) from each Hotel were taken for data collection, which made up a total of 100 **samples** for the study. **Interview Schedule** was the tool used for data collection, which was further analyzed with the help of **Percentage**.

Result and discussions:

Analysis of the Respondents:

Maximum respondents are from 25-40 years of age (54%), lives in Joint family (64%) and are staying in their own house (52%). Maximum respondents were unmarried (82%) and are living with their parents (95%). Maximum Respondents are Graduate (95%), and are earning more than 10,000/- per month as their salary (88%).

Table No. 1:
Discrimination with respect to salary and rewards n=100

Sr. No.	Options	Yes Percentage	No Percentage
1.	Paid according to work	53 %	47 %
2.	Satisfied with the salary	41 %	59 %
3.	Material benefit from work place other than salary	36 %	64 %
4.	Rewarded for the quality of work	28 %	72 %

It can be seen from Table no 1: that, maximum respondents are paid according to the work done by them (53%). 59% of respondents are not satisfied with their salary. 64% respondents do not get any other material benefit other than salary, while 72% are not rewarded for the quality of efforts put by them in their work place.

It can be seen from Table no: 2 that 68% respondents have received less opportunities in their job as compared to men. 58% say that promotion considered according to their gender. 78% respondents say that their decisions are not taken while planning any activity or programme in their work place. 83% respondents feel that promotion opportunities are given more to men as compared to women. 88% respondents feel that they are more capable of top positions as good as their male counterparts. For 56% respondents time of job and shift are not considered.

It can be seen form Table no 3: that for 89% respondents work environment is not pleasing,

Table No. 2:
Equal Opportunity for both Genders n=100

S.N.	Options	Yes Percentage	No Percentage
1.	Women receive less opportunity than men	68 %	32 %
2.	Promotion considered according to gender	58 %	42 %
3.	Women's decision taken while planning at work place	22 %	78 %
4.	Promotion given to men more as compared to women	83 %	17 %
5.	Women capable to fill top position same as men	88 %	12 %
6.	Time and shifts considered for both genders differently	44 %	56 %

Table No: 3
Impact of gender discrimination n=100

S.N.	Options	Yes Percentage	No Percentage
1.	Work environment pleasing	11 %	89 %
2.	Job satisfaction	27 %	73 %
3.	Satisfied with interpersonal connection	18 %	82 %
4.	Affects productivity	76 %	24 %

73% respondents are not satisfied with their job. 82% respondents are not satisfied with their interpersonal connection with their employer and colleagues. While 76% respondents say that their productivity is affected because of gender discrimination.

Conclusion:

It can be concluded that maximum respondents are young female, living with their family and are graduate. Maximum respondents are not satisfied with their salary and do not get any extra rewards for their quality of work. Maximum respondents feel that they receive less opportunity as compared to men; their decisions are not taken into consideration while planning any event in the work place. Many feel that even being capable of top position they are not considered. This hampers the overall work environment. Maximum respondents are not satisfied with their interpersonal connection and it affects their productivity.

It can therefore be inferred that there is a negative and unproductive impact of gender discrimination on women in hotel industry.

References:

1. Saminathan V. "Gender Discrimination at Workplace", International Journal of Multidisciplinary Research E-ISSN: 2582-2160, Volume 5, Issue 6, December 2023.
2. Vaishnavi G., "Gender Inequality in Work place", International Journal of Novel Research and Development, Volume 8, Issue 11, November 2023, ISSN: 2456-4184.
3. Luther David, "Common Challenges in the Hospitality Industry in 2024",

   https://www.netsuite.com/portal/resources/articles/erp/hospitality-industry-challenges.shtml
4. Hosang G. H., "Gender Discrimination, Victimization and Women's Mental Health", Cambridge University Press, Volume 213, Issue 6, December 2018, pp: 682-684. https://doi.org/101192/bjp.2018.244
5. Jonathan A. S., "10 Tips to fight Gender Discrimination", 7th January 2015.
6. Silva S. "Gender Bias in Hospitality Sector: Female and Male Jobs", International Conference on Tourism Research, May 2023, Volume 6, Number 1, pp: 292-297.
7. Consequences of Gender Discrimination, October 24, 2024, "Sociology of Gender, Sociology of Inequality.

Eco Friendly LED Lighting for Organizations

Nita Shinde [*], Anil G. Beldar [**]

[*] Department of Physics, LAD & Smt. RP College for Women, Nagpur 440007, India
[**] Department of Chemistry, P. S. G. V. P. Mandal's S. I. Patil Arts, G. B. Patel Science and S. T. K. V. Sangh Commerce College, Shahada, Nandurbar 425409, India
Corresponding Author: nita.shinde29@gmail.com

Abstract

LED technology has a positive impact on the environmental and economic performance of organizations. This green technology is used to tackle various major challenges and helps to reduce pollution, can be a good source of energy .

This paper analyses use of energy efficient ,energy saving and eco friendly LED lighting . Currently used incandescent lighting and compact fluorescent lighting system in organizations have disadvantages of decrease in energy and global warming are replaced by green technology of LED lights which is possible by using inorganic phosphor LED materials. This paper analyses fundamental aspects of LED lights to evaluate the performance ,efficiency, lifetime; color rendering index(CRI), Internationaledel' Eclairage (CIE) Coordinates and correlated color temperature (CCT) of LEDs.

Keywords: Luminescence, characterizations, synthesis methods , LEDs

1. Introduction

Global warming, waste and air pollution, and climate change have effects on the environment, because of global warming and weather variations it causes destruction continuously in the world and hence the earth's temperature is rising, Earth's temperature has increased because of the massive emissions of greenhouse gases, such as carbon dioxide and carbon monoxide, which prevent heat from being transported into space by air. One of the developing nations that is substituting "Green Technology" for traditional technology in its operational operations. Additionally, countries are allocating a significant portion of their budgets to the production of green technology across all spending categories. So it is important to find an effective way to improve environmental quality and sustainability[1]. Energy-efficient technology which would significantly reduce energy waste and damage to the environment.[2]. Light Emitting Diodes offer a great potential to reduce carbon emissions. Green technology is defined as technology that is beneficial to the environment and is produced in such a way that it will help to protect the environment & natural resource.It leads to a reduction in monetary and social costs and a reduction in the pollution of greenhouse gases and other contaminants in the atmosphere. This would indirectly increase new production rates, particularly for developing countries such as India, because energy-efficient lighting is one of the most effective strategies for lowering CO2 emissions [2]. The government encourages the phasing out of incandescent light sources in buildings and to replace these with more

efficient technologies such as light-emitting diodes (LEDs) [3-4] To increase the use of energy, efficient products among organizations, the Indian government, Energy efficiency Action Plan (MAHAVITARAN) has been developed. This is an initiative to improve environmental quality and sustainability.

1.1 LED Lighting Technology

The development of ever-more-efficient methods to produce visible light in the required spectral area may be seen as the history of lighting. Among the conventional technologies created thus far are fluorescence and incandescence. Over the previous 200 years, all

of these technologies have advanced significantly, but they now seem to be reaching saturation at efficiency levels between 1 and 25%. [5]

LED lighting , a recently developed technology, has the potential to cut lighting energy consumption in half and make a major contribution to the country's climate change initiatives. Many researchers worldwide are conducting novel research to support the advancement of the scientific and technological basis required to realize the promise and potential of LED lighting. In actuality, there are several obstacles at every turn, and it is exceedingly difficult to effectively produce white light from semiconductor materials with band gaps that cover the visible spectrum. The lighting technologies in use today are briefly covered here.

1.1.1 Incandescent lamps

The incandescent lights are vacuum-filled tungsten filament lamps. It would not be convenient for circuits to fuse when a filament fracture occurs, which is the typical end of lamp life. Tungsten-halogen lamps include tungsten filaments, exactly like conventional incandescent lamps, but they also contain halogen gas inside of them. They emit a brighter, whiter light than conventional incandescent bulbs and are usually employed for ornamental and show reasons. They last two to four times longer than ordinary incandescent lights and are roughly twice as efficient as conventional incandescent lamps. The lifespan of incandescent bulbs is just 1000–2000 hours. Actually, only approximately 15% of the energy they utilize is discharged as heat and goes towards producing light. The least costly to purchase but the most expensive to run are incandescent lights.

1.1.2 Fluorescent lamps

The first mercury vapour lamp technology was created in 1901 by American Peter Cooper Hewitt (1861–1921), who also received a patent for it (U.S. Patents No. 682,690/9). General Electric created the first workable and practical fluorescent lamp (U.S. Patent No. 2,259,040), which was first offered for sale as a product in 1938.

These fluorescent lamps are made up of mixture of noble gases and mercury of vapour within a waterproof glass tube coated in phosphor of low pressure atmosphere. Because of the mercury present over there , the waste from these lamps is hazardous, and adequate management is required for both disposal and recycling [6]. Electron collides, which are emitted by two tungsten filaments with mercury atoms, activate this gas and generate UV radiation that is projected towards the phosphor coating that absorbs and fluorinates them, emitting other radiation in the visible spectrum. The filaments consume a significant amount of electrical power, generating heat. [7].

A potential replacement for incandescent light bulbs is the fluorescent lamp. There is some blue/green radiation coming from the fluorescent tube due to the low pressure of mercury vapor, however the majority of the radiation is in UV at 253.7 nm and 185 nm. The glass's inner wall features a tiny layer of phosphor coating, which is intended to capture UV light and transmit it into the visible spectrum. This process has an efficiency of about 50%. Fluorescent bulbs can last up to 20 times longer than conventional incandescent lamps and are roughly 3-5 times more efficient. Compact fluorescent lights, sometimes known as CFLs, are light-producing devices that employ gasses and phosphor inside the lamp to produce light. They come in a variety of sizes and shapes, with a lifespan of roughly 7,000 to 10,000 hours. Compared to an incandescent bulb, they convert 6.7-8.8% of input power to light, use 2.5 times less electricity, and last 8–10 times longer. The CFL operates at its best at 20.1C, and as the temperature drops, so does its efficiency.

1.1.3 Light-Emitting Diode Technology: LEDs

Table 1: Average distribution of the transformation of electrical energy in incandescent lamps, Fluorescent Lamps ,CFL and LEDs

Energy Conversion	Visible Light	Heat	Life Span	Efficiency(Lm/W)
Incandescent lamps	5- 10 %	90-95 %	1,200 hours	12–18
Fluorescent Lamps	25 %	75 %	20,000 hours	80-100
CFL	25-30 %	70-75 %	8,000 hours	60-70
LEDs	80-90 %	20 %	25,000 hours	64

LED technology is based on a semiconductor (diode) junction that emits photons when an electric field is applied to the material. The electric field produces the electrons and holes in the material, the recombination of which creates the photons. The wavelength of the light wavelength always depends on the energy band gap of the electron-hole recombination. By choosing the materials correctly and modifying the wavelength of the light by coating the LED package or bulb with a phosphor, an LED lamp is able to produce white light. White LED light can also be produced by mixing of colors, which are the combination of different colored LEDs (usually green ,red and blue). It may have numerous applications, LEDs of all colors generally have gallium (Ga), indium (In), and arsenic (As) in small amounts of by-product metals (Wilburn 2012).

LED lamps and luminaires are increasingly used in households, offices, and industrial and commercial buildings in place of incandescent and fluorescent lamps and luminaires.

A luminaire is a complete light fixture, it contains one or more lamps, their housing, and any necessary drivers or ballasts. Fluorescent technology needs a ballast to control the operation of the lamp, and LED technology requires a control gear and a driver that are integrated into the base. LED lamps are available in various colors, shapes, luminous intensity distributions, and luminous fluxes. Dimmable LED lamps are also becoming widely available. Luminescence is the emission of light by substances absorbing energies without heat generation, closely related to spectroscopy, which studies radiation absorption and emission laws. [8]. Owing to their extraordinary luminous qualities, phosphors doped with rare earth elements (RE) are essential to display technology. Excellent chemical and thermal stability, a long operating life, sharp peak emission band, and eco-friendliness are all features they provide. RE-doped phosphors fall into two main categories: those that emit light in both broad and narrow bands. These materials exhibit two interesting luminescence features: narrow emission lines and crystal field dependence. Narrow band emitting phosphors due to the transition between the 4f levels (Eu^{3+}, Eu^{2+}, Tb^{3+}, Gd^{3+}, Yb^{3+}, Dy^{3+}, Sm^{3+}, Tm^{3+}, Er^{3+}, Nd^{3+}, etc.) and broad band emission phosphors attributable to the 5d → 4f transition (Eu^{2+}, Ce^{3+}) [9]. It is possible to manipulate the doping concentration and preferred occupancy of RE ions at different crystallographic sites with different coordination numbers to modify the optical properties of the host materials. Luminescent materials can convert radiation energy from CRTs, UV light, and X-rays into visible or infrared light. They fall into three categories: host luminophore, host + activator, and host + sensitizer + activator. White LEDs are green lighting sources with a high luminescence efficiency, a long lifespan, and an environmentally friendly design. By 2020, The widespread use of LEDs benefits the environment by reducing global electricity

consumption. Solid-state lighting (SSL) saves significant amounts of energy, accounting for at least 20% of the country's total electricity, consumption. [10]

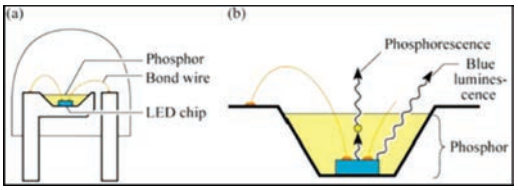


Fig. 1(A) Basic structure of LED consists of a diode (LED chip) and a phosphor.
(B) Electroluminescence is used to create blue emission which is combined and used to excite the appropriate phosphor [11], [12]

1. Synthetic methods for phosphors

Synthesis of luminescent materials can be challenging due to factors like incorporating activators, eliminating impurities, determining grain size and morphology, production costs, batch homogeneity, and reproducibility, which can impact the desired characteristics of the phosphors. The methods for preparing phosphors include various approaches.

(a) Novel Synthesis: Polymer pyrolysis method, Spray pyrolysis method, Spray drying method, Freeze-drying method, Laser ablation method, Sono chemical method, Sol-gel method, Combustion synthesis method, Solid state Metathesis method

(b) Solid State: Melting method, Molten Salt method, Solid State Diffusion method.

(c) Wet-Chemical: Co-precipitation method, Re-crystallization method

(d) Ethanol Centrifuge Technique: Co-precipitation method

3. Characterization techniques of LEDs

LED devices are characterized by CRT, CCT, CIE co-ordinates, luminous efficiency, Quantum efficiency, life time measure ments ,Life span etc To choose a suitable phosphor for LED fabrication. These are the key parameters, that need to be considered before using phosphors for LED applications. A brief description is as :

3.1 Color Rendering Index

CRI measures a light source's ability to reflect color accurately, with Ra ranging from 0 to 100. High CRI (Ra≈100%) ensures clear visibility in daylight, while industrial applications require phosphor with high CRI values.

3.2 CIE chromaticity coordinates

The Commission International de I'Eclairage (CIE) chromaticity coordinate system describes color composition in terms of three primaries (RGB). Three models have been proposed: CIE 1931, CIE 1960, and CIE 1976. CIE chromaticity coordinates are a set of co-ordinates (x, y, z) representing artificial colors. The primary colors red, blue, and green are represented as (0.67, 0.33), (0.14, 0.08), (0.21, 0.71), respectively, while pure white is represented as (0.33, 0.33).

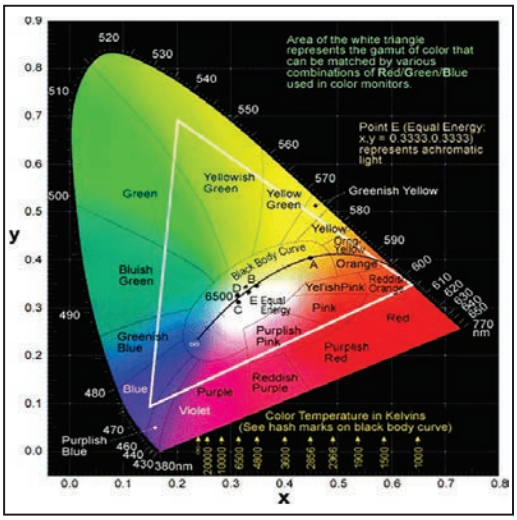


Fig. 2. CIE chromaticity diagram.

3.3 Correlated colour temperature (CCT)

Correlated colour temperature (CCT) is the black body's absolute temperature that is comparable to the chromaticity of the light source. The widely used incandescent light bulb produces light by way of heat radiation.

Nonetheless, luminescence emanates from several sources of light. It defines the properties of light's colour, which are usually warm (yellowish) or cool (bluish). Warmer light is indicated by a low CCT (2500-3500 K), whereas cooler light (blue light) is indicated by a high CCT (5000 K). [13], [14].

3.4 Luminous efficacy

Luminous efficacy is the conversion of energy into light, expressed in lumens per watt (lm/W). It contradicts the CRI, as a high CRI requires proper spectral dispersion, making luminescence efficiency low. [15].

3.5 Quantum efficiency

Quantum efficiency, also known as quantum yield, is the ratio of photons emitted to absorbed in a phosphor material. Synthesized phosphors were used in LED fabrication, influencing the External Quantum Efficiency (EQE) of the device. Key parameters include injection efficiency, internal quantum efficiency, and extraction efficiency, which affect the EQE of the LED. These factors influence the number of photons emitted and absorbed in the device.

4. Conclusion:

Technology and digitalization highlight global power generation and consumption issues, with lighting accounting for 20% of total power output. Low power consumption LED light sources are crucial for the next generation of illumination. Due to their improved stability, intense luminous efficiency, low power consumption, thermal resistance, environmentally friendly manufacturing process, and appealing appearance, single phase component phosphor assemblies with UV or n-UV excitable LEDs have drawn attention for practical applications inside and outside classrooms.

References

1. Rostamzadeh, R.; Govindan, K.; Esmaeili, A.; Sabaghi, M.. Ecol. Indic. 2015, 49, 188–203. [CrossRef]
2. Zailani, S.; Govindan, K.; Iranmanesh, M.; Shaharudin, M.R.; Chong, Y.S.

   J. Clean. Prod. 2015, 108, 1115–1122. [CrossRef]
3. Halonen, L.; Tetri, E.; Bhusal, P. Guidebook on Energy E_cient Electric Lighting for Buildings; Department of Electrical Engineering, Aalto University: Espoo, Finland, 2010.
4. Jaafar, N.; Sulaiman, A.; Moghavvemi, S.; Tajudeen, F.; Dehdar, F. Light. Res. Technol. 2020. [CrossRef]
5. N. Thejokalyani a, S.J.Dhoble, Renewable and Sustainable Energy Reviews 32 (2014) 448–467
6. Lecler, M.T.; Zimmermann, F.; Silvente, E.; Masson, A.; Morèle, Y.; Remy, A.; Chollot,. Waste Manag. 2018, 76, 250–260. [CrossRef].
7. Thomson, G. The Museum Environment, 2nd ed.; Elsevier Science: Burlington, VT, USA, 2013; ISBN 13-978-0750620413. [CrossRef].
8. D.R. Vij. Luminescence of solids Plenum Press New York, USA 131 (1998).
9. Nazarov M, Noh DY. Rare earth double activated phosphors for different applications. J Rare Earths 2010;28:1–11.
10. M.D. Mehare , Chaitali M. Mehare, H.C. Swart , S.J. Dhoble , Progress in Materials Science 133 (2023) 101067
11. D. Chitnis, N. Thejo, H.C. Swart, S.J. Dhoble, Renew. Sust. Energ. Rev. 64 (2016) 727–748.
12. Abhijeet R. Kadam and S.J. Dhoble , Functional Materials from Carbon, Inorganic, and Organic Sources

    https://doi.org/10.1016/B978-0-323-85788-8.00008-2
13. Zhang J, Hua Z, Zhang F. excitation. Ceram Int 2015;41:9910–5.
14. Huang CH, Chen TM, Liu WR, Chiu YC, Yeh YT, Jang SM. ACS Appl Mater Interfaces 2010;2:259–64.
15. Nair GB, Swart HC, Dhoble SJ.Prog Mater Sci 2020;109:100622.

ACTIVATED CHARCOAL IN COSMETICS : A STUDY

***Dr. S. Pandhare, **P. Maithy**

[*]M.Tech , Ph.D, P.G.Diploma (Quality Assurance of Cosmetics),
L.A.D. & Smt. R.P. College for Women, Nagpur
[**]M.Tech (Cosmetic Technology) L.A.D. & Smt. R.P. College for Women, Nagpur.

Abstract

Activated charcoal, known for its highly porous structure and extensive surface area, has garnered significant attention in the cosmetic industry for its purported detoxifying and purifying properties. The study explores the various applications and benefits of activated charcoal in cosmetic gel.

Activated charcoal is widely used in facial masks, cleansers, and exfoliants due to its ability to absorb toxins, impurities, and excess oils from the skin1. This detoxifying effect helps in reducing acne, blackheads, and other skin imperfections, promoting a clearer and healthier complexion. Additionally, its mild abrasive properties make it a popular ingredient in exfoliating scrubs, aiding in the removal of dead skin cells and enhancing skin texture2.

Activated charcoal is incorporated into toothpaste and teeth whitening products for its potential to adsorb plaque and stains, contributing to a brighter smile3. Its antibacterial properties also assist in maintaining oral hygiene by reducing bad breath and preventing gum disease3.

Activated charcoal offers promising advantages, it is crucial to consider formulation concentrations, potential skin sensitivity, and long-term effects. Further research is needed to fully understand the mechanisms behind its cosmetic benefits and to establish standardized guidelines for its safe and effective use.

Introduction

ACTIVATED CHARCOAL MILLIGLOBULES THE CONCEPT:

PROTECT – CLEANSE – DETOXIFY

Skin is exposed daily to pollutants, dirt, excess oil and toxins that if not captured and neutralized can cause inflammation, discoloration and premature aging. milliglobules with Activated Charcoal was designed to help absorb and neutralize contaminants by purifying the skin and keeping it clean and radiant [1]. Activated Charcoal milliglobules are a spherical delivery system that allows formulating with all the benefits of Activated Charcoal without having to create a dark formulation.

An effective ingredient for skin protection, cleansing and detoxification Activated Charcoal is charcoal that has been treated with oxygen to increase its porosity and absorbance capacity. Each charcoal particle provides a large surface area, in fact, 1g of activated charcoal contains a surface area of about 890 square meters [2]. When in contact with the skin, Activated Charcoal can soak up excessive sebum to help cleanse the skin. It also has a protective and detoxifying role by entrapping and removing pollutants such as volatile organic compounds or by capturing heavy metals and toxins absorbed by the body and excreted through sweat. [3]

ACTIVATED CHARCOAL - MECHANISMS OF ACTION ON THE SKIN:

1. Adsorption: Activated charcoal has a porous structure with a large surface area that allows it to adsorb (not absorb) substances onto its surface. [4] This property helps in trapping dirt, toxins, pollutants, and excess oils from the skin.

2. Unclogging pores: Due to its adsorptive properties, activated charcoal can help draw out impurities and unclog pores. [5] This makes it effective in skincare products aimed at treating acne and blackheads.

3. Oil balancing: Activated charcoal can absorb excess oil from the skin's surface, which can help

in managing oily skin and reducing shine[9].

4. Exfoliation: Some skincare products with activated charcoal particles or charcoal-based scrubs can provide gentle exfoliation, removing dead skin cells and promoting a smoother complexion.[6]

5. Antibacterial properties: Activated charcoal has been shown to have antibacterial properties, which can be beneficial for acne-prone skin by helping to reduce bacteria on the skin's surface.[7-8]

6. Soothing and calming: In some formulations, activated charcoal can have a soothing effect on the skin, making it suitable for sensitive or irritated skin types. [9-10]

Experimental

FORMULATION AND DEVELOPMENT OF ACTIVATED CHARCOAL MILLIGLOBULE

Carbopol is preferred in gel formulations for several reasons rooted in its unique properties and performance characteristics. Carbopol polymers are highly efficient thickeners, capable of creating gels with a wide range of viscosities. This versatility allows formulators to tailor the consistency of the gel to meet specific application needs, from thin lotions to thick gels. Carbopol gels exhibit excellent clarity and transparency, which are desirable for cosmetic and pharmaceutical products where appearance matters. This clarity enhances the aesthetic appeal of the product and contributes to a pleasant user experience. Another significant advantage of Carbopol is its shear-thinning behaviour, meaning the viscosity decreases during application, facilitating smooth application and spreadability. This property ensures that the gel can be easily dispensed and evenly distributed over the skin.

Hence it was decided to prepare clear gel base formula for the incorporation of Activated charcoal milliglobules as an active.

Formulation of Gel Base:

Trial formulation was prepared by changing the concentration of Carbopol 940 and Triethanolamine.

Formulation Table 1

Sr. No.	Ingredients	F1 %	F2 %	F3 %
1.	Carbopol 940	0.5	0.8	1.0
2.	Propylene glycol	4.0	4.0	4.0
3.	Glycerin	-	4.0	4.0
4.	Sodium Benzoate	0.2	0.2	0.2
5.	Triethanolamine	0.5	0.8	1.0
6.	Purified Water	Up to 100	Up to 100	Up to 100
7.	Activated Charcoal	1.0	1.0	1.0

Preparation of exfoliating gel:

The following general procedure was followed for the preparation of different trials of gel.

Phase l. Carbopol was sieved properly and dispersed in small amount of water and then it was allowed to swell for half an hour

Phase 2. Sodium benzoate was dissolved in small amount of water.

Phase 3. TEA was well dissolved in a small quantity of water. After the Phase I and Phase 2 were uniformly mixed, TEA was added till the required pH was obtained.

Observation

Formulation (F1): - Base 1 trial was hazy in appearance and low viscosity. This might be lower concentration of Carbopol & TEA. Therefore, it was not selected for the final product development.

Formulation (F2): - Base 2 trial was not giving proper transparency and have low viscosity. This might be improper ratio of Carbopol and TEA.

Formulation (F3): - The consistency of Base 3 trial was gel like. The ratio of Carbopol and TEA was kept to be at 1:1. Therefore, it was selected for the final product development.

Final Formulation Table 2 for F3

Sr. No.	Ingredients	F3 %	For 50 gms
1.	Carbopol 940	1.0	0.5
2.	Propylene glycol	4.0	2.0
3.	Glycerin	4.0	2.0
4.	Sodium Benzoate	0.2	0.1
5.	Triethanolamine	1.0	0.5
6.	Purified Water	Up to 100	44.4
7.	Activated Charcoal	1.0	0.5

Result:

The formulated gel was evaluated for its rheological characteristics and stability parameters for one month. Preformulation studies were carried out for testing the stability of milliglobules for which organoleptic properties such as colour, odour, and texture were examined and the pH, solubility; melting point tests were also done. There were no separation observed and the product was stable and can be recommended for further studies.

Exfoliating gels enriched with activated charcoal milliglobules represent a pivotal advancement in modern skincare, harnessing the purifying and detoxifying properties of activated charcoal for effective skin cleansing and gentle exfoliation. These products have demonstrated their ability to efficiently lift impurities, pollutants, and excess oils from the skin's surface, making them particularly valuable for individuals grappling with oily skin and recurring acne. The formulation with milliglobules ensures an even distribution and controlled application, which not only enhances user experience but also minimizes the risk of irritation, distinguishing them from traditional abrasive scrubs. The enthusiastic reception from consumers underscores a growing demand for skincare solutions that combine efficacy with sensitivity towards skin health and environmental impact, emphasizing the importance of ongoing research to refine formulations and meet evolving consumer expectations for natural and sustainable skincare alternatives.

In conclusion, this study has explored the formulation of Exfoliating gel with incorporation of Activated Charcoal Milliglobules. The gel prepared was found to be stable and activated charcoal particles or charcoal-based gels can provide gentle exfoliation, removing dead skin cells and promoting a smoother complexion.

REFERENCES

1. Vaibhav A. Borase, Rahul S. Kapadnis, Ashok Y. Chaudhari, Dr. Rishikesh S. Bachhav, A Review on Novel Drug Delivery System, Journal of Emerging Technologies and Innovative Research, 2020, 20.

2. Yahya Rahimpour and Hamed Hamishehkar, Liposomes in cosmeceutics, Informa UK, 2012, 444.

3. Liu, P.; Chen, G.; Zhang, J. A Review of Liposomes as a Drug Delivery System: Current Status of Approved Products, Regulatory Environments, and Future Perspectives. Molecules 2022, 27, 1372.

4. Rajesh z. Mujoriya, Kishor dhamande, Dr.Ramesh babu bodla, Niosomal Drug Delivery System – A Review, International Journal of Applied Pharmaceutics, 2011, 7 & 9.

5. Reshmy Rajan, Shoma Jose, V. P. Biju Mukund, Deepa T. Vasudevan, Transferosomes – A vesicular transdermal delivery system for enhanced drug permeation, Journal of Advanced Pharmaceutical Technology & Research, 2011, 139.

6. S. D Mankar, Gayatri Mahale, Review on Microsponges a Novel Drug Delivery System, Asian Journal of Pharmaceutical Research, 2022, 242

7. Dr. S. Kulkarni, Dr.V.Meghre, Practical Cosmetic Microbiology, Denett & Co., 2011, 90.

8. J.B Moore R.J, Wilkinson, Harry's Cosmeticology, 7th edition, Chemical Publishing Company, 2008, The Skin : 5.

9. Soumia Belouafa, Fatima Habti, Saïd Benhar, Bouchaïb Belafkih, Souad Tayane, Souad Hamdouch, Ahmed Bennamara, and Abdelmjid Abourriche Laboratory of Biomolecules and Organic Synthesis, Department of Chemistry, Faculty of Sciences Ben M'Sik, University Hassan II of Casablanca, Avenue Driss El Harti B.P 7955, Sidi Othmane Casablanca, Morocco

10. Development and Evaluation of Stability of a Gel Formulation Containing the Monoterpene Borneol Milla Gabriela Belarmino Dantas, 1 Silvio Alan Gonçalves Bomfim Reis, 1Camila Mahara Dias Damasceno,1 Larissa Araújo Rolim, 1 Pedro José Rolim-Neto, 2 Ferdinando Oliveira Carvalho, 3 Lucindo José Quintans-Junior, 4 and Jackson Roberto Guedes da Silva Almeida1 , *

Recent Advances and Challenges in Plastic Waste Recycling: A Review

Spruha A. Gharad*

*L.A.D. and Smt. R. P. College for Women, Nagpur-440010 (India)
Email id- spruhagharad@gmail.com
Contact no. 9405200694

Abstract

The growing environmental concerns over plastic waste have driven significant research and technological advancements in recycling. This review summarizes recent progress in plastic recycling, focusing on emerging technologies, innovative strategies, and their environmental, economic, and social implications. It highlights breakthroughs in mechanical, chemical, and biological methods, including advanced sorting, novel chemical processes, and enzymatic biocatalysis. Challenges such as contamination, cost constraints, and infrastructure gaps are critically examined, along with the environmental impacts of recycling methods, including energy use and emissions. This work aims to guide stakeholders toward effective strategies for reducing plastic waste and promoting a sustainable future.

Keywords: plastic waste, plastic recycling, chemical recycling, biological recycling, enzymatic biocatalysis, environmental impact

Introduction:

Plastics, known for their lightweight, durability, and cost-effectiveness, are versatile materials easily moulded into a diverse array of products for various applications. With their prevalence in everyday items, especially in food packaging and essential goods, plastics play an essential role in numerous industries, including construction, engineering, medical, automotive, and aerospace. The initial synthetic plastics were polystyrene (PS) in 1839, polyvinyl chloride (PVC) in 1835, and Bakelite in 1907 [1]. The significant expansion of industrial plastic production began around 1950 when global output reached 2 million tons annually. [2] Presently, global plastic production stands at approximately 380 million tons per year, with projections suggesting that over 30,000 million tons will be produced by the end of 2050. This growth can be attributed to three primary factors [3] 1. the development of new plastic materials with altered structures and processing conditions for novel applications, 2. increased plastic usage in developing economies due to economic improvements, and 3. a reduction in plastic production costs facilitated by inexpensive fossil feedstocks.

The majority of plastics exhibit a non-biodegradable nature rendering them exceptionally durable.[4] Even plastics labelled as degradable may persist over an extended period, influenced by local environmental conditions such as ultraviolet light exposure, oxygen levels, and temperature variations. [5] Biodegradable plastics, on the other hand, necessitate the presence of specific micro-organisms for degradation. Consequently, degradation rates vary significantly across landfills, terrestrial environments, and marine ecosystems.[6] When plastic items undergo weathering-induced degradation, they initially break down into smaller plastic debris pieces. However, the polymer itself may not fully degrade within a meaningful timeframe. This phenomenon results in the accumulation of substantial quantities of end-of-life plastics in landfills and as debris in the natural environment, giving rise to both waste management challenges and environmental damage. [7-9]

In the past few years, the plastic production has increased manifold and so does the plastic waste, but the problematic issue is that most of the plastic waste is going to the landfills

or clogging our water bodies. In developed nations, landfills often feature robust plastic covering to prevent environmental leakage. [10] Conversely, less developed countries commonly utilize open landfills, making it easier for plastic to seep into the environment. In the United States, which boasts a modern solid waste disposal system, an estimated 0.98–1.26 million metric tons of plastic (equivalent to 2.33–2.99% of generated plastic waste) leak into the environment. [10] Natural disasters, such as the 2011 Tohoku earthquake and tsunami in Japan, contribute significantly to plastic waste in the environment, depositing an estimated 5 million tons of debris into the ocean. By 2030, it is projected that a staggering 58.4 million tons of plastics will enter the world's oceans annually. [11]

Recycling serves not only as a waste-management strategy but also aligns with the concept of industrial ecology, akin to natural ecosystems where there are no wastes, only products.[12] In the context of plastics, recycling emerges as a means to mitigate environmental impact and curb resource depletion. Essentially, a substantial focus on recycling, coupled with reductions in use, reuse, repair, or re-manufacturing, enables maintaining a certain level of product service with lower material inputs than would otherwise be necessary. This comprehensive approach diminishes energy and material usage per unit of output, fostering enhanced eco-efficiency.

This review encompasses a comprehensive examination of the swiftly advancing field of plastic recycling methodologies, encompassing mechanical recycling, chemical recycling, depolymerization, biological recycling, and waste-to-energy strategies. This study illuminates the imminent challenges and provides insights into future directions for the sustainable management of the booming plastic waste generation.

Types of Plastics:

Various types of plastics designed for a wide range of applications are accessible in the market. However, only certain plastics fall into the recyclable category, specifically thermoplastics such as PET (polyethylene terephthalate), HDPE (high-density polyethylene), LDPE (low-density polyethylene), PVC (polyvinyl chloride), PP (polypropylene), and PS (polystyrene). Thermosetting plastics and synthetic fibers, including multilayer and laminated plastic, Teflon, PUF (polyurethane foam), Bakelite, polycarbonate, melamine, and nylon, belong to the non-recyclable category.

Plastics are further categorized based on particle size as follows:

- Nanoplastics: particle size < 0.0001 mm
- Small microplastics: particle size 0.00001–1 mm
- Large microplastics: particle size 1–4.75 mm
- Mesoplastics: particle size 4.76–200 mm
- Macroplastics: particle size > 200 mm

The Society of the Plastics Industry (SPI) has designated codes 1–6 for various thermoplastics to facilitate the identification of the polymer used in manufacturing different materials and to streamline the recycling process. Table 1 illustrates the classification of various plastics along with some of their common applications. [13]

Recent Plastic Recycling Techniques:

The efficient recycling of plastic waste is a crucial aspect of the plastics industry's shift towards a circular economy. Recycling plastic contributes to reduce energy consumption and greenhouse gas emissions, promoting a sustainable manufacturing process and incorporating discarded plastic materials into the circular economy. The recycling of plastic waste, coupled with the creation of new plastic materials for reuse, stands as a key sustainability

Table 1: Society of the Plastics Industry Codes: Structures and Common Applications

SPI Code	Energy Conversion	Structure	Applications
1	Polyethylene terephthalate (PET)	1 PETE	Soda bottles, water bottles, medicine jars, food packaging
2	High-density polyethylene (HDPE)	2 HDPE	Soap dispenser, detergent containers, trash bags, bleach bottles
3	Polyvinyl chloride (PVC)	3 V	Plumbing pipes, cables, thermal insulation, food foils
4	Low-density polyethylene (LDPE)	4 LDPE	Bubble wrap, squeezable bottles, frozen food bags
5	Polypropylene (PP)	5 PP	Plastic straws, bottle caps, reusable food containers, packaging tape
6	Polystyrene (PS)	6 PS	Styrofoam, plastic cutlery, CD cases, disposable cups
7	Other	7 OTHER	Baby feeding bottles, fibreglass, 5-gallon water bottles

advantage. Recycling plastic waste involves four primary approaches: primary, secondary, tertiary, and quaternary recycling. Each recycling technique plays a significant role in generating new polymer, but they come with their own set of advantages and disadvantages. **Figure 1** represents diverse plastic waste recycling techniques. [14]

1. Primary recycling:

Primary recycling, also known as re-extrusion [15] or the closed-loop process, [16] involves recycling uncontaminated, single-type polymers with properties close to those of virgin materials. [17] This method utilizes scrap plastics that closely resemble the original products and is applicable to clean or semi-clean scrap after effective contamination removal. Typically, municipal solid waste (MSW) is unsuitable for primary recycling due to excessive contamination. [18] To enhance properties compared to virgin material, clean scrap is sometimes introduced into collected waste. This technique is popular among manufacturers as it allows the conversion of plastic waste into products of original quality. It generally involves injection moulding and other mechanical recycling techniques, differing primarily in the quality of the material. [19]

2. Secondary recycling:

Primary and secondary recycling methods, which are widely adopted, are integral to mechanical recycling practices for plastic and are employed in the recycling of post-consumer plastic waste (PSW) through mechanical means. [20-21] Secondary recycling involves transforming materials mechanically for the production of less demanding products.

2.1 Mechanical Recycling:

Mechanical recycling, also known as secondary or material recycling, transforms plastic waste through physical processes into secondary plastic materials. This multistep process involves collection, sorting, heat treatment, re-compounding, and extruding to produce recycled material. [22] While capable of handling single-polymer plastics like PVC, PET, PP, and PS, it is a dominant technique for post-

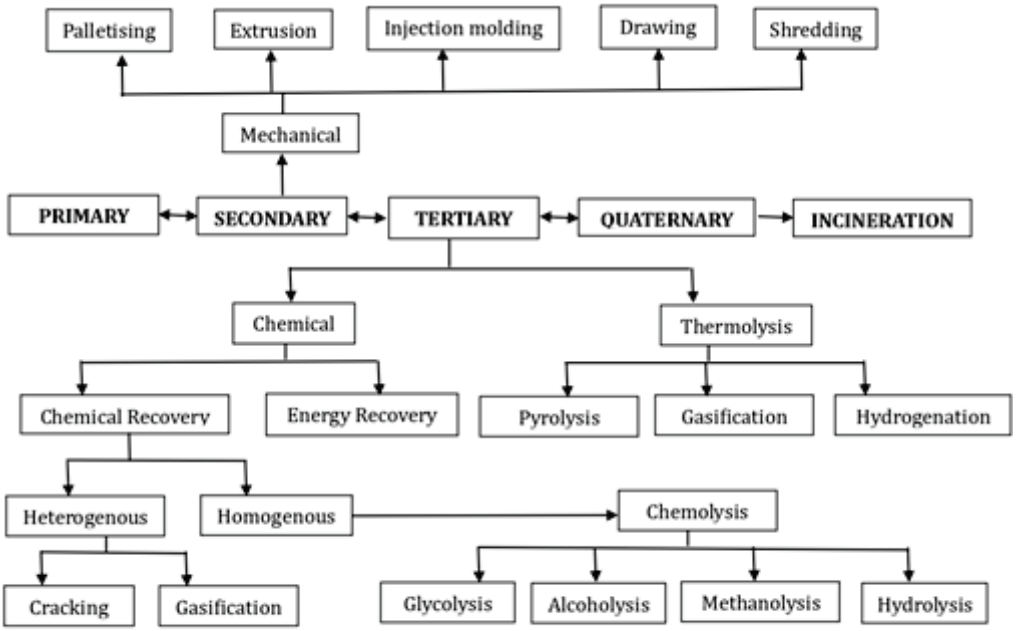


Fig 1: Diverse Plastic Recycling Techniques

consumer plastic packaging waste. Sorting methods include zig-zag, air tabling, ballistic, gravity separation, froth flotation, and electrostatic separation. Newer sensor-based technologies, like plastic colour sorting and near-infrared, are also available. [23] After sorting, plastics are melted and moulded or re-granulated for direct reuse. During the re-granulation process, shredded plastic undergoes melting before being transformed into granules. [24]

3. Tertiary recycling:

Primary and secondary recycling techniques can sometimes be challenging to execute, involving the identification and sorting of materials through various methods. Both primary and secondary techniques do not align with the principle of energy sustainability. In contrast, tertiary recycling demonstrates a contribution to energy sustainability by generating raw materials from which plastics are originally made, garnering attention from recyclers.

Tertiary recycling also known as Chemical recycling involves various methods of recycling:

3.1 Thermolysis:

It involves treating plastic solid waste with controlled heat without the use of catalysts. This process can be categorized into advanced thermochemical techniques such as

3.1.1 Pyrolysis (thermal cracking in an inert atmosphere):

Pyrolysis stands out as the most promising avenue among various chemical recycling methods. It involves subjecting the feedstock material to moderate temperatures (typically between 300 and 700 °C), depending on the type of feedstock and reactor, in an inert and oxygen-free setting, leading to its degradation. The pyrolysis process is an advanced conversion technology capable of generating a clean, high calorific value gas from a diverse range of waste and biomass streams. Various forms of pyrolysis, characterized by differing reaction times, have been devised, including fast, catalytic fast,

intermediate, slow, and vacuum pyrolysis. [25] This process involves controlling the heat flow and pressure, resulting in the degradation of the long chains of organic materials into smaller and less complex molecules. [26] The outcome of plastics pyrolysis comprises liquids (condensable vapours or oil), solids (char), and gases (non-condensable).

3.1.2 Gasification:

Gasification processes have the capability to transform various organic solid materials (such as coal, biomass, plastics, and organic waste) into a gaseous blend containing carbon monoxide (CO), hydrogen (H_2), carbon dioxide (CO_2), and methane (CH_4) through partial oxidation. [27-28] Gasification is commonly performed in the presence of either pure oxygen or air and steam, under temperatures ranging from 700 to 1500 °C and atmospheric pressure. [29-30] Gasification stands as a mature technology, and the growing focus on its application in biomass conversion propels the creation of more effective and sustainable solutions.

3.1.3 Hydrogenation (Hydrocracking):

The hydrocracking process is employed in transforming heavy plastic molecules into lighter molecules. It occurs in the presence of hydrogen, facilitating the cleavage of carbon-carbon bonds while successive hydrogenating unsaturated molecules formed during the process. [31] Hydrocracking stands out as a particularly promising technique for converting waste plastics into high-quality liquid fuels. Its advantages over pyrolysis and catalytic cracking are noteworthy as it yields a highly saturated liquid product directly usable as transportation fuel or fuel oil for energy generation, without the need for further processing. [32-33]

3.2 Depolymerization:

Depolymerization of plastics involves a chemical process that recovers various monomer units, allowing them to be reused in new plastics manufacturing or converted into their raw monomeric forms through methods such as hydrolysis, glycolysis, and alcoholysis. [34] This technique is commonly employed to extract monomers from recoverable resin grades, including PET, polyamides like nylons, and polyurethanes, yielding excellent results. Through chemical recycling, depolymerization transforms plastic polymers into sulfur-free liquid power sources, enabling energy recovery from plastic wastes. [35]

Plastic solid waste recycling through chemical methods involves a range of technologies, such as hydrolysis, glycolysis, fractionation, hydroglycolysis, aminolysis, methanolysis, and acid cleavage.

3.3 Biological Recycling:

Bio-recycling, an emerging technology, employs microorganisms like bacteria or fungi to decompose plastic into its fundamental components, enabling their reuse. This process involves microorganisms breaking down waste polymer materials and utilizing biological processes such as anaerobic digestion or photosynthesis to create new materials. Plastics waste (PW) can undergo biological recycling through two methods: aerobic composting and anaerobic digestion. [36] Biodegradable plastics can effectively serve in numerous other applications after their initial use (Panda et al. 2010). [37]

Enzymatic biocatalysis is gaining prominence as an environmentally friendly substitute for traditional plastic treatment and recycling techniques. [38] Enzymatic transformation of plastic waste could function under milder reaction conditions involving lower temperatures and pressures compared to chemical recycling methods, thereby markedly decreasing energy and reagent usage. Enzymatic biocatalysis breaks down plastic substrates into oligomers and monomers, which can be retrieved as raw materials for producing new plastic goods or synthesizing other valuable

chemicals in a circular economic approach. The majority of reported enzymes target hydrolysable plastics like polyesters, polyamides, and polyurethanes. [39-40]

4. Quaternary recycling:

As plastic waste undergoes multiple recycling cycles through primary, secondary, and tertiary methods, its properties gradually degrade. Eventually, when the material becomes unusable, traditional disposal methods like landfilling are employed, posing risks of surface contamination. However, for more efficient waste management, quaternary recycling emerges as a viable solution. With advancements in incineration technology, municipal solid waste (MSW) disposal via combustion is on the rise. [41] In quaternary recycling, waste materials are processed for energy recovery through incineration, resulting in waste volume reduction, with the remaining residue potentially being landfilled.[42] Energy recovery through incineration becomes a practical option when conventional recycling methods are constrained. [15]

Challenges in Plastic Recycling:

Recycling waste plastics remains a formidable challenge within the waste management sector despite concerted efforts from industrialists and waste management specialists. Regrettably, the majority of recyclable plastics still find their way into landfills. Once disposed of in landfills, plastic materials become intermixed with soil and undergo an extremely slow decomposition process, spanning hundreds of years. One proposed strategy for mitigating landfill waste involves substituting conventional plastics with biodegradable alternatives. While biodegradable plastics possess structures that can be broken down by soil microbes, this method hampers the recovery of monomers, and its long-term environmental impacts are yet to be fully understood. Oxo-degradable plastics, a significant category within bioplastics, face challenges stemming from their tendency to degrade quickly into microplastics under favourable conditions such as sunlight and oxygen exposure. [43]

The degradation and variability of plastic waste present notable challenges for recyclers engaged in mechanical recycling. In numerous instances, recycled plastics lack the identical mechanical characteristics as virgin materials, leading to several challenges in recycling both mono and mixed plastic waste. Moreover, the endeavour to devise innovative technologies for eliminating volatile organic compounds to enhance the quality of recycled plastics stands as a pivotal technological obstacle in mechanical recycling. [44] Additionally, social and economic challenges include sorting mixed plastics, insufficient investments, legislative gaps, and concerns about the quality of recycled products [45]

In chemical recycling, processing mixed waste presents a formidable challenge due to the complexity of reactions, as various types of polymers exhibit vastly different spectra during degradation pathways The inclusion of PVC in the waste stream exhibits additional complications due to its density and the release of hydrochloric acid (HCl) during processing, leading to incomplete segregation. [27] Moreover, challenges in chemical recycling arise from factors such as unstable waste supply, inadequate reactor technology, and the presence of inorganic materials in the waste stream. [45] Furthermore, obstacles such as insufficient investments, the generation of by-products, and the use of metal-based catalyst systems add to the complexities of chemical valorisation in plastic waste management. [43-44]

Research findings suggest that many plastic waste recycling technologies have adverse environmental impacts, contributing to air, water, and land pollution. Literature indicates that methods such as incineration and landfill disposal are environmentally detrimental. Moreover, conventional PW recycling processes

are associated with significant greenhouse gas emissions, posing risks to society.

Conclusion:

The review provides an in-depth analysis of various methods for managing waste plastic, along with the challenges hindering the establishment of a sustainable policy for plastic waste management. The diverse recycling methods outlined in this paper have significantly enhanced the environmental profile of waste management, especially in the realm of plastic waste recycling, treatment, and recovery. Reusing and reducing the consumption of single-use plastic materials are undoubtedly advantageous steps in addressing the present environmental challenges. Recent encouraging trends indicate increased plastic recycling rates globally, resulting in reduced waste in landfills and oceans. This progress paves the way for a more robust circular economy for plastics.

REFERENCES

1. Thompson, R. C., Swan, S. H., Moore, C. J. and Vom Saal, F. S. (2009). Our Plastic Age. *The Royal Society Publishing*, *364*, 1973–1976.
2. R. Jambeck, J. R., & Law, K. L. (2017). Production, use, and fate of all plastics ever made. *Science advances*, *3*(7), e1700782.
3. Ragauskas, A. J., Huber, G. W., Wang, J., Guss, A., O'Neill, H. M., Lin, C. S. K., ... & Meng, X. (2021). New technologies are needed to improve the recycling and upcycling of waste plastics. *ChemSusChem*, *14*(19), 3982-3984.
4. dy, A. L. (1994). Assessment of environmental biodegradation of synthetic polymers. *Journal of Macromolecular Science, Part C: Polymer Reviews*, *34*(1), 25-76.
5. Swift, G., Wiles, D. (2004). Degradable polymers and plastics in landfill sites. *Encyclopedia Polym. Sci. Technol. 9*, 40–51.
6. Kyrikou, I., & Briassoulis, D. (2007). Biodegradation of agricultural plastic films: a critical review. *Journal of Polymers and the Environment*, *15*, 125-150.
7. D. K., Galgani, F., Thompson, R. C., & Barlaz, M. (2009). Accumulation and fragmentation of plastic debris in global environments. *Philosophical transactions of the royal society B: biological sciences*, *364*(1526), 1985-1998.
8. M. R. (2009). Environmental implications of plastic debris in marine settings—entanglement, ingestion, smothering, hangers-on, hitch-hiking and alien invasions. *Phil. Trans. R. Soc. B, 364,* 2013–2025.
9. Ryan, P. G., Moore, C. J., Van Franeker, J. A., & Moloney, C. L. (2009). Monitoring the abundance of plastic debris in the marine environment. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *364*(1526), 1999-2012.
10. C. H. (2001). Waste containment: Strategies and performance. *Australian Geomechanics*, *36*(4), 1-25.
11. Law, K. L., Starr, N., Siegler, T. R., Jambeck, J. R., Mallos, N. J., & Leonard, G. H. (2020). The United States' contribution of plastic waste to land and ocean. *Science advances*, *6*(44), eabd0288.

(11). National Academies of Sciences, Engineering, and Medicine. (2021). *Reckoning with the US role in global ocean plastic waste*.

12. R. A., & Gallopoulos, N. E. (1989). Strategies for manufacturing. *Scientific American*, *261*(3), 144-153.
13. Lamba, P., Kaur, D. P., Raj, S., Sorout, J. (2022). *Environmental Science and Pollution Research, 29*, 86156–86179.
14. Singh, N., Hui, D., Singh, R., Ahuja, I. P. S., Feo, L., & Fraternali, F. (2017). Recycling of plastic solid waste: A state of art review and future applications. *Composites Part B: Engineering*, *115*, 409-422.
15. S. M., Lettieri, P., & Baeyens, J. (2009). Recycling and recovery routes of plastic solid waste (PSW): A review. *Waste management*, *29*(10), 2625-2643.
16. Sadat-Shojai, M, Bakhshandeh G.R. (2011). Recycling of PVC wastes. *Polymer Degradation and Stability*, *96*(4), 404-415.
17. Kumar, S., Panda, A. K., & Singh, R. K. (2011). A review on tertiary recycling of high-density polyethylene to fuel. *Resources, Conservation and Recycling*, *55*(11), 893-910.
18. Yu, J., Sun, L., Ma, C., Qiao, Y., & Yao, H. (2016). Thermal degradation of PVC: A review. *Waste management*, *48*, 300-314.29. Lopez, G., Artetxe, M., Amutio, M., Alvarez, J., Bilbao, J., & Olazar, M. (2018). Recent advances in the gasification of waste plastics. A critical overview. *Renewable and Sustainable Energy Reviews*, *82*, 576-596.
19. C. (2008) Intelligent recycling (presentation). Department of engineering. Institute for Manufacturing, University of Cambridge.
20. S. M., Lettieri, P., & Baeyens, J. (2010). The valorization of plastic solid waste (PSW) by primary to quaternary routes: From re-use to energy and chemicals. *Progress in Energy and Combustion Science*, *36*(1), 103-129.

21. Mastellone, M.L. (1999). Thermal treatments of plastic wastes by means of fluidized bed reactors. Ph.D. thesis. Italy: Department of Chemical Engineering, Second University of Naples.
22. Ragaert, K., Delva, L., & Van Geem, K. (2017). Mechanical and chemical recycling of solid plastic waste. *Waste management*, *69*, 24-58.
23. Ministry of Housing & Urban Affairs (MOHUA) (2019) PW management issues, solutions & case studies.
24. A., Dhumal, C. V., Sengupta, P., Kumar, A., Pramanik, N. K., & Alam, T. (2021). Challenges and possible solutions to mitigate the problems of single-use plastics used for packaging food items: A review. *Journal of Food Science and Technology*, *58*(9), 3251-3269.
25. Czajczynska, D., Anguilano, L., Ghazal, H., Krzyzynska, R., Reynolds, A.J., Spencer, N., Jouhara, H. (2017). Potential of pyrolysis processes in the waste management sector. *Thermal Science and Engineering Progress*, *3*, 171-197.
26. Antelava A., Constantinou A., Manos G., Dutta A. (2017). A review on thermal and catalytic pyrolysis of plastic solid waste (PSW). *Journal of Environmental Management. 197*, 177-198.
27. S., Foscolo, P.U. (2015). New concepts in biomass gasification. Progress in Energy and Combustion Science, 46, 72-95.
28. Sikarwar, V. S., Ming, Z., Fennell, P.S., Shah, N., Anthony, E.J. (2017). Progress in biofuel production from gasification Progress in Energy and Combustion Science, 61, 189-248.
30. U. (2012). Process and technological aspects of municipal solid waste gasification. A review, Waste Management, *32*(4), 625-639.
31. Weitkamp, J. Catalytic hydrocracking: mechanisms and versatility of the process. (2012). *Chem Cat Chem*, *4*, 292–296.
32. Mosio-Mosiewski, J., Warzala, M., Morawski, I., & Dobrzanski, T. (2007). High-pressure catalytic and thermal cracking of polyethylene. *Fuel processing technology*, *88*(4), 359-364.
33. M. Muhammad, F. I., Muhammad, R. U., (2018). Hydrocracking of virgin and waste plastics: A detailed review. *Renewable and Sustainable Energy Reviews, 90*, 490–515.
34. Mohanty, A., Borah, R. K., Fatrekar, A. P., Krishnan, S., & Vernekar, A. A. (2021). Stepping towards benign alternatives: sustainable conversion of plastic waste into valuable products. *Chemical Communications*, *57*(80), 10277-10291.
35. Bhandari N. L., Bhattarai, S., Bhandari, G., Subedi, S., & Dhakal, K. N. (2021). A review on current practices of plastics waste management and future prospects. *Journal of Institute of Science and Technology*, *26*(1), 107-118.
36. Singh, R. K., & Ruj, B. (2015). Plastic waste management and disposal techniques-Indian scenario. *International Journal of Plastics Technology*, *19*(2), 211-226.
37. Panda, A. K., Singh, R. K., & Mishra, D. K. (2010). Thermolysis of waste plastics to liquid fuel: A suitable method for plastic waste management and manufacture of value-added products—A world prospective. *Renewable and Sustainable Energy Reviews*, *14*(1), 233-248.
38. Wei, R., Tiso, T., Bertling, J., O'Connor, K., Blank, L.M. and Bornscheuer, U.T. (2020). Possibilities and limitations of biotechnological plastic degradation and recycling. *Nature Catalysis, 3*(11), 867-871.45. Payne, J., McKeown, P., & Jones, M. D. (2019). A circular economy approach to plastic waste. *Polymer Degradation and Stability*, *165*, 170-181.
39. C.C., Dai, L., Ma, L., Guo, R.T. (2020). Enzymatic degradation of plant biomass and synthetic polymers. *Nature Reviews. Chemistry, 4*, 114-126.
40. Magnin, A., Pollet, E., Phalip, V., & Avérous, L. (2020). Evaluation of biological degradation of polyurethanes. *Biotechnology Advances*, *39*, 107457.
41. Subramanian, P. M. (2000). Plastics recycling and waste management in the US. *Resources, Conservation and Recycling, 28*(3-4), 253-263.
42. Scott, G. (2000). 'Green'polymers. *Polymer degradation and stability, 68*(1), 1-7.
43. Kubowicz, S., & Booth, A. M. (2017). Biodegradability of plastics: challenges and misconceptions.
44. A., Valdés, F. J., & Fullana, A. (2020). A review on VOCs from recycled plastics. *Sustainable materials and technologies*, *25*, e00179.

EMPOWERMENT OF RURAL WOMEN THROUGH KITCHEN GARDEN

Dr. Tehseen R. Choudhary

Asst. Professor, P. G. Department of Extension Education,
L. A. D. & Smt. R. P. College, Nagpur

Abstract

The image of rural women in the field of agriculture is still considered as secondary, she being the entire backbone of the work. She knowingly or unknowingly do a lot of work in the farms and field but her work is unrecognized. Kitchen garden allows a woman to take charge of her own production, kitchen, nutritional requirement of her family, money, and will also provide with an extra income. Kitchen garden emerges as a powerful instrument of empowerment for rural women offering a transformative benefit of sustainability and a variety of financial benefit. It also provide rural women with a means to contribute to the family income and become a source of self-economic independent. The present study was conducted in Hingna Taluka of Nagpur District. Survey Method was used to collect data. Purposive Sampling Technique was done to select the samples, making up a total of 50 samples. Interview Schedule was the tool used for data collection, which was further analyzed with the help of Percentage. It can be concluded that maximum respondents are gaining economic benefit by selling produce of their kitchen garden. . They are also saving money on pesticides and fertilizers by using recycled garden waste in the form of organic manure. Maximum respondents are saving money for education and marriage of their children. They are even satisfied by the additional income which is generated through kitchen garden and are also thinking to expand it. It can therefore be inferred that rural women are empowered through kitchen garden.

Key Words: Kitchen garden, women and agriculture, women empowerment, kitchen garden and economic benefit.

Introduction

A Kitchen garden is a small plot of land cultivated near or around homes. an area, especially a part of a large garden, where fruit, vegetables, and herbs are grown. It is purposefully designed to grow a variety of fruits, vegetables and herbs that can be used for household consumption and excess production can be sold into the market. Kitchen gardens are scalable, making them feasible even in limited spaces, and they empower individuals to take charge of their own production.

Economic benefits of gardening

Gardeners feed their families first and then sell, barter or give away surplus garden foods. In certain contexts, however, income generation may become the primary objective of the home garden. Marketing household kitchen garden products can be a tedious work, but not impossible. [1]

The potential economic benefits of kitchen gardening include the following:

Gardening gives dual benefits of food and income generation;

Gardens provide fodder for household animals and supplies for other household needs (handicrafts, fuel wood, furniture, baskets, etc.);

Marketing of garden produce is often the only source of independent income for women.

According to AIDINDIA, “there are now 13,725 Kitchen Gardens across the 183 villages in Tamil Nadu.[2] The Project was first initiated to help families grow their own vegetables to get adequate daily nutrition. But ever since the project began, families started to see a surplus in their produce. So much that they have begun to sell their excess produce which has now become a second source of income apart from their primary occupations. The beneficiary families not only eat healthily. They also harvest enough

vegetables to sell to others and earn more income. The beneficiary families have also inspired more people in their villages to establish Kitchen Gardens." [3] It is clear from the above paragraph that kitchen garden serves as a medium of providing healthy nutrition to the family and generating extra income too. [4]

Challenges Women Face in Agriculture

Despite their significant contributions, women in agriculture still face numerous challenges:

- **Unequal access to land and resources:** Women often lack ownership of land and resources, making it difficult for them to start or expand their farms.
- **Limited access to education and training:** Women are often excluded from formal agricultural training programs, hindering their ability to adopt new technologies and practices.
- **Gender discrimination and social stigma:** Traditional gender roles and societal expectations can limit women's participation in agriculture and subject them to discrimination and harassment.
- **Lack of financial support and market access:** Women farmers often struggle to access credit and secure fair prices for their produce, hindering their economic empowerment. [5]

"The women are the backbone of agricultural workforce but worldwide her hard work has mostly been unpaid. She does the most tedious and back-breaking tasks in agriculture, animal husbandry and homes. The research efforts at the ICAR institutes have been tried to relieve her of the drudgery by providing time and labour saving tools"

The study also noted that majority of the rural women are uneducated, unskilled and tradition-bounded, therefore their productive capacities are also low, and counted as unskilled labor. Rural women have very hectic life. Her work starts from dawn and ends at dusk. The daily routine work begins from house cleaning, fetching drinking water, dish washing, laundry, preparing food for family, care of children, tailoring and sewing clothes. She manages these activities very smartly. Women farmers are frequently ignored in development strategies and policies. Women's are even more constrained because of cultural, traditional and sociological factors [6-7]

Despite their considerable involvement and contribution, women's role in agricultural sector in undervalued and unrecognized. Therefore, particular attention has to be given to the roles of women because they undertake major responsibilities in agricultural production in addition to performing household chores and community work. According to Sehgal Foundation in an article "The Vital Contribution of Women to Indian Agriculture" stated that, most labour intensive manual operations in agriculture such as cattle management, fodder collection, milking, threshing, etc. are performed by women. The community management role played by rural women helps ensure the dissemination of information and extension at community level".[8]

It is clearly mentioned in the above paragraph, that women's role in agriculture is often unrecognized, but due to the increase in awareness and various options available, women are moving towards financial independence by kitchen garden. Kitchen garden not only provides healthy and nutritious food production year round but also provides an individual with economic independence. Fresh vegetables grown in kitchen garden ensure a balanced diet and will also taste better than the best variety purchased from the market. Kitchen garden provides with an opportunity for women to generate income through either selling kitchen garden produce or saving money, that otherwise would be used to buy fruits and vegetables.

Women should be given training by local government bodies with respect to how to develop and maintain a kitchen garden.

Women can play many roles in kitchen gardens, including:

- **Learning agricultural skills**

Kitchen gardening can help women learn about crop cycles, resource management, and sustainable farming techniques. This knowledge can help them contribute to the success of their kitchen gardens and become more influential in farming decisions within their communities.

- **Making decisions**

Kitchen gardens can give women a space to use their knowledge of fruits and vegetables to make decisions about what to grow for their households.

- **Generating income**

Kitchen gardens can provide economic benefits for resource-poor families, including income generation and household economic welfare. Women can sell the products they grow or save money by eating food they grow at home. This extra income can help families pay for other needs, like education and food.

Empowerment

Kitchen gardening can help women feel empowered. For example, one study found that women who formed gardening groups with other women in their community experienced positive effects on their empowerment. These groups can help women share ideas, build self-confidence, and sustain improvements made during the project.

- **Providing employment**

Kitchen gardening can also provide employment opportunities for women, especially in places where social norms prevent them from working outside their homes

Objectives of the study:

1. To study the socio-economic level o the respondent.
2. To find out whether kitchen garden is providing economic benefit to the respondents.
3. To find out the reason of saving money through kitchen garden.
4. To find out satisfaction level of respondents through kitchen garden.

Need and importance of the study:

Kitchen garden plays a very important role in providing additional nutritional requirement to all the family members. It not just provides nutrition but gives an opportunity to an individual to have an extra income for the family. The produce which is grown in the kitchen garden can be sold in the market and can make an individual economically independent.

The present study will be useful for community planners, organizers, policy makers, extension workers, researchers and change agents for planning future training strategies for community development.

Research Methodology:

The present study "Empowerment of Rural Women through Kitchen Garden" was conducted in Gondahairi, Mangrul, Metaumri and Mohgaon Villages of **Hingna Taluka** of Nagpur District. **Survey Method** was used to collect data. **Purposive Sampling Technique** was done to select the samples. Total **Sample was 50.Interview Schedule** was the tool used for data collection, which was further analyzed with the help of **Percentage.**

Result and Discussion:

Demographic analysis of respondents:

Maximum respondents are from 31-40 years of age (50%), lives in Joint family (44%) and are staying in their own house (52%). Maximum respondents have 150-200 square feet land for kitchen garden (42%). Maximum respondents grow vegetables like tomatoes and brinjal in their kitchen garden (56% & 48% respectively). Maximum respondents consume the produce from kitchen garden (78%). Sixty percent of

respondents sell produce from their kitchen garden. Maximum respondents earns up to 5000 rupees through selling produce from their kitchen garden (54%).

It is clear from Table no. 1, 60% of respondents sell the kitchen garden produce in market and earn economic profit. 72% respondents do not invest money in buying fertilizers and manure as they recycle kitchen waste and prepare organic manure. According to 78% respondents, there is economic profit and money is saved as compared to saving done before kIt can be seen from

Table no 1:
Economic Benefit through Kitchen Garden

Sr. No.	Options	Number	Percentage
1.	Sell Kitchen garden produce in Market	30	60%
2.	Organic manure through recycling kitchen garden waste	36	72%
3.	Money saved as compared to savings done before kitchen garden	39	78%

Table no. 2:
Reason for saving money through kitchen garden

n=50

Sr. No.	Reasons	Number	Percentage
1.	Monthly expenses	34	68%
2.	Medical expenses	35	70%
3.	Education of children	44	88%
4.	Marriage of children	41	82%
5.	Saving for their own old age	32	64%
6.	Emergency needs	38	76%

Table no. 3:
Satisfaction level through kitchen garden

n=50

Sr. No.	Options	Number	Percentage
1.	Benefit in additional income generation	44	88%
2.	Kitchen garden helpful in saving money	46	92%
3.	Satisfaction gained through kitchen garden	38	76%
4.	Thinking to expand kitchen garden	30	60%

Table no. 2, 68% respondents are saving money for their monthly expenses, while 70% for medical needs. 88% respondents are saving money for the education of their children and 82% for their marriage. 64% respondents are saving money for their own old age and 76% for emergency needitchen garden.

As stated in Table no. 3, for 88% respondents' kitchen garden has benefitted in additional income generating. 92% respondents say that kitchen garden is helpful in saving money. 76% respondents have saved money through kitchen garden, while 60% of them are thinking to expand their existing kitchen garden.

Conclusion:

It can be concluded that maximum respondents are young adult females and belong to low socio-

economic status, but after kitchen garden their status is improved. Maximum respondents are gaining economic benefit by selling produce of their kitchen garden. Their money is saved as compared to earlier conditions. They are also saving money on pesticides and fertilizers by using recycled garden waste in the form of organic manure.

Maximum respondents are saving money for education and marriage of their children. They are even satisfied by the additional income which is generated through kitchen garden and are also thinking to expand it. It can therefore be inferred that rural women are empowered through kitchen garden.

References:

1. Jayasheela G, "THE ROLE OF WOMEN: IN INDIAN AGRICULTURE SECTOR" Govt First Grade College for Womens, Belagavi, www.ijcrt.org © 2015 IJCRT | Volume 3, Issue 2 June 2015 | ISSN: 2320-2882.
2. "The Vital Contribution of Women to Indian Agriculture", Sehgal Foundation, June 2024,
3. Satapathy B. S. et.al., "Scientific Backyard Kitchen Gardening", NRRI Technology Bulletin-142, ICAR NRRI, March 2024,
4. Webb P. & Kennedy E. "Impact of Agriculture on Nutrition", Food and Nutrition Bulletin, Volume 35, Number 1, p. 126.
5. http://celkau.in/Agrienterprises/enerprise/8.Kitchn%20garden/KITCHEN%20GARDEN.pdf
6. https://www.lingayasvidyapeeth.edu.in/the-role ofwomen-in-agriculture-breaking-barriers/
7. https://agritech.tnau.ac.in/women_in_agri/pdf/index/in_agri.pdf
8. https://www.smsfoundation.org/#

Adolescent Street Vendors – A Comparative Assessment

Thacker S.*, Rathi N. and *Arwa Balapurwala**

* Assistant Professor, Dept. of Human Development, L.A.D. and Smt. R.P College for Women, Nagpur
** Professor and Head, Dept. of Human Development, L.A.D. and Smt. R.P College for Women, Nagpur
***PG Student, Dept. of Human Development, L.A.D. and Smt. R.P. College for Women, Nagpur

Abstract

Street Vendors are a global phenomenon. Street Vendors are identified as self-employed workers in the informal sector who offer their labor to sell goods and services on the street without having any permanent built structure (NPUSV, 2006). Various studies have revealed that street vendors comprise of one of the most marginalized sections of the urban poor. It is seen that a large number of adolescents are becoming street vendors. In these adolescents there may be children with special talents, skills and intellectual capacities which remain unharnessed. For the benefit of the vendors and the society it is essential that we make attempts to understand their personality. Hence their emotional maturity and self-concept is being assessed in this study along with other general variables. The effective sample consisted of 25 adolescents of age range 14-18 years belonging to the street vendor category. Standardized psychological test– Emotional Maturity Scale and Self-concept Questionnaire was employed along with the self-prepared questionnaire for data collection. It was found that 52% of adolescent street vendors had above average self-concept and 60% of adolescent street vendors revealed unstable emotional status.

Introduction

The term 'Street Vendor, as quoted, in the Street Vendors (Protection of livelihood and Regulation of Street Vending) Act, 2014, means 'a person engaged in the vending of articles, goods, wares, food items or merchandise of everyday use or offering services to the general public in a street, lane, side walk, footpath, pavement, public park or any other public place or private area or from a temporary built up structure or by moving from place to place and also includes hawker, peddler, squatter and all other synonymous terms which may be local or region specific'. [1]

Circumstances such as poverty and economic compulsions, social and customary reasons (girls to earn for dowry), educational backwardness (poor in studies, lack of interest, teacher behaviour) etc. force the adolescents to work as vendors.

"Self-concept" is attitudes, feelings, perceptions and evaluations of self as an object (Hall and Lindzey 1970). George Herbert Mead said that one's identity emerges out of external social interactions and internal feelings of oneself". Self is not evident at truth, but emerges once time through language play and game. Types of self-concept includes physical, social, temperamental, educational, moral and intellectual. **Emotional Maturity** – The American Psychological Association defines emotional maturity as a high and appropriate level of emotional control and expression.

Emotional matured individuals are self-aware, attuned to their emotions and know how to manage them. The concept of emotional maturity symbolizes a person's innate ways to express emotions as intelligently as possible.

Signs of emotional maturity includes – flexibility in words and actions, openness in learning, good sense of humor, calm disposition. Being emotionally nature will help to resolve conflicts and day to day issues in a much healthier way.

Justification of the study: It is seen that a large

number of adolescents are becoming street vendors. In these adolescents there may be children with special talents, skills and intellectual capacities which remain unharnessed. This could be a major loss to the society. Even though the government has started making laws for the welfare of street vendors, this is a very slow and cucumber process.[1-2] have highlighted the problems of street vendors which are mainly issues related to street vendors social protection, working conditions, credit accessibility and their public space utilization. Studies also indicate that an extremely high proportion of vendors surveyed had suffered harassment, confiscation of goods, fines or evictions.[3-4] Generally, these vendors, living in conditions of poverty may become very aggressive, the other people on the roads may abuse them and ridicule them which might affect their self-concept and then they start behaving badly.[5-6] Hence a vicious cycle is formed. For the benefit of the vendors and the society it is essential that we make attempts to understand their personality. [7] Hence their emotional maturity and self-concept is being assessed in this study along with other general variables.

Aim: To study the emotional maturity and self-concept of street vendors.

Objectives:

1. To study the socio-economic and religious background of the Adolescent Vendor.
2. To collect information about the educational status of the Adolescent Vendor.
3. To gather information about the recreational status of the Adolescent Vendor.
4. To study the nutritional status of the Adolescent Vendor.
5. To assess the Self-Concept of the Adolescent Vendor.
6. To assess the Emotional Maturity of the Adolescent Vendor.

Review of literature:

Rao, Shah and George (2015) through their study found that adolescent street vendors had precarious conditions of work and life, involving an extensive workload, very low sales and profits, and no guarantee as to safety and security. When such street vendors fall ill or are injured, they do not have any option to depend on any other person for continuing their business.

Saha (2011) examined the working life of street vendors in Mumbai. The study shows that the street vendors borrow from moneylenders not merely for their economic activity but also for social security purposes at an exorbitant rate of interest, which, in turn, leads them to fall into a debt-trap situation. They have extremely long working hours and they enjoy neither safety nor security at they work place as the face constant harassment from the local authorities.

Research Methodology:

Sample size: The sampling technique used for the present investigation was "purposive sampling". The effective sample consisted of 25 adolescents of age range 14-18 years belonging to the street vendor category. All the subjects belonged to the Lower Income Group. Their family background however differed. The present study was conducted across Nagpur City.

Tools used: The tools used for this study are:

1. An Informal Interview schedule and a Self-Prepared Questionnaire.
2. Emotional Maturity Scale (EMS) developed by Dr. Yashvir Singh and Dr. Mahesh Bhargava was used to assess the level of Emotional Maturity among vendors.
3. Self-Concept Questionnaire developed by Dr Rajkumar Saraswat: The Self Concept Questionnaire was translated from English to Hindi for the convenience of the vendors. Two people validated the

translated tool.

Hypotheses:

- Self-concept of adolescent street vendors will be inferior.
- The Adolescent Street vendors will be emotionally unstable.

Statistical treatment:

Case study approach was used for data collection. Percentages were calculated.

Results and Discussion:

The Self-constructed questionnaire was divided in 6 areas i.e. general, economic, educational, nutritional, social and religious spheres. These areas are depicted in the form of tables as under:

The kind of houses the Adolescent Street Vendors stayed was good and they were also aware of their surroundings. 72% were familiar with who the Prime Minister of our country is. 60% Adolescent vendors reported customers behaved with respect. The adolescent vendors

Table 1 General information of Adolescent Street vendors

General Information	Responses	Total	Percentage (%)
Housing conditions	Pukka	16	64
	Kuccha	9	36
Acquainted of Prime Minister	Yes	18	72
	No	7	28
Aware of President	Yes	13	52
	No	12	48

Table 2 Economic information of Adolescent Street vendors

Economic Information	Responses	Total	Percentage (%)
Mothers working / non-working	Non-Working	17	68
	Working	8	32
Fixed area of work	Yes	22	88
	No	3	12
Hand-made goods	No	18	72
	Yes	7	28
Income	2500 and above	13	52
	2500 and below	12	48
Customer's conduct	One of respect	15	60
	One of irritation	10	40
House Ownership	Yes	15	60
	No	10	40
Availability of Washrooms	Yes	15	60
	No	10	40

Possession of Cable	Yes	23	92
	No	2	8
Availability of furniture	Yes	18	72
	No	7	28
Accessibility of a ration card	Yes	20	80
	No	5	20
Account in a bank or post offce	Yes	24	96
	No	1	4

had the riches of owing a property of their own, in which they had the availability of furniture as per their requirements, had constructed washrooms at home, made a ration card and even opened an account to deposit their savings. Overall, the economic conditions of these adolescent street vendors were quite good.

52% of the adolescent vendors are parallelly pursuing their education. Most of them went to government schools. Adolescent vendors showed disinterest in continuing their studies.

Table 3 Educational information of Adolescent Street vendors

Educational Information	Responses	Total	Percentage (%)
Educated Adolescents	Yes	13	52
	No	12	48
Reason for not studying	Responsibility Yes	15	60
	No	10	40
	Economic Pressure Yes	17	68
	No	8	32
Type of School	Government	20	80
	Private	5	20
Purchase uniform	Yes	13	52
	No	12	48
Afford school expenses	Yes	15	60
	No	10	40
Tutors help	Yes	5	20
	No	20	80
Further interest in study	Yes	11	44
	No	14	56

Maximum of vendors use gas for cooking

Table 4 Nutritional information of Adolescent Street vendors

Nutritional Information	Responses	Total	Percentage (%)
Medium of Cooking	Gas	22	88
	Stove	3	12
Food Expenses	>2000	13	52
	< 2000	12	48
Number of Meals per day	2	17	68
	3	8	32
Food eaten (dal and vegetables)	Yes	20	80
	No	5	20
Inclusion of fruits	Yes	7	28
	No	18	72
Reference of hospital	Private	13	52
	Government	12	48
Feeling tiredness	Yes	19	76
	No	8	24

purpose, food was prepared thrice a day including breakfast, lunch and dinner, in which they ate dal and vegetable and even included fruits in their diet. They preferred to get a checkup done in private rather than government hospitals. The adolescent street vendors overall had a healthy diet and spent above average of their income on food. 76% of adolescents reported that they felt tired after a long day's work.

Table 5 reveals that of the 25 only 10 of the

Table 5 Social information of Adolescent Street vendors

Social Information	Responses	Total	Percentage (%)
Shared problems with	Family	5	20
	Friends	20	80
Relatives staying together	Yes	5	20
	No	20	80
Relation with neighbors	Healthy	13	52
	Unhealthy	12	48
Celebrate festivals	Yes	25	100
	No	0	0
Addiction (Gutka)	Yes	18	72
	No	7	28

Visit to exhibitions or fares	Yes	23	92
	No	2	8
Indulgence in gambling	Yes	12	48
	No	13	52
Interest in sports	Yes	23	92
	No	2	8
Play games	Yes	22	88
	No	3	20
Watch Television	Yes	25	100
	No	0	0

adolescents devoted only 1 hour in a day for their personal entertainment, 80% of them shared their day-to-day problems with close friends and they also shared a healthy relation with their neighbors. They celebrated all kinds of festivals, visited exhibitions or fares if any in the city, preferred to be with their friends in free time.

100% of adolescent vendors believed in God and that they valued religion and customs associated with them, they even prepared food according to the festivals they celebrated, some also believed in superstitious things and black magic.

Contrary to the expectations, 15 adolescent

Table 6 Religious information of Adolescent Street vendors

Religious Information	Responses	Total	Percentage (%)
Possessing religious values	Yes	25	100
	No	0	0
Preparing traditional food	Yes	23	92
	No	2	8
Belief in Black Magic	Yes	18	72
	No	7	28
Loss in self confidence	Yes	13.00	52
	No	12.00	48
Work satisfaction	Yes	25.00	100
	No	0.00	0
Future plans (Business)	Yes	13	52
	No	12	48

Table 7 Self-concept of Adolescent Street vendors

Self-concept	Total	Percentage (%)
Above average	15	60
Below average	10	40

vendors reported above average self-concept. This could be because these adolescents feel a sense of security and identity that they are also earners and therefore feel confident about it.

Again, it is seen that these adolescent vendors have exhibited emotional maturity. Life's varied experiences coupled with their personality traits make them emotionally unstable.

Table 8 Emotional Maturity of Adolescent Street vendors

Emotional Maturity	Total	Percentage (%)
Above average	10	40
Below average	15	60

CONCLUSIONS :

The findings of the present survey revealed the following facts:

- 52% of Adolescent Street Vendors had above average self-concept, hence the results failed to support the hypothesis.
- 60% of Adolescent Street Vendors revealed unstable emotional status. The results supported the hypothesis.
- Socially, they were well adjusted.
- Most of the adolescent street vendors, failed to show interest in future studies.
- They were very conscious about the diet they consumed and spent good amount of their income on the food they ate.
- They revealed high religious values and engaged in all kind of religious activities.
- All the adolescents were highly satisfied with the kind of jobs they were engaged in, in spite of their low status in society.

RECOMMENDATIONS :

- The government to help them in every way i.e. recreational centers and coaching centers should provide more facilities.
- More vocational opportunities should be provided to such under-privileged children.
- Recreational centers to be initiated with minimal entry fee. These centers to be managed by Psychologists.
- Schools should incorporate in their curriculum sharing and caring subjects.

SUGGESTIONS :

- The sample size can be increased for better results.
- More variables can be added for further studies, like intelligence and creativity.
- A comparative study between street vendors and rag pickers can yield interesting results.

LIMITATION:

- The sample size was only 25.

References :

1. Bhowmik, S. K., & Saha, D. (2012). Street Vending in Ten Cities in India. In National Association of Street Vendors of India (Issue June).
2. Hurlock, E. B. (1953). Developmental psychology. McGraw-Hill.
3. Mangal, S. K. Advanced Educational Psychology.

2nd ed. Published by Prentice Hall of India Pvt. Ltd, New Delhi.2004, Pp. 314-317,320-321,324-325

4. Santrock, J. W. (2006). *Life-span development* (10th ed.). McGraw-Hill.
5. Saraswat, R. K. (1984). Manual for Self-concept Questionnaire, Agra: National Psychological Corporation.
6. Singh, Y., and Bhargava, M. (1994). Emotional Maturity Scale. National Psychological Corporation Manual Agra (U.P.)
7. http://www.streetnet.org.za/docs/research/2012/en/NASVIReportSurvey.pdf

Tea tree oil: A potential antimicrobial agent

1 Ishani Jain , 2 Dr. Sonal Dhabekar

[1]Student, [2]Assistant Professor

Post Graduate Department of Cosmetic Technology, LAD and Smt. RP College for Women, Seminary Hills, Nagpur, 440006, Maharashtra, India.

Abstract

Melaleuca alternifolia, or Tea Tree, native to Australia's subtropical coastal regions, which belongs to family Myrtaceae thrives in warm, humid climates. Renowned for its essential oil , rich in terpene hydrocarbons, it offers antimicrobial, anti-inflammatory, and therapeutic benefits. TTO is widely used in alternative medicine but requires careful handling to avoid toxicity. The oil, extracted primarily through steam distillation, contains around 100 compounds with significant medicinal properties. Ongoing research aims to better understand TTO's efficacy and mechanisms in treating various conditions.

Keywords: Anti- microbial , Anti-fungal, essential oil, Melaleuca alternifolia, Tea Tree, Terpinene.

Introduction

Melaleuca alternifolia, commonly known as the tea tree, is a versatile plant native to Australia with a rich history and diverse applications. Discovered by Captain James Cook in 1770 in New South Wales, it was initially used as a tea substitute by sailors.[1] Its medicinal properties quickly gained recognition, and over the years, its cultivation spread globally, becoming a staple in both traditional and modern medicine.[2]

A mature tea tree typically grows between 3 to 8 meters, with a shrub-like appearance. Its aromatic and herbaceous nature makes it valuable for various applications, including medicinal uses, broom fence production, bark paintings, and fuel.[3] The essential oil derived from its leaves, known as tea tree oil (TTO), is notable for its therapeutic constituents. TTO is colorless to pale yellow with a fresh, camphoraceous aroma. Its chemical composition includes approximately 100 different compounds, primarily terpene hydrocarbons like monoterpenes, sesquiterpenes, and their related alcohols. Standards ensure consistency and quality, such as requiring terpinen-4-ol to constitute at least 30% of the oil while limiting 1,8-cineole to no more than 15% due to its potential irritant properties.[4-5]

While TTO has many benefits, it must be used cautiously. Ingesting it can cause severe poisoning, and topical use may lead to skin irritation or allergic reactions, especially in sensitive individuals. Dilution and adherence to guidelines are crucial to minimize adverse effects.[67] Traditionally extracted through steam distillation, TTO can also be obtained via methods like solvent extraction, CO2 supercritical extraction, microwave technology, and enfleurage, though steam distillation remains the standard.[8-9]

Recent studies have highlighted TTO's antifungal properties, effective against a wide range of fungi, including Aspergillus Niger. The oil's mechanisms include disrupting fungal membranes and inhibiting crucial cellular functions. [10-11]

TEA TREE OIL

Melaleuca Alternifolia, commonly called the Tea tree belongs from family Myrtaceae. It is native to the subtropical coastal regions of Australia, thrives in warm, humid climates with well-drained soils and abundant rainfall. These geographical and environmental factors contribute to the optimal growth conditions for tea trees, making them a valuable resource for the production of tea tree oil.[12-13]

Tea tree has been used for soothing, anti-acne, antioxidant, antimicrobial and perfuming. The distillation is done from the leaves of tea tree which is colourless to pale yellow. Fresh and sanitary, camphoraceous aroma.

The Australian tea tree plant, Melaleuca alternifolia, is famous for its production of essential oils rich in medicinal and therapeutic constituents. Beyond its medicinal value, various parts of the plant are utilized for different applications, such as broom fence production, bark paintings, and fuel from its wood.[14]

In recent decades, complementary and alternative medicines which includes TTO, have gained popularity. TTO, derived mainly from Melaleuca alternifolia, is valued for its antimicrobial properties and is commonly used in topical formulations for treating cutaneous infections. Widely available over the counter in Australia, Europe, and North America, TTO is marketed as a remedy for various ailments.[15]

These volatile and aromatic compounds, often considered polymers of isoprene, contribute to TTO's therapeutic properties. Early reports described varying numbers of components in TTO, but a seminal paper by Brophy and colleagues extensively analysed over 800 TTO samples, identifying approximately 100 components with varying concentrations.[10]

Efforts to validate the therapeutic properties of tea tree oil have led to increased scrutiny, both in vitro and in vivo. Despite the growing interest, there is ongoing research to better understand the efficacy and mechanisms of action of tea tree oil in treating various conditions.

Toxicity

Tea tree oil, while widely used for its antimicrobial and anti-inflammatory properties, can be toxic if misused. Ingesting tea tree oil can lead to severe poisoning, causing symptoms such as confusion, ataxia, and potentially coma. Topically, it may cause skin irritation or allergic reactions, particularly in individuals with sensitive skin or allergies. It's essential to use tea tree oil in diluted forms and follow recommended guidelines to avoid adverse effects. Proper usage ensures its benefits while minimizing the risk of toxicity.

Precaution

Before using the tea tree oil it is good rule to consult the doctor if you are pregnant , breastfeeding and any underlying health condition. or can do patch test as it can be sensitive to skin causing irritation. If you have skin condition like eczema , then it is recommended to avoid tea tree oil as it can worsen your condition, even if you have respiratory related problem like asthma , can also be triggered if you inhale the oil .

Extraction Process

Historically, steam distillation has been the primary method for extracting tea tree oil (TTO) from Melaleuca alternifolia plants. This method, known for its simplicity and effectiveness, involves distilling raw plant materials, particularly leaves, to obtain the oil. While steam distillation remains prevalent, advancements in research and technology have led to the exploration of alternative extraction methods such as solvent extraction, CO2 supercritical extraction, microwave technology, and enfleurage.

Among these alternatives, solvent extraction has gained attention. However, it's worth noting that other methods like CO2 supercritical extraction and microwave technology offer their own advantages and may be explored further in future studies. Despite considerations for alternative methods, steam distillation continues to be the standard practice due to its reliability and effectiveness in producing TTO.

For instance, in a study conducted at the Department of Chemistry, University of Agriculture Faisalabad, Pakistan, hydro-distillation was utilized. This involved placing 8–10 kg of plant material into a distillation flask

submerged in 12 L of water. The setup was sealed and heated to 250°C for 4–5 hours, resulting in the collection of TTO in a separating funnel. The percentage yield of the extracted oil was then calculated and stored appropriately. While alternative methods are explored, steam distillation remains the benchmark for TTO extraction.

Chemical Constituents

Tea tree oil (TTO) extracted from Melaleuca leaves comprises approximately 100 different compounds, mainly terpene hydrocarbons such as monoterpenes ($C_{10}H_{16}$), sesquiterpenes ($C_{15}H_{24}$), and their related alcohols. Terpenes, which are volatile and aromatic hydrocarbons, can be seen as polymers of isoprene (C_5H_8). Notable monoterpenes found in TTO include terpinen-4-o1, γ-terpinene, α-terpinene, 1,8-cineole, terpinolene, ρ-cymene, α-pinene, α-terpineol, aromadendrene, δ-cadinene, limonene, sabiene, globulol, and viridiflorol.

The antimicrobial and antifungal properties of TTO are significantly influenced by the presence of terpinen-4-ol and 1,8-cineole, as well as the interactions among other components. These major components are regulated by international standards such as ISO 4730 and Australian Standard AS 2782-2009, which define the composition of "Oil of Melaleuca – terpinen-4-ol type." The standards set minimum and maximum composition ranges for 14 components of TTO.

Component	ISO 4730 range[a]	Typical composition[b]
Terpinen-4-ol	≥30c	40.1
γ – Terpinene	10-28	23.0
α – Terpinene	5-13	10.4
1,8- Cineole	≤ 15d	5.1
Terpinolene	1.5-5	3.1
ρ – Cymene	0.5-12	2.9
α – Pinene	1-6	2.6
α – Terpineol	1.5-8	2.4
Aromadendrene	Trace-7	1.5
δ – Cadinene	Trace-8	1.3
Limonene	0.5-4	1.0
Sabinene	Trace-3.5	0.2
Globulol	Trace- 3	0.2
Viridriflorol	Trace-1.5	0.1

Table no 1- Composition of tea tree oil

Terpinen-4-ol is required to be at least 30%, while the maximum composition of 1,8-cineole should not exceed 15% due to its potential irritant properties. These standards are essential for maintaining consistency and quality across different chemotypes of M. alternifolia, which can produce TTO with varying compositions. Six chemotypes have been identified, including the terpinen-4-ol chemotype, terpinolene chemotype, and four 1,8-cineole chemotypes.

Despite the complexity of TTO's composition, certain combinations of components are more

likely to contribute to its antimicrobial properties. Terpinen-4-ol and α-terpineol have been identified as dominant factors in the antifungal and antibacterial actions of TTO. Additionally, α-pinene, linalool, and limonene may also contribute to microbial activity. Therefore, understanding the synergistic relationships between various components is crucial for harnessing the medicinal properties of TTO beyond just terpinen-4-ol and 1,8-cineole.

[a]ISO 4730 , International Organization for Standardization standard no. 4730

[b]From reference

[c]No upper limit is set, although 48% has been proposed

[d]No lower limit is set

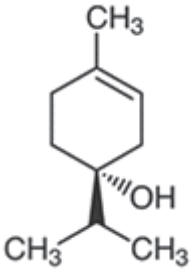


Figure no – 1
Terpinen - 4 - ol.

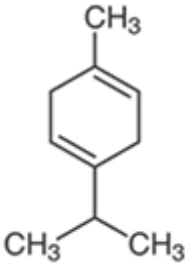


Figure no – 2
γ - Terpinene

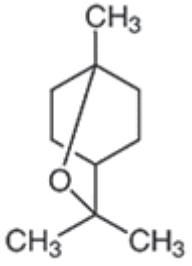


Figure no – 3
1,8- Cineole

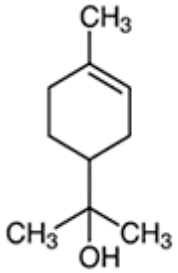


Figure no – 4
α – Terpineol

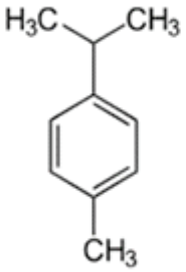


Figure no – 5
ρ – Cymene

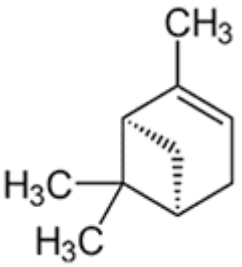


Figure no – 6
α – Pinene

Therapeutical benefits of chemical constituents

1 Terpinen-4-ol- Antibacterial, antifungal and anti-inflammatory

2 γ – Terpinene- free radical scavenging activity, refreshing, antioxident.

3 α – Terpinene- Antioxident, antifungal, antibacterial, sedative and repellent.

4 1,8- Cineole- Bronchodilator, antiviral, antitussive, mucolytic, mucociliary, anti – inflammatory and cough suppressant.

5 Terpinolene- anti-fungal, antimicrobial. antioxidant, and anti-proliferative relaxant, antibacterial

6 ρ – Cymene- Relaxant

7 α – Pinene- Cognitive, anti-inflammatory.

8 α – Terpineol- anti proliferative, antifungal, anti-cancer, anti – inflammatory, and

antibacterial.

BENEFITS AND FEATURE

· Tea tree has been found in Australia (Sellar, 1992)

· It was included in munition factories and military aid kits in tropical areas during World War Two for skin injuries (Sellar, 1992)

· The oil possesses Antibacterial, Anti-fungal Properties Anti-inflammatory and Antiviral (Sellar, 1992).

· Can treat acne, athlete's foot, contact dermatitis, or head lice (Davis, 1988)

· Can help soothe dry skin by reducing itching and irritation (K. A. Hammer, 2004)

· Help to reduce redness and swelling (C. F. Carson, 1993)

· It is an effective wound healer (C. F. Carson, 1993)

· Treat dandruff by removing chemicals and dead skin cells from the scalp (Park, 2005).

· The oil is as effective as benzoyl peroxide or salicylic acid for treating acne (Andrew C. Satchell MB, 2002)

Anti- fungal property of tea tree oil

Recent comprehensive investigations into the susceptibility of fungi to tea tree oil (TTO) have provided more thorough data compared to earlier fragmented studies. Previously, research primarily focused on Candida albicans as a model organism. However, recent findings indicate that a variety of yeasts, dermatophytes, and filamentous fungi are susceptible to TTO. Minimum inhibitory concentrations (MICs) typically range between 0.03 and 0.5%, with fungicidal concentrations ranging from 0.12 to 2%. Notably, Aspergillus niger has shown higher minimal fungicidal concentrations (MFCs) of up to 8%. Additionally, assays have revealed that germinated fungal conidia are more susceptible to TTO, suggesting that the intact conidial wall provides protection. Furthermore, TTO vapors have been found to inhibit fungal growth and affect sporulation.

Tea tree can be used in range of 5-100% to cure the onychomycosis nail disease which is from 5-8% for the initial stage but it takes 6 month to 12 month to cure the disease depending on the concentration of the tea tree.

Mechanisms of tea tree oil for anti-fungal property.

Tea tree oil (TTO) demonstrates a multifaceted approach in combating Aspergillus niger. Firstly, it disrupts fungal membranes, altering their permeability and fluidity, which compromises crucial cellular functions like respiration and energy production, resulting in growth inhibition. Additionally, TTO inhibits glucose-induced medium acidification, driven by plasma membrane ATPase, implying damage to plasma and/or mitochondrial membranes. Furthermore, TTO hinders the formation of germ tubes, pivotal for fungal pathogenesis, further impeding growth and virulence. This combined action of membrane disruption, metabolic inhibition, and interference with fungal morphogenesis underscores TTO's efficacy against A. niger. Its ability to target multiple aspects of fungal physiology makes it a promising natural antifungal agent. Overall, the mechanism involves a sophisticated interplay of actions that collectively contribute to TTO's effectiveness in combating A. niger infections.

CONCLUSION

Melaleuca alternifolia (Tea Tree), is a remarkable plant native to the subtropical coastal regions of Australia, thriving in specific environmental conditions that optimize its growth. The essential oil derived from its leaves, Tea Tree Oil (TTO), has garnered significant attention for its medicinal and therapeutic properties. Its antimicrobial, anti-inflammatory, and antioxidant qualities make it a popular choice in complementary and alternative medicine, widely available over the counter in various regions.

The complex chemical composition of TTO, primarily composed of terpene hydrocarbons such as monoterpenes, sesquiterpenes, and related alcohols, underpins its therapeutic benefits. Despite the increasing scrutiny and ongoing research to validate its efficacy, TTO continues to be a valuable resource in treating cutaneous infections and other ailments.

However, proper usage and precautions are essential to avoid potential toxicity and adverse effects. The traditional steam distillation method remains the standard for extracting high-quality TTO, although alternative methods are being explored.

The multifaceted applications and benefits of Melaleuca alternifolia, from its medicinal uses to its role in various industries, highlight its significance as a versatile and valuable plant. As research continues, a deeper understanding of its therapeutic mechanisms and potential applications will further enhance its utility and safety in diverse fields.

REFERENCES

1. Wulansari Aprilla, Jufri Mahdi , budianti Angky, Studies on the formulation , physical stability , and in vitro antibacterial activity of tea tree oil(Melaleuca Alternifolia) nanoemulsion gel, International journal of applied pharmaceutics, 18 July 2017
2. Mondello Francesca , bernardis De Flavia, Girolamo Antonietta, Salvatore Giuseppe, Cassone Antonio, In Vitro and vivo activity of tea tree oil against azole-susceptible and resistant human pathogenic yeasts, Istituto Superiore di Sanita, Viale Regina Elena 229,00161 Rome, Italy, Journal of Antimicrobial Chemotherpy (2003)51, 1223-1229, 9 February 2003.
3. Gafner Stefan, Dowell Ashley, American Botanical Council, PO Box 144345, Austin, TX 78714 Southern Cross University, Military Road, East Lismore, NSW 2480, Australia , Tea Tree oil Laboratory Guidance Document, Botanical Adulterants Prevention Program, September 2018
4. Malathi Sankara, lahari side, Konapalli Rajani, Sampagavi Mahalakshmi, M.Sushma, A total survey on leaves of melaleuca alternifolia, WORLD JOURNAL OF CURRENT MEDICAL AND PHARMACEUTICAL RESEARCH, 9 Augest 2020.
5. C. F. Carson, K. A. Hammer, and T. V. Riley, Melaleuca alternifolia (Tea Tree) Oil: a Review of Antimicrobial and Other Medicinal Propertie, Discipline of Microbiology, CLINICAL MICROBIOLOGY REVIEWS, Jan. 2006, p. 50–62,
6. LE Tien Thuy Thin , Nguyen huong Thu Thi, LE Khang Thanh, ANTIFUNGAL ACTIVITY OF TEA TREE ESSENTIAL OILS (MELALEUCA ALTERNIFOLIA) AGAINST PHYTOPATHOGENIC FUNGI, International Journal Of Advanced Research (IJAR), September 2019.
7. Brophy JJ, Davies NW, Southwell IA, Stiff IA, Williams LR (1989), Gas chromatographic quality control for oil of Melaleuca terpinen-4-ol type (Australian tea tree). J. Agric. Food Chem., 37 (5), pp 1330–1335.
8. International Standard , ISO 4730: 2017 specifies certain characteristics of the essential oil of Melaleuca, terpinene-4-ol type (Tea Tree Oil) , in order to facilitate assessment of its quality.
9. C. F. Carson, T. V. (1993, February 1st). Antimicrobial activity of the essential oil of Melaleuca alternifolia. Letters in Applied Microbiology, 49-55. doi:https://doi.org/10.1111/j.1472-765X.1993.tb00340.x
10. Hammer, K. (2015, February). Treatment of acne with tea tree oil (melaleuca) products: A review of efficacy, tolerability and potential modes of action. International Journal of Antimicrobial Agents, 106-110. doi:https://doi.org/10.1016/j.ijantimicag.2014.10.011
11. Nader Pazyar MD, R. Y. (2012, September 24). A review of applications of tea tree oil in dermatology. International Journal of Dermatology, 114. doi: https://doi.org/10.1111/j.1365-4632.2012.05654.x
12. Park, E.-H. (2005). A Study on Efficiency of Essential Oil for Dandruff Symptoms Relief - Focused on Tea tree oil - Journal of the Korean Society of Fashion and Beauty. Retrieved from https://koreascience.kr/article/JAKO200506142241534.page
13. Sellar, W. (1992). The Directory Of Essential Oils. London: Vermilion an imprint of Ebury.
14. Sidra Sabir, M. A. (n.d.). Pharmacological attributes and nutritional benefits of tea tree. International Journal of Biosciences. doi:http://dx.doi.org/10.12692/ijb/5.2.80-91

NAVIGATING COSMETIC CHOICES: AVOID ADVERSE EFFECT

Muskan Paliwal[1], Sakshi Dhote[1], Nibha Bajpai[2]

[1]PG Student, [2]Assistant Professor
Department of Cosmetic Technology,
L.A.D. & Smt. R.P. College of Home Science & Home Science Technology,
Seminary Hill, Nagpur, Maharashtra-440006

Abstract

Cosmetics, encompassing a broad range of products such as skincare, hair care, makeup, and fragrances, are designed to enhance or alter the appearance and maintain personal hygiene. With advancements in this industry, skincare products are now meticulously formulated to address various skin concerns, such as dryness, oiliness, acne, and aging, with each product containing specific active ingredients aimed at targeting these issues. However, it is sometimes observed that the allure of branding, packaging, and advertising can overshadow the careful selection of product for one's skin type. While these marketing aspects play a significant role in consumer choices, they should not be the sole factors driving decisions. Neglecting to match products with one's specific skin type and needs can inadvertently lead to adverse effects such as allergic reactions, irritation, breakouts, and long-term skin damage. Therefore, it is crucial for consumers to identify and prioritize key ingredients tailored to their specific skin needs to ensure both efficacy and safety in their cosmetic choices. This awareness not only enhances the benefits of cosmetic use but also minimizes the risk of unwanted side effects.

Keyword: Adverse reaction, Allergic reaction, Hair Care, Skin Care, Skin Damage

Introduction

Cosmetics have been used for centuries to enhance or change the appearance of the face and body. They encompass a broad array of products, including makeup such as foundation, lipstick, and mascara, skincare items like moisturizers, cleansers, and toners, hair care products including shampoos, conditioners, and hair dyes, and fragrances such as perfumes and colognes. Additionally, cosmetics extend to personal care products, such as deodorants and dental care items. These products serve various purposes, including beautification, cleansing, and maintaining personal hygiene.

These products are formulated by number of ingredients which might cause reaction to skin if it is not suitable to one's skin type.

Skin is the largest organ of the human body, serving as a protective barrier between the internal organs and the external environment. It consists of three main layers(Fig1):[1]

1.**Epidermis**: The outermost layer, providing a waterproof barrier and creating skin tone.[2]

2.**Dermis**: Beneath the epidermis, containing tough connective tissue, hair follicles, and sweat glands.[2]

3.**Hypodermis** (Subcutaneous layer): Made of fat and connective tissue [2]

The study of skin is known as dermatology. Dermatologists specialize in diagnosing and treating skin disorders, diseases, and conditions, as well as cosmetic issues. They focus on skin health, disease prevention, and treatments for conditions like acne, eczema, psoriasis, and skin cancer.

Cosmetics work on the skin in various ways, depending on the type of product and its formulation.

Here are some key points on interaction of cosmetics with the skin:

1.**Topical Action**: Most cosmetics work on the surface of the skin.

For example: foundation, blush, and powder rest on the skin to provide color and a smoother appearance. Sunscreens create a barrier to

protect the skin from UV radiation.[3-4]

2.**Absorption:** Some cosmetic ingredients are designed to penetrate the upper layers of the skin to deliver active ingredients more effectively. This is common in skincare products like moisturizers, serums, and anti-aging creams. Ingredients such as hyaluronic acid, retinoids, and peptides can penetrate the skin to provide hydration, stimulate collagen production, or promote cell turnover.[5-6]

3.**Chemical Interaction:** Certain cosmetics, like exfoliants and acne treatments, contain active ingredients e.g., salicylic acid, benzoyl peroxide that chemically interact with the skin to remove dead cells, unclog pores, or reduce inflammation.[7]

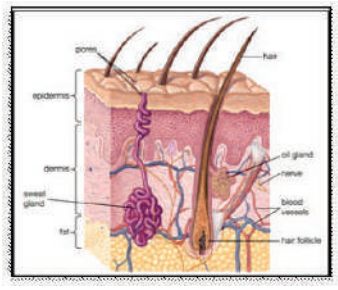


Fig 1: Structure of Skin[2]

The interaction of chemical ingredients in hair care products, such as bleaches and hair colorants, is designed to achieve effective results. However, for individuals with sensitive skin, certain ingredients may cause adverse reactions. For example, para-phenylenediamine (PPD), commonly found in hair dyes, can cause allergic reactions in some people. Performing a patch test prior to use can help ensure safety and prevent irritation.[7]

4. **Physical Changes**: Products like primers and pore minimizers create a smoother surface by filling in fine lines and pores, enhancing the appearance of the skin even without deep absorption.[8]

The absorption and effectiveness of cosmetics depend on factors such as the molecular size of the ingredients, the formulation of the product, and the condition of the skin. Proper formulation ensures that the active ingredients reach the desired depth of the skin to achieve their intended effect.

When the skin interacts with unfavourable or incompatible ingredients, several adverse reactions can occur, ranging from mild irritation to severe damage.[9-10]

Fig 2: Irritation and redness

1.**Irritation and Redness**: Ingredients that are too harsh or not suited to a person's skin type can cause redness, itching, and general irritation. This is often seen with overuse of exfoliants or products with strong acids(Fig 2).[9]

Fig 3: Allergic Reaction

2.**Allergic Reactions:** Some individuals may be allergic to certain ingredients, leading to allergic contact dermatitis. Symptoms include redness, itching, swelling, and hives. Common allergens include fragrances, preservatives, and certain botanical extracts(Fig 3).[10]

3.**Dryness and Peeling:** Harsh ingredients or improper use of certain products can strip the skin of its natural oils, leading to dryness, flakiness, and peeling. Alcohol-based products and strong acne treatments like benzoyl peroxide can cause such effects (Fig 4).[11]

Fig 4: Dryness and peeling

Fig 5: Breakouts and Acne

Fig 6: Photosensitivity

Fig 7: Chemical Burn

Fig 8: Long-term damage

4.**Breakouts and Acne**: Non-comedogenic products are designed not to clog pores, but using incompatible or comedogenic ingredients can lead to clogged pores, resulting in blackheads, whiteheads, and acne (Fig 5).[11-12]

5.**Photosensitivity:** Some ingredients can make the skin more sensitive to sunlight, leading to sunburns or hyperpigmentation when exposed to UV rays. Ingredients like retinoids and alpha hydroxy acids (AHAs) can cause photosensitivity (Fig 6).[13-14]

6.**Chemical Burns**: Extremely harsh chemicals or misuse of certain products can cause chemical burns, leading to pain, blistering, and skin damage. This can occur with high concentrations of acids or improper use of professional-grade treatments (Fig 7).[13]

7.**Long-term Damage:** Prolonged use of incompatible ingredients can lead to long-term skin damage, such as premature aging, hyperpigmentation, and compromised skin barrier function.[14]

Products with appropriate active ingredients can deliver desired results without adverse effects.

8.**Preventing Adverse Reactions**: Understanding ingredient lists and potential allergens can help avoid products that might cause reactions like redness, itching, or swelling.

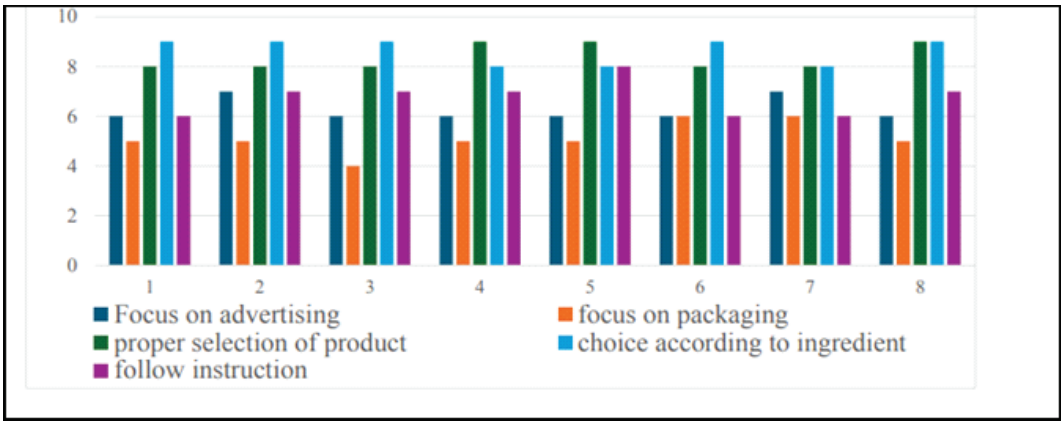
Minimizing exposure to harmful or harsh chemicals reduces the risk of severe skin damage and long-term issues.[15]

9.**Longevity of Results:**Consistently using products those are suitable for one's skin type can improve overall skin health, leading to long-lasting positive effects.

Properly chosen skincare routines support the skin's natural functions, promoting a healthy complexion over time. [15]

The graph 1 illustrates the results of a study analysing consumer focus on various product

selection parameters, including advertising, packaging, proper product selection, choice according to ingredients, and following instructions. Each parameter is represented by different coloured bars. The data reveals that "choice according to ingredient" (light blue) consistently ranks higher, indicating a strong preference among consumers for this factor. "Proper selection of product" (green) also shows significant importance. On the other hand, "focus on advertising" (blue) and "focus on packaging" (orange) have moderate influence, while "following instructions" (purple) varies across different categories, suggesting that while instructions are important, they are not the primary focus for most consumers. Overall, the graph highlights that consumers prioritize intrinsic product qualities like ingredients over external aspects such as advertising and packaging.



Graph 1: Results on Focused Parameters: Advertising, Packaging, Product Selection, Ingredient Choice, and Following Instructions

DISCUSSION AND CONCLUSION

Choosing the right cosmetic products, including skin and hair care items and perfumes, is crucial for maintaining health and beauty. However, consumers often overlook ingredient lists and in case, the use of harmful or unsuitable components that might worsen skin issues or cause new problems. Additionally, not all products suit every skin type, and choosing the product based on advertising rather than personal needs can lead to incompatibility, resulting in irritation or ineffective results. It is essential to select products formulated for specific skin types based on individual skin characteristics.

By understanding the ingredients and their interaction with one's skin, can set realistic expectations and achieve satisfying results without any unexpected side effects. For example, active ingredients like retinoids, vitamin C, niacinamide, and salicylic acid, and harmful substances such as parabens, sulfates, artificial fragrances, and alcohol, which can be sensitive to someone's skin types. It is advisable to ensure the safety and compatibility of nature or synthetic ingredients, ensure they are safe and compatible with skin. For any new product, always perform a patch test to check for adverse reactions as per the instructions given on the product.

While attractive packaging and advertising can be appealing, they should not overshadow the importance of ingredient safety and compatibility with one's skin type. Products should be chosen to moisturize and interact positively without causing overreaction in selection of product. Consulting to provide personalized recommendation, especially for

specific skin concern. Additionally, reading unbiased reviews and researching a brand's reputation and product efficacy helps in making informed decisions. Focus on skin's needs rather than following trends or popular products is important. By thoughtfully evaluating these factors, can enhance skin & hair health and minimizing the risk of side effects.

It is concluded that by selecting proper cosmetic products requires a thoughtful evaluation of one's skin type, ingredient preferences, and specific skin concerns. By considering these parameters, one can make informed choices that enhance skin & hair health and beauty, while minimizing the risk of side effects.

REFERENCES :

1) Michele Metych, Cosmetic; body decoration, The Editors of Encyclopaedia Britannica, Jul 26, 2024, https://www.britannica.com/art/cosmetic.

2) National Cancer Institute. Layers of the Skin, Mar 16, 2021,(https://training.seer.cancer.gov/melanoma/anatomy/layers.html).

3) Martin M. Cosmetics and their relation to drugs. In: S James, G James, eds. Encyclopaedia of Pharmaceutical Technology. Marcel Dekker. Inc., Vol 2. 15 May 2002, 649-657.

4) Milica Lukić ,Ivana Pantelić, and Snežana D. Savić, Towards Optimal pH of the Skin and Topical Formulations: From the Current State of the Art to Tailored Products, MDPI, Vol 8, 21 Aug 2021, 69.

5) Steffi Hansen, Ulrich F. Schaefer, Modeling the human skin barrier - Towards a better understanding of dermal absorption, Science Direct, 12 Feb 2021, https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/skin-absorption.

6) Kahan V1, Andersen ML, Tomimori J, Tufik S. The interaction of products with skin Sarah Chapman Science Series, vol 6, 28 Dec 2010, https://www.sarahchapman.com/pages/interaction-of-products-with-skin.

7) Saptadip Samanta, Indian Journal of Physiology and Allied Science, The Physiological Society of India, Vol 73, 22 Mar 2022, 0367-8350.

8) Bilal M, Iqbal HMN. An insight into toxicity and human-health-related adverse consequences of cosmeceuticals - A review. Sci Total Environ. 20 Jun 2019 ,555-568.

9) Kaličanin B, Velimirovic D. A study of the possible harmful effects of cosmetic beauty products on human health. Biol Trace Elem Res. 2016, 476-484.

10) Besné I, Descombes C, Breton L. Effect of age and anatomical site on density of sensory innervation in nerve endings in human epidermis. Arch Dermatol. Vol 11, 2022, 1445–1450.

11) Ureña-Paniego C, Montero-Vilchez T, Sanabria-de-la-Torre R, Ramírez-Muñoz A, Arias-Santiago S. Generational differences in perceived severity of atopic dermatitis. Int J Dermatol. 25 Jul 2024.

12) Ezzedine K, Shourick J, Merhand S, Sampogna F, Taieb C. Perceived clinical severity of atopic dermatitis in adolescents: comparison between patients' and parents' evaluation. J Am Acad Dermatol. Vol 1, May 2021, 164–165.

13) Allen N, Damian to Increase Sunscreen Use in Adults: A Review of the Literature. Health Educ Behav, vol 3, jun 2022, 415-423.

14) Adriana Solange Maddaleno, Maria Pilar Vinardell and Montserrat Mitjans, Innovative Strategies for Photoallergy Assessment: Breaking Free from Animal Models in Cosmetic Ingredient Development, MDPI, Vol 11, 25 Mar 2024, 47-51.

15) Thomas M. Polasek , Carl M. J. Kirkpatrick and Amin Rostami-Hodjegan, Precision dosing to avoid adverse drug reactions, Therapeutic Advances in Drug Safety, vol 10, 28 Jun 2019, 1-6.

Impact of Social Media on Travellers

Dr. Nandita Sapra

Department of Hotel Management and Catering Technology
L.A.D & S.R.P. College for Women, Nagpur.

Abstract

There are currently over 600 million active monthly users on X (formerly Twitter) and over 3 billion active monthly users on Facebook, and these numbers are growing every second. There are different ways social media can benefit the travellers who are planning to travel. On the other hand there has been much written on the level of activity by bloggers/ travellers who have already travelled and share their travel experiences, recommending preferred accommodations, offering critics of ambience and service . The impact of social media has gained popularity as travellers turn to online networking to share their ideas, suggestions and photographs. Travellers prefer to collect information online from various interactive web pages and networking sites according to their needs rather than approaching a tour operator. The present study analyses how the travellers use the different applications of social media used for searching, identifying, planning, booking, sharing experiences and exploring travel destinations and also different age categories of the users. Convenience and purposive sampling was used. The quantitative analysis was done. It can be concluded that the social media plays a vital role in influencing travellers' decision making process to visit any tourist destination in present scenario. In the age of internet and smart devices the influence of social media is ever increasing.

Keywords : Social media, Impact, Travellers.

Introduction

Social media has the advantage of reaching global audience even in remote corners of the world with no time lag, easy accessibility by those receiving the communication as long as they can get their hands on a computer keyboard, twenty four hours, seven day operations thereby overcoming the time difference. Searching for the information through the internet has been greatly influenced by large search engines that limit search results to only include the most popular social media sites.[1] Now with the use of AI people get access to the accurate solution to their queries. People get guidance on best season to travel, visited, weather, activities to be done, timings and fare comparison of hotels, restaurants etc. Social media has streamlined the trip-planning process, enabling travellers to research, book and manage their itineraries seamlessly. With integrated booking features and targeted ads, platforms such as Instagram, Facebook and Twitter facilitate direct bookings for flights, accommodation, activities and tours. When people search for a new travel destination they usually get recommendations from friends or family. Because of social media websites, the travellers post their pictures and videos from their vacation. They can check-in to several locations and also post online reviews of the place they were visiting. After the vacation, people post more pictures on Facebook, Twitter or YouTube.

Aim:

To study the impact of Social Media on Travellers

Objectives:

1. To study the importance and impact of social media on travellers.

2. To study the applications of social media used by travellers.

3. To analyse the use of social media in various age categories

Limitations

The study is limited to people residing in Nagpur city only.

Review of Literature:

When the respondents were asked to select their favourite online social networking site for travel

related purposes, they indicated that Facebook was their favourite social networking website for travel related purposes, YouTube was second in preference while many indicated use of websites such as Agoda, TripAdvisor, Trivago etc. as their preferred website have positive impact on tourism website views, enhancing the business websites' popularity.

Blogging helps travelling. The new trend in today's society is blogging. A blog is a website that is more personal. There are a lot of people that have a blog on tourism. These blogs describe locations vividly starting from the hotel that they stayed at to the travel agency they used. This is again free advertising which helps the travel and tourism companies a lot. A survey showed that companies with a travel blog generated 88% more inbound leads than those who did not have one.

Social Media Impacting Travel and Tourism**:** With today's technology, there is an app for almost everything, especially for hotels, restaurants, tourist attractions and museums. A lot of different surveys showed that a significant amount of people use apps for travel information and to have a better knowledge about a certain place. They may ask a friend, a forum, a family member, or look through different travelling and tourism apps. Owing to these different apps and because of social media, more and more people will find out about a different location. They can read some reviews about the place, or read some blog posts.

Reviews: Another thing that is very popular today is writing reviews. A lot of people write reviews about the place they went to. You can find reviews about locations, the hotel, activities, restaurants and a lot more. A study showed that over 74% of travellers write reviews because they want to share with other people the travelling experience they had. Also 98% find Trip Advisor reviews to be the most accurate and the most helpful. 53% of travellers, will not book a hotel that doesn't have any review. Written reviews are infact very popular and very influential. A lot of people decide where to go simply by reading reviews online. If a person wrote a review about a bad experience, a lot of people will not want to go to that place or they can reconsider that destination. Over 70% of global consumers say that online reviews are the second most trusted form of advertising.

Facebook**:** Another very influential website on travellers is Facebook. Facebook is particularly great because you can find pages about a destination, or a hotel. One can find people commenting about the destination and pictures of the destination. Another thing that you can find on Facebook is pictures of your friend's vacation. Some people get influential when they see their friends' pictures in a certain location and see how much fun they have. Facebook users said that their travelling plans were affected by a friend's picture of their trips. Overall, social media is very influential when it comes to travelling and tourism. It influences in a positive way and is a good thing. Now, people find more information about the destinations they want to go to and have a higher chance of having a good time because they know what they expect! [2]

The utilization of social media has matured during the past decade and has begun to influence almost all areas like belief, standard of living, assessments, decision-making and especially travelling. It also influence usage and purchase pattern of services and products. Social media has developed as dominant channel for all tourism industry to associate with their target audience. Originally, the primary intention of social media was entertainment however, the rise in the use of internet and the development in communication and information technologies many firms diverted their business to social media to promote and market their products. Tourism entrepreneurs may reach more potential customers instantly and at cost next to nothing through the active utilize of social media. On other side, social media has appeared as one of the unique place that influences tourists' travel

options. Particularly tourists, who mostly procure intangible products, use of social media networking platforms as information sources in order to ensure that they buy right products prior they experience them. Nowadays, the rising numbers of tourists are also posting photos, videos, ratings, reviews and their vacation related experiences in social media.[3]

Social media is now acknowledged to have a significant part in sustaining and promoting the reputation of tourism locations. Unquestionably, the dynamic online environment plays an important role in promoting tourism on a worldwide scale. In order to use this knowledge to market Indian tourist attractions, it is therefore essential to understand how social media functions. [4]

Research Methodology :

Selection of Area: The area selected for research is Nagpur city, the people residing in Nagpur.

Selection of Sample: The sample for the study was convenience and purposive sampling. 100 persons residing in Nagpur were selected for the study.

Data Collection: To collect the data for this research two sources were:

Primary Data: Questionnaire with multiple choice questions was prepared to collect data.

Secondary Data: Secondary data was collected from related researches, articles and journals.

Data Analysis: The data collected was tabulated and analysed. The result was discussed by means of figures and graphs and its interpretation.

Result and Discussion: The data collected for the study is further graphically represented.

From Fig.1. It is evident that 71% travellers prefer to use social media for travel planning.

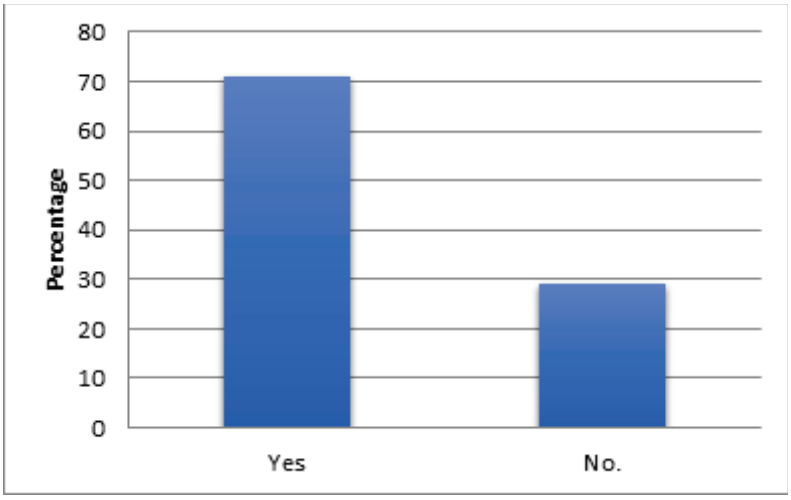


Fig.1. Usage of Social Media

29%travellers do not use social media. They still prefer to go to a travel agent for their travel plans.

From Fig.2, it is evident that travellers use different applications of social media. 23% travellers use travel blogs, 34% use online reviews, 19% use Facebook, 11% use X(Twitter) and 13% travellers use Instagram for finalizing their travel plans.

From Fig.3, It is evident that 90% travellers use different applications of social media from the age category between 20-30 years. 80% travellers use different applications of social media from the age category between 31-40 years, 75% travellers use different applications

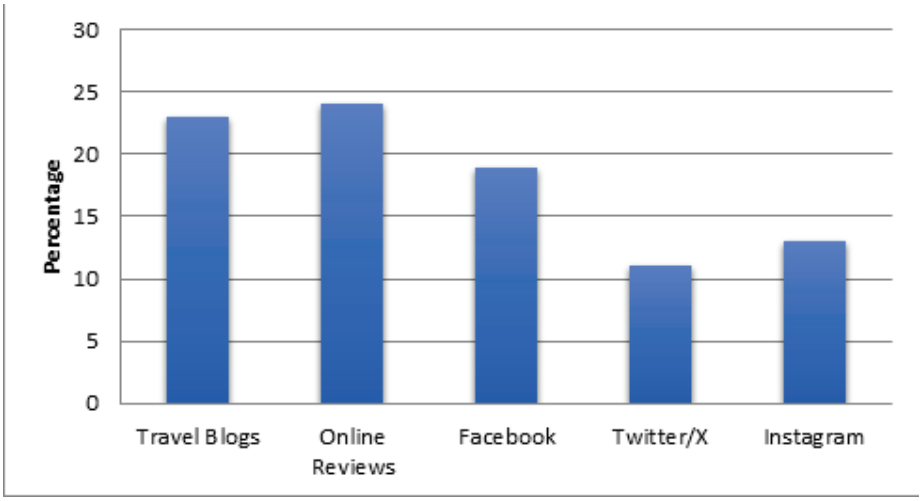


Fig.2. Social Media Applications Used

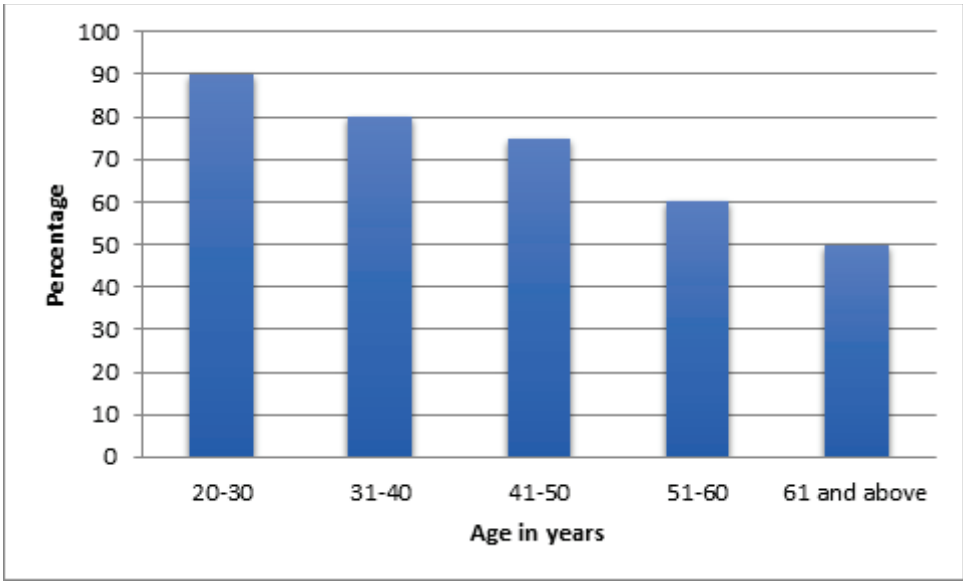


Fig.3: Use of Social Media in different age categories

of social media from the age category between 41-50 years. 60% travellers use different applications of social media from the age category between 51-60 years. 50% travellers use different applications of social media from the age category between 60 and above years.

Summary and Conclusion:

Social media has transformed the outlook of tourism, making information more accessible in detail. Platforms like YouTube, Instagram, and Twitter provide opportunities to share knowledge and experiences of any particular destination. Now there are many interactive sites which use AI to resolve each and every query to the specific details making it easy for a tourist to take a decision. Also navigation sites

help a traveller locate and reach the exact location very easily, and help in planning of itinerary making travel easy, pleasant and comfortable.

REFERENCES

1. Social Media In tourism and Hospitality: A Literature Review , Journal of Travel & Tourism Marketing, ISSN: 1054-8408. Daniel Leung.
2. Tourismos: An international multidisciplinary journal of Tourism, vol,12, No.3, Pp 48-74.
3. Importance of Social media platforms in tourism industry, Futuristic Trends in Management ,Volume 3 Book 26 Pp.107-117, ISBN: 978-93-5747-518-1, Rinzing Lama .
4. A study on impact of social media in promoting tourism, International Journal of Development Research,Volume: 13, ISSN NO: 2230 – 9926, Dwivedi et al.

Research Journal

Call for Papers

Research papers, research articles, research accounts, review articles, book reviews, research news, commentary, communication, etc. on the subjects from the Faculties of Arts, Social Sciences and Commerce are invited for the publica-tion in the **Research Journal Vol. 20, No. (2), 2024.**

The articles may be sent as an e-mail attachment in MS-Word to ladcollege@yahoo.co.uk or printed/typed copy alongwith CD by post, on or be-fore **31st Dec 2024** at the following address: **The Convenor, Research Devel-opment Cell, L.A.D. and Smt. R. P. College for Women, Nagpur - 440 010.**

GUIDELINES FOR CONTRIBUTORS

Two issues of Research Journal are published every year. Of these, the first issue covers research papers pertaining to Science, Social Sciences and Com-merce and the second issue incorporates research papers from Home Science, Applied Electronics, Cosmetic Technology, Hotel Management and Catering Technology, Interior Designing and research topics of interdisciplinary studies.

Manuscript Preparation : Papers must normally present results of original work. Reviews and articles based on important fields and emerging areas will also be considered for publication. Submission of the script will be held to imply that it has not been previously published and is not under consideration for publication elsewhere and further that, if accepted, it will not be published elsewhere. The guidelines for contribution are given in the journal. The format for contributors given in the journal should be submitted along with the manuscript. The decision of the Editorial board will be final for selection of the paper for publication. For any other information, contact: The Convenor, Research Development Cell. L.A.D. and Smt. R. P. College for Women, Nagpur.

Papers should be typed in double space on one side of the white paper. Pages should be numbered starting from the title page, text of the paper, references, tables and figures. The title page should include the title of the paper, name/s of author/s and the name of the institution/s. The name of the author should not ap-pear anywhere else in the paper. The paper should include:

1. **Title :** It should be short and expressive and should contain words suitable for indexing.

2. **Abstract :** All papers must have an abstract of not more than 200 words, should convey main points of the paper, outline the result and conclusions. Presentation of numerical results should be avoided in the abstract.

3. **Key words :** About 3-5 keywords should be provided for indexing and in formation retrieval. Phrases of several words should be avoided.

4. **Text :** All papers should have a brief introduction. The text should be inte-ligible to readers in different disciplines. All technical terms, symbols and abbreviations should be defined. In case of scientific papers, the units of measures should be either metric or Sl. Tables must be numbered in Arabic numerals in their order of appearance in the text. Reference for table number or figure number must be depicted in the text. Tables should have descriptive title. Line drawings, figures, should be roughly twice the printed size and submitted in duplicate. Photocopies of photographs should not be submitted. Handwritten symbols and equations should be avoided as far as possible. Spelling of the symbols may be typed and provided in brackets alongwith the symbol at the end of the paper on a separate sheet.

   The text should incorporate the following details:

I) Brief introduction focusing on literature and scope of study
ii) Subheads at appropriate places such as materials and methods, obser-vations, results, discussions or result and discussion, conclusions, etc.
iii) Illustrations that will help general readers.

5. **References :** References should be numbered in superscript, serially in the order in which they appear through the text followed by tables and figures. List of references at the end of the text should be in the following format:

   Sr.No.. Name of Author, (year of publication). Title of paper, Title of Journal, **Vol:, No., p.p.**

   Illustration

   Zachmann, E. J. and Molina, E.A.J. (1993) Presence of Culturable Bacteria in Cocoons of the Earthworm Eisenia Fetida. Applied and Environmental Mi crobiology, **Vol. 59 No. 6** pp 1904-1910.

   Reference to books should include name(s) of author(s), initials, (year of publication), title of the book, edition, initials and name(s) of editors, if any, place of publication, publisher and chapter or pages referred to.

   References to report and unpublished conference proceedings should include title of the report/paper.

   References to theses must include title of thesis, degree for which submitted, the name of the university and city where it is located.

6. **Acknowledgement :** Author may acknowledge the help received during the course of investigations in 2-3 lines at the end of references.

7. **The word limit for various contributions :**

General Articles	: 2000words
Review Articles	: 2500 words, cited references not more than 50
Research Paper	: 2500 words
Research Account	: 2500 words, cited references not more than 50
Research Articles	: 2000 words
Book Review	: 1500 words
Research Communication	: 500 words
Research News	: 500 words

FORMAT FOR SUBMISSION OF RESEARCH PAPER / ARTICLE

Title of Paper _____

Name of Contributor _____

Institutional Address _____

_____

Ph. Nos. _____ E-mail _____

Residential Address _____

_____

Ph. No. (Resi.) _____ (Off.) _____ (Mob.) _____

Post Held _____

Qualifications _____

Publications _____

_____

Any other (awards, citations etc.) _____

Abstract of paper in not mare than 200 words (MS word) _____

_____

_____

_____

_____

_____

_____

_____

Declaration

The research paper/article entitled _____

_____

contributed by me/us for publication in the Research Journal is my own original work. It has not been sent for publication in any other research journal.

Encl. : Two copies of manuscript of paper & CD.

Date: _____

Signature of author

Name _____

Designation _____

Panel of Reviewers

Research Journal, Volume 19, No. (2), 2023 (ISSN 0974 - 0317)