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**National Conference on Modern  
Emerging Trends In Sciences  
[ NCMETS-2024 ]**

**Date : 12th March 2024**

**Organized By  
Faculty of Science**

**Jijamata Bahuuddeshiya Shikshan Prasarak Mandal Patoda Dwara  
Sanchalit, Sambhajirao Kendre Mahavidyalaya, Jalkot, Maharashtra, India**

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Sambhajirao Kendre Mahavidyalaya, Jalkot, Ta. Jalkot, Dist. Latur,  
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## **About Jalkot**

Jalkot is one of the newly established Taluka place in Latur district, located at the border of Marathwada and Karnataka. This is a historical place where Shaiva culture prevailed. Once upon a time, it was a famous cotton market. This land gave birth to various freedom fighters that fought against 'Nizam.' in Marathwada mukti sangram. Jalkot has the famous old temple of Veerbhadra. This place maintains harmony among various cultures and communities. About 32 km apart and towards the south, Udgir city is located. It has the famous "Udaigiri Fort." In 1760, a war took place between Nizam and Maratha in Udgir. Kandhar is 20km away from Jalkot, which was the capital of the 'Rashtrakutas' kingdom and was the biggest market place where businessmen from the Middle East visited. Kandhar has a glorious period of development in religious thought, particularly Buddhism and Shaivism.

## **About College**

The college supports and cooperates with initiatives of the affiliated university to design the curriculum from time to time. The college offers 3 UG programmes, i.e., B.A., B.Sc., and B.Com. The college is affiliated with Swami Ramanand Teerth Marathwada University, Nanded. The college has been accredited at B+ in its second cycle in July 2023. The college follows the semester as well as the CBCS pattern for UG-level courses as per the guidelines of Parent University. The flexibility to choose subjects is provided to students. Faculty actively participate in seminars, workshops, refresher courses, orientation programmes, faculty development programmes, and short-term courses. All three faculties contribute through the Board of Studies of the University, and participation in the curriculum design and restructure of the university syllabus provides the right impetus and direction for enriching the curricular aspects of our institution. In 2019–20, our two faculties are working on the Board of Studies of Parent University and contributing to curriculum enrichment. Apart from this, many faculties organise curriculum-related workshops and seminars, which help the students get updated on new areas and trends in the curriculum. The institution has a formal system of curriculum delivery and implementation in a planned and coordinated manner, involving the faculties of the college. The respective departments, the timetable, and the infrastructure

committees coordinate to meet the infrastructural requirements. Books and reading materials are made available to the students through the central library. Students are also exposed to practical experience through educational tours, excursions, and field projects.

### **About Conference**

This National Conference is organized by science faculty with the aim of encouraging young minds and drawing special attention to new innovation in emerging areas of the basic sciences. The conference will provide a platform to share their innovative ideas through paper presentations and publications. We are excited to welcome all participants and hope that the conference will be productive and enjoyable. Hence, the central theme of this conference is decided as per the prepositions following the sub-themes.

### **Sub Theme of Conference**

- ✓ Biodiversity Conservation
- ✓ Animal Physiology
- ✓ Physiological System Modelling
- ✓ Plant Pathology
- ✓ Ecosystem
- ✓ Environmental Biology
- ✓ Genetics
- ✓ Entomology
- ✓ Global Pollution Problem
- ✓ Fisheries and Aquaculture
- ✓ Bioinformatics and computational Biology
- ✓ Biofuels and Fermentation Technology
- ✓ Integrated & Organic Farming system
- ✓ Biochemistry and Biophysics
- ✓ Nanoscience
- ✓ Energy Devices
- ✓ Algebra, analysis & Differential Equation

- ✓ Statistics and Discrete Maths.
- ✓ Mathematics: Indian Knowledge System
- ✓ Pedagogical Approaches in Mathematics
- ✓ Weathering of rocks and its significance
- ✓ Role of tectonic movement in Biodiversity
- ✓ Water Quality Analysis
- ✓ Applied Mathematics & Integral Equations
- ✓ Dairy Science & Technology
- ✓ Organic synthesis, Medicinal chemistry
- ✓ Environmental Chemistry
- ✓ All allied subjects



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# Exploring Green Chemistry Approaches in Organic Synthesis for Sustainable Medicinal Compounds

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## ABSTRACT

This research paper delves into the innovative realm of green chemistry approaches applied to organic synthesis with a specific focus on the development of sustainable medicinal compounds. The growing concern for environmental impact and the need for eco-friendlier methodologies in the field of organic synthesis have prompted researchers to explore greener alternatives. This paper reviews recent advancements in green chemistry principles and their integration into the synthesis of bioactive molecules, aiming for a more sustainable and environmentally friendly approach in medicinal chemistry.

**Keywords:** Green chemistry, organic synthesis, medicinal compounds, sustainability, eco-friendly, etc.

## I. INTRODUCTION

The field of organic synthesis in medicinal chemistry has long been characterized by its pursuit of innovative compounds with therapeutic potential. As the demand for novel drugs continues to rise, so does the imperative to develop sustainable and environmentally conscious methodologies in the synthesis of these compounds. The introduction sets the stage by highlighting the overarching context, emphasizing the need for a shift towards green chemistry principles in organic synthesis for the creation of sustainable medicinal compounds.[1]

### Background:

The pharmaceutical industry plays a pivotal role in addressing global health challenges, but its conventional practices have been associated with significant environmental consequences. Traditional organic synthesis methods often rely on reagents and solvents that generate hazardous waste, consume substantial energy, and contribute to pollution. Against the backdrop of increasing awareness about environmental sustainability, there is a growing recognition of the need to reevaluate and reform the processes involved in drug discovery and development.

**1.1 Rationale for Green Chemistry in Medicinal Chemistry:** The integration of green chemistry principles into the realm of organic synthesis is driven by a confluence of factors. Firstly, there is a mounting global concern about the environmental impact of industrial processes, including those in the pharmaceutical sector. Secondly, the pharmaceutical industry itself faces the challenge of maintaining its economic

viability while adapting to evolving regulatory frameworks that emphasize sustainability. Thirdly, the health and safety of researchers and end-users are paramount, necessitating a shift away from potentially harmful practices. [2]

**1.2 Objectives of the Paper:** This research paper aims to explore and elucidate the application of green chemistry approaches in the synthesis of organic compounds with medicinal relevance. By delving into the principles of green chemistry, the objective is to demonstrate how these principles can be harnessed to create a more sustainable and environmentally friendly framework for the development of medicinal compounds. The paper seeks to provide insights into various strategies, methodologies, and case studies where green chemistry has been successfully applied, offering a comprehensive overview of the current landscape and potential future directions.

**1.3 Significance of Green Synthesis in Medicinal Chemistry:** The adoption of green chemistry in medicinal chemistry is not merely an ethical choice; it is a strategic imperative for the pharmaceutical industry. The significance lies in the potential to mitigate the environmental impact of drug development, improve the safety of laboratory practices, adhere to regulatory requirements, and enhance the long-term sustainability of the industry. The paper aims to underscore the importance of this paradigm shift by showcasing how green synthesis methodologies contribute to the broader goals of sustainability and responsible scientific innovation. [3]

## II. GREEN CHEMISTRY PRINCIPLES

Green chemistry principles provide a holistic framework for designing, developing, and implementing sustainable and environmentally friendly practices in chemical processes. In the context of organic synthesis for medicinal compounds, the incorporation of green chemistry principles is paramount to achieving a more ecologically responsible approach. This section examines key green chemistry principles and their significance in the pursuit of sustainable drug development. [2,3]

### 2.1. Atom Economy:

Atom economy is a fundamental green chemistry principle that emphasizes the efficient use of raw materials in a chemical reaction, minimizing waste generation. In traditional synthesis methods, reactions often produce significant by-products, leading to low atom economy. Green synthesis strategies focus on designing reactions that result in high atom economy, thereby reducing the environmental impact.

*Significance:*

- **Minimizing Waste:** High atom economy ensures that a larger proportion of the starting materials is converted into the desired product, reducing the generation of waste and by-products.
- **Resource Efficiency:** Efficient utilization of raw materials contributes to resource conservation and aligns with the principles of sustainability.

### 2.2. Solvent Selection:

Solvent selection plays a crucial role in green chemistry, as traditional solvents can be harmful to both human health and the environment. Green solvents are characterized by their low toxicity, low volatility, and reduced environmental impact, offering a safer and more sustainable alternative to conventional solvents.

*Significance:*

- A. **Reduced Emissions:** Green solvents contribute to lower emissions of volatile organic compounds (VOCs), improving air quality and minimizing the ecological footprint.
- B. **Health and Safety:** The use of eco-friendly solvents enhances the safety of laboratory personnel by reducing exposure to potentially hazardous substances.
- C. **Biodegradability:** Many green solvents are biodegradable, diminishing their impact on ecosystems in the case of accidental spills.

### 2.3. Renewable Feedstocks:

Green chemistry encourages the use of renewable feedstocks derived from biomass, plants, or other sustainable sources. By transitioning away from fossil fuel-based feedstocks, researchers can promote the development of more sustainable and eco-friendly synthetic routes.

*Significance:*

- A. **Reduced Dependence on Fossil Fuels:** Utilizing renewable feedstocks helps decrease reliance on finite fossil fuel resources, contributing to long-term sustainability.
- B. **Carbon Neutrality:** Biomass-derived feedstocks can be carbon-neutral or have a lower carbon footprint, supporting efforts to mitigate climate change. [3]

### 2.4. Energy Efficiency:

Green chemistry aims to minimize energy consumption in chemical processes, considering factors such as reaction temperature, pressure, and the use of energy-efficient techniques. Energy-efficient practices not only reduce the environmental impact but also contribute to cost-effectiveness.

*Significance:*

- A. **Lower Environmental Footprint:** Energy-efficient processes result in reduced greenhouse gas emissions and environmental impact, aligning with sustainability goals.
- B. **Cost Savings:** Energy-efficient methodologies can lead to cost savings in both operational and environmental management aspects. Incorporating these green chemistry principles into the synthesis of organic compounds for medicinal applications represents a proactive and sustainable approach. By adhering to these principles, researchers can contribute to the development of pharmaceuticals with reduced environmental impact, improved safety profiles, and long-term sustainability. The subsequent sections of this paper will delve into case studies and applications where these principles have been successfully implemented, further illustrating their practical relevance in the field of medicinal chemistry. [4]

## III. ENVIRONMENTAL IMPACT [5-6]

**Reduced Volatile Organic Compounds (VOCs):** Eco-friendly solvents typically have lower volatility and lower emissions of volatile organic compounds, contributing to improved air quality and reducing the risk of respiratory issues for laboratory personnel and surrounding communities.

**Minimized Ozone Depletion Potential:** Some traditional solvents contribute to ozone layer depletion. Eco-friendly solvents are often designed to have a lower ozone depletion potential, aligning with global efforts to protect the ozone layer. [5-6]

### 1) Health and Safety:

**Reduced Toxicity:** Eco-friendly solvents are chosen for their lower toxicity profiles, ensuring a safer working environment for researchers and minimizing potential health hazards associated with exposure.

**Biodegradability:** Many eco-friendly solvents are biodegradable, meaning they break down into harmless by-products over time. This characteristic reduces the long-term impact on ecosystems in the event of accidental spills or disposal.

### 2) Resource Efficiency:

**Renewable Feedstocks:** Eco-friendly solvents can be derived from renewable resources, such as bio-based feedstocks, reducing dependence on fossil fuels and contributing to a more sustainable resource utilization.

**Energy Efficiency:** Some green solvents can be more easily recycled or reused, leading to improved energy efficiency and reduced overall environmental footprint compared to traditional solvents.

### 3) Regulatory Compliance:

**Alignment with Regulations:** The use of eco-friendly solvents aligns with evolving environmental regulations and industry standards, ensuring compliance with increasingly stringent requirements for sustainable and responsible chemical practices. [6-7]

#### Economic Considerations:

**Cost-Effectiveness:** While some eco-friendly solvents may initially be more expensive, their cost-effectiveness can be realized through improved process efficiency, reduced waste management costs, and compliance with regulations, making them economically viable in the long run.

### 4) Examples of Eco-Friendly Solvents:

**Supercritical Carbon Dioxide (scCO<sub>2</sub>):** Non-toxic, non-flammable, and readily available, scCO<sub>2</sub> is used in various processes as a green alternative.

**Ionic Liquids:** These solvents offer low volatility, high thermal stability, and can be designed for specific applications, making them versatile and eco-friendly.

**Water:** In certain cases, water can serve as a green solvent, especially when combined with other techniques like micellar catalysis or solid-supported synthesis. [8]

## IV. GREEN SYNTHESIS OF ANTI-CANCER

Green synthesis, also known as environmentally friendly synthesis or sustainable synthesis, involves the use of environmentally benign reagents and conditions to produce various compounds, including pharmaceuticals. In the context of anti-cancer agents, green synthesis aims to minimize the environmental impact of drug production while maximizing efficiency and safety. Here are some examples of successful green synthesis approaches in the development of anti-cancer compounds:

#### Plant-Derived Compounds:

Many anti-cancer agents are derived from plants, and their extraction and synthesis methods have been optimized for sustainability. For example, paclitaxel, a widely used anti-cancer drug, is initially extracted from the bark of the Pacific yew tree. However, researchers have developed sustainable methods to synthesize paclitaxel or its analogues using plant cell cultures, avoiding the need for extensive deforestation.[8]

**Biocatalysis:**

Enzymes and microorganisms can be employed in the synthesis of anti-cancer compounds. This approach often eliminates the need for hazardous chemicals and reduces energy consumption. For instance, researchers have utilized enzymes to catalyze key steps in the synthesis of certain anti-cancer drugs, making the process more environmentally friendly.[4,7]

**Microwave-Assisted Synthesis:**

Microwave-assisted synthesis is a green chemistry technique that reduces reaction times and increases yields, thus improving the overall efficiency of the synthesis process. This approach has been applied to the synthesis of various anti-cancer compounds, leading to reduced energy consumption and waste generation.

**Solvent-Free Synthesis:**

Traditional organic synthesis often involves the use of large quantities of organic solvents, which can be harmful to the environment. Green synthesis methods focus on solvent-free or water-based reactions. This reduces the environmental impact and enhances the safety of the synthesis process. Researchers have successfully applied solvent-free approaches in the synthesis of certain anti-cancer agents.[8,9]

**Use of Renewable Resources:**

Utilizing renewable resources as starting materials for the synthesis of anti-cancer compounds contributes to the sustainability of the process. For example, researchers have explored the use of biomass-derived feedstocks in the synthesis of drug intermediates, reducing reliance on non-renewable resources.

**Continuous Flow Synthesis:**

Continuous flow synthesis involves the continuous pumping of reactants through a reaction chamber, offering several advantages, such as improved control of reaction conditions and reduced waste generation. This approach has been explored in the synthesis of anti-cancer agents, providing more efficient and environmentally friendly processes. The ecological benefits of these green synthesis approaches include the reduction of hazardous waste, lower energy consumption, and a decrease in the use of toxic chemicals. By adopting these sustainable methods, researchers aim to create anti-cancer compounds with a smaller environmental footprint, contributing to the overall goal of developing pharmaceuticals in an environmentally responsible manner.[10,11]

## V. CHALLENGES AND FUTURE PERSPECTIVE

**Complexity of Molecules:**

Anti-cancer agents and antibiotics are often complex molecules with intricate structures. Developing green synthesis methods for such complex compounds can be challenging due to the need for precise control over reaction conditions and stereochemistry.

**Scalability:**

Transitioning from laboratory-scale synthesis to large-scale production presents challenges in terms of scalability and economic feasibility. Green synthesis methods need to be scalable to meet the demands of pharmaceutical production.

**Regulatory Compliance:**

Adherence to regulatory standards is crucial in the pharmaceutical industry. Implementing green synthesis methods may require validation and approval from regulatory bodies, which can be a time-consuming process.

**Cost Considerations:**

Green synthesis methods should be cost-effective to be adopted on a large scale. Developing sustainable processes that are economically competitive with traditional methods remains a significant challenge.

**Limited Availability of Green Reagents:**

The availability of green reagents and catalysts suitable for the synthesis of anti-cancer agents and antibiotics can be limited. Developing and sourcing environmentally friendly reagents is crucial for the success of green synthesis approaches.

**Interdisciplinary Collaboration:**

Green synthesis requires collaboration between chemists, biologists, engineers, and environmental scientists. Establishing effective interdisciplinary collaborations can be challenging due to differences in methodologies and language across disciplines.

**Future Perspectives:****1. Advancements in Biotechnology:**

Continued advancements in biotechnology, including synthetic biology and metabolic engineering, can play a significant role in the green synthesis of pharmaceuticals. Engineered microorganisms and cell cultures can be designed to produce complex molecules more sustainably.

**2. Innovative Catalysis Techniques:**

Research on novel catalysis techniques, including organocatalysis and photocatalysis, can provide more sustainable and efficient methods for the synthesis of anti-cancer agents and antibiotics.

**3. Machine Learning and Computational Chemistry:**

Integration of machine learning and computational chemistry can accelerate the discovery of green synthesis routes by predicting optimal reaction conditions, identifying suitable catalysts, and optimizing reaction pathways.

**4. Circular Economy Approaches:**

Embracing circular economy principles in pharmaceutical manufacturing can contribute to sustainability. Reusing and recycling by-products, as well as incorporating waste from one process as a resource for another, can minimize environmental impact.

**5. Global Collaboration and Standardization:**

Global collaboration and the establishment of standardized protocols for green synthesis can facilitate the widespread adoption of sustainable practices in the pharmaceutical industry. This includes shared databases of green reagents and methodologies.[7-9]

**6. Public Awareness and Demand:**

Increased public awareness and demand for sustainable and environmentally friendly pharmaceuticals can drive the industry toward adopting green synthesis methods. Consumer preferences for eco-friendly products may influence pharmaceutical companies to prioritize green practices.

**7. Policy Support:**

Supportive policies and incentives from governments and regulatory bodies can encourage pharmaceutical companies to invest in and adopt green synthesis methods. This may include tax incentives, grants, and recognition for environmentally sustainable practices.

Addressing these challenges and exploring these future perspectives can contribute to the development of more sustainable and environmentally friendly processes for synthesizing anti-cancer agents and antibiotics, ultimately benefiting both human health and the planet.[7-11]

## VI. CONCLUSION

In conclusion, the sustainable synthesis of anti-cancer agents and antibiotics represents a pivotal frontier in pharmaceutical research and development. The challenges associated with the complexity of these molecules, scalability, regulatory compliance, cost considerations, and the limited availability of green reagents underscore the intricate nature of transitioning to environmentally friendly synthesis methods. However, amidst these challenges, there are promising future perspectives that illuminate the path forward. Advancements in biotechnology, catalysis techniques, machine learning, and computational chemistry hold the potential to revolutionize the landscape of green synthesis. The interdisciplinary nature of green synthesis necessitates collaboration across scientific domains, emphasizing the importance of breaking down silos and fostering innovation at the intersection of chemistry, biology, engineering, and environmental science. As we strive for sustainable solutions, the adoption of eco-friendly practices not only aligns with the principles of green chemistry but also reflects a collective responsibility to safeguard both human health and the environment.

In the pursuit of sustainable synthesis methods, researchers, industry stakeholders, and policymakers must work hand in hand to overcome challenges and seize the opportunities presented by evolving technologies. By doing so, we can envision a future where the production of anti-cancer agents and antibiotics is characterized by efficiency, cost-effectiveness, and a minimal ecological footprint. This journey towards sustainability in pharmaceutical synthesis underscores the importance of responsible innovation in meeting the healthcare needs of current and future generations while preserving the health of our planet.

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# Studies On Sensorial Characterization of Toned Milk Shrikhand Manufactured by Using Jaggery

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## ABSTRACT

Shrikhand is a traditional Indian sweet dish prepared from curd. It is popular in Gujarat, Maharashtra and some parts of Karnataka, Madhya Pradesh and Rajasthan. An effort was made to produce novel fermented milk product. Further efforts were made to optimize levels of Jaggery in preparation of Shrikhand by sensory evaluation. Shrikhand were prepared from Toned Milk chakka with various levels of Jaggery i.e. T1 35%, T2 40%, T3 45%. And it was discussed from the findings that treatment T2 (7.9) showed highest overall acceptability scores than other treatments.

**Keywords:** Value added Shrikhand, Toned Milk, Jaggery powder and Sensory evaluation.

## I. INTRODUCTION

Functional foods are gaining popularity in the food industry because they have been shown to improve human health. Because of their nutritious importance, dairy products are projected to remain key dietary components in the future, making the dairy business particularly vital to the Indian Economy. Lactic acid fermentation is used to make it [5]. The name Shrikhand is derived from the Sanskrit word “Shrikarini” meaning a curd preparation with addition of sugar, flavouring materials, dried fruits etc. Dahi, Shrikhand and lassi are well known fermented milk products consumed throughout India. It is produced from dahi (curd) whey is drained off from curd to yield chakka. The basic ingredients sugar, flavour, colour are thoroughly mixed into chakka and to form a sort homogenous mass called Shrikhand. The type of milk and its quality and composition affect the quality of the chakka and the resultant Shrikhand. These products vary considerable in composition, flavour and texture according to the nature of fermenting organisms, the type of milk used and the manufacturing process [4]. Shrikhand is made by blending chakka with 50-75 percent sugar. Despite Shrikhand popularity and growing market in India and beyond, organized marketing choices are limited due to a lack of systematic packaging and shelf life studies [3]. During present investigation Shrikhand was prepared by admixing chakka made from Toned Milk (3.0% Fat & 8.5% SNF) with different levels of Jaggery.

## II. METHOD AND MATERIALS

### Value addition of Toned Milk Shrikhand by blending Jaggery

The experiment was carried out in research laboratory of Department of Dairy Science, Maharashtra Udayagiri Mahavidyalaya, Udgir, MS during 2023-2024. The materials and method adopted during this investigation are given below.

Toned Milk was procured from the local market of brand Natural Dairy and other ingredients were procured from the super market for present study. A fresh good quality Jaggery powder was made available as a sweetening agent. Milk was heated at 85°C followed by cooling at 28°C. Inoculation was done by using the starter culture *Streptococcus thermophiles* and *Lactobacillus acidophilus* at the rate of 2% and incubated at 37°C for 8-10 hours until a firm coagulum was formed and transferred to a muslin cloth and hung for drainage of whey for another 6 hours, the semi-solid mass left after drainage called chakka formed base for Shrikhand. [2][6]. Then chakka was mixed with the different levels of Jaggery. For control sample T<sub>0</sub> sugar were added @40%, where for treatments i.e. T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> addition of Jaggery @ 35%, 40%, 45% respectively, by cent per cent replacement of sugar.

## III. RESULTS AND DISCUSSION

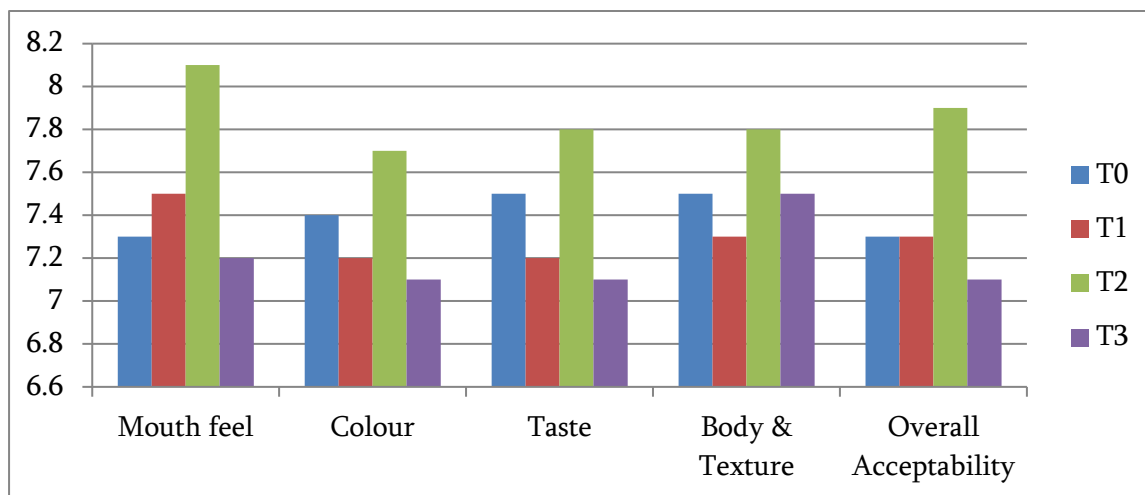
Organoleptic evaluation of the sample was done by 5 well trained judges at regular intervals using nine point hedonic rating scale to grade Toned Milk Shrikhand blended with Jaggery with the scores ranging from like extremely (9.0) to dislike extremely (1.0) [1].

**Table 1: Effect of characteristics Jaggery on sensory scores of Shrikhand**

Treatments/attributes	T <sub>0</sub>	T <sub>1</sub>	T <sub>2</sub>	T <sub>3</sub>
Mouth feel	7.3±0.04 <sup>c</sup>	7.5±0.05 <sup>b</sup>	8.1±0.16 <sup>a</sup>	7.2±0.10 <sup>bc</sup>
Colour	7.4±0.14 <sup>ab</sup>	7.2±0.09 <sup>b</sup>	7.7±0.11 <sup>a</sup>	7.1±0.12 <sup>b</sup>
Taste	7.5±0.17 <sup>ab</sup>	7.2±0.08 <sup>b</sup>	7.8±0.15 <sup>a</sup>	7.1±0.04 <sup>b</sup>
Body and Texture	7.5±0.13 <sup>b</sup>	7.3±0.06 <sup>b</sup>	7.8±0.08 <sup>a</sup>	7.5±0.09 <sup>b</sup>
Overall acceptability	7.3±0.11 <sup>b</sup>	7.3±0.08 <sup>b</sup>	7.9±0.12 <sup>a</sup>	7.1±0.07 <sup>b</sup>

All the values are given in mean ± S.E. Where n=4, <sup>a-c</sup> values with the same superscript within the same column are not significantly different (P>0.05).

**Fig 1: Sensory Evaluation of Toned Milk Shrikhand blended with Jaggery**



### Mouth Feel

The mean score of mouth feel for treatments T<sub>2</sub> was highest i.e. 8.1. There was a significant difference ( $P < 0.05$ ) in mouth feel scores observed in different treatment combinations as T<sub>2</sub> followed by T<sub>1</sub> (7.5), T<sub>0</sub> (7.3) and T<sub>3</sub> (7.2).

### Colour

The maximum colour score of 7.7 found in treatment T<sub>2</sub> followed by T<sub>4</sub> (7.4), T<sub>1</sub> (7.2) and T<sub>3</sub> (7.1) there was significant ( $P > 0.05$ ) difference between the experimental samples when prepared with Jaggery.

### Taste

The mean score for taste ranged from 7.1 to 7.8. The values of the scores of taste for treatment T<sub>2</sub> scored highest 7.8 followed by T<sub>0</sub> (7.5), T<sub>1</sub> (7.2) and T<sub>3</sub> (7.1). It is also observed from the above findings that the percentage of the addition of Jaggery powder effect significantly ( $P < 0.05$ ) on the taste of Shrikhand.

### Body and Texture

It was observed that the body and texture of Shrikhand was significantly ( $P < 0.05$ ) influenced due to blending of Jaggery at 40 % (T<sub>2</sub>). The score for body and texture of Shrikhand prepared under each treatment ranged from 7.3 (T<sub>1</sub>) to 7.8 (T<sub>2</sub>). The highest score for body and texture of Shrikhand was recorded 7.8 for T<sub>2</sub>.

### Overall acceptability

The mean score of Shrikhand for various treatments varied between 7.1-7.9. The sensory evaluation revealed that the Shrikhand prepared with 40% T<sub>2</sub> (7.9) Jaggery powder was better than control Shrikhand i.e. T<sub>0</sub> (7.3). It was conclude that among all blends used in research, T<sub>2</sub> was the best one for producing good quality Shrikhand sweetened with Jaggery powder. There was a significant difference  $P > 0.05$  in overall acceptability scores observed in different treatment combinations.

## IV. CONCLUSION

It was concluded that the blended Shrikhand can be successfully prepared by using Toned milk with addition of Jaggery. It was found that the experimental Shrikhand in treatment T<sub>2</sub> (@40% Jaggery) was best and received highest score in sensory characteristics (mouth feel, colour, taste, body and texture & overall acceptability).

## V. ACKNOWLEDGEMENT

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# Assessment of Trees for Their Tolerance to Ambient Air Pollution

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## ABSTRACT

Air Pollution tolerance index (APTI) of 10 species growing adjacent to roadside and exposed to varying degrees of air pollution were determined by calculating ascorbic acid, total chlorophyll, leaf extract pH and relative water content of tissues.

The responses of plants to air pollution is studied by analyzing changes in biochemical parameters of plants as compared to control. All these pollutants exert various biochemical effects on plants growing in polluted area. This pollution load of an area affects the growth of various plants in non-uniform manner. Present study discusses the biomonitoring of air pollution in Udgir town by using air pollution tolerance index of some commonly available plants planted as avenue plants in town.

## I. INTRODUCTION

Emissions of gaseous air pollutants have increased in the last decade in spite of increased controls and concern for air quality. Prediction of future development also indicates that a further increase in emission must be expected. When it is considered that total control of air pollutants is technically and especially economically impossible, it is important that, in the future, emissions are controlled within a technical and economic framework to such an extent that ambient pollutant concentrations near the ground present no hazard to man or his environment.

Keeping in view of the increasing importance of bio-indicators in environmental monitoring. Generally the plant responses to pollutants are characteristic rather than specific. Attempts have been made to assess certain plant species which can specifically categorized as sensitive for a particular pollutant. The sensitive species were used for monitoring of air pollutant. The exposed plants are then analyzed with respect to changes in the selected parameters. The changes are then compared to those obtained in the same species exposed at pollution free zone and taken as control.

## II. MATERIALS AND METHODS

Ten different angiosperms plants were selected to determine Air Pollution Tolerance Index (APTI).

Air pollution tolerance index (APTI) shows the tolerance level of a plant to air pollution. Singh and Rao (1983) made an attempt to determine the APTI values, to get an empirical value for the tolerance level of a plant to air pollution. The formula suggested by them was as follows:

$$\text{APTI} = \frac{A(T + P) + R}{10}$$

Where, A is ascorbic acid content of leaf in mg / gm dry weight, P is the leaf extract pH, T is total chlorophyll content & R is the relative water content of leaf. The entire sum was divided by 10 to obtain a small manageable figure.

### III.RESULT AND DISCUSSION

**Table 1: Air Pollution Tolerance Index (APTI) of some selected plant taxa located study site.**

Sr. No.	Name of the Plant	Ascorbic Acid content (mg/g)	Total chlorophyll content (mg/g)	pH	Relative water content %	APTI
1	<i>Annona squamosa</i> L.	47	2	7	67	49.00
2	<i>Azadirachta indica</i> A. Juss.	48.12	1.98	6.8	85.14	50.76
3	<i>Cassia siamea</i> Lamk.	43	1	6.8	69.75	40.52
4	<i>Dalbergia sisso</i> Roxb.ex Dc.	29.68	0.95	5.4	61.18	24.96
5	<i>Ficus benghalensis</i> L .	47.45	2.31	6.5	86.2	50.42
6	<i>Ficus religiosa</i> L.	46.3	2	6.9	85.17	49.72
7	<i>Terminalia catappa</i> L	57	1.5	6.9	60	53.88
8	<i>Mangifera indica</i> L.	27.68	1.68	5.9	75.9	28.57
9	<i>Spathodia companulata</i> P.Beauv.	57	1.25	6.5	52	49.38
10	<i>Sterculia foetida</i> L.	37.18	2.18	5.9	77.9	37.83

#### APTI (Air Pollution Tolerance Index):

The APTI values have been investigated for many areas. This value gave a correct picture of the tolerance/sensitivity level of plants (Table No. 1). The value were highest (53.88) for *Terminalia catappa* L and lowest (24.96) for *Dalbergia sissoo* .

APTI values in response to automobile pollution at Udgir showed minimum reduction .Therefore, the plants were seen as highly tolerant to automobile pollution while the. The plant responses to pollutants thus depend upon a number of factors. It is seen that plants having higher index values are more tolerant to air pollution and can be used as a filter or sink to mitigate pollution, while plants having low index value can be used to indicate levels of air pollution. (Agarwal and Bhatnagar,1982)

Datta and Ray (1995) concluded that species having low index values are more sensitive to air pollution and *vice versa*. In the context of the present findings, this appears to be an arbitrary classification because the level of total chlorophyll ascorbic acid, relative water content and pH; which determine APTI level of a species; are intrinsic features of each species and no comparisons can be made amongst the species.

The less degradation of chlorophyll and ascorbic acid contents further substantiates their resistant abilities. It is noteworthy that the plants of the former category are regarded as ideal species, which could be effectively employed for phytomonitoring automobile exhaust pollution along side the busy traffic ways.

Air pollution tolerance level of each plant is different, and plants do not show a uniform behaviour. Plants on the basis of their response to pollutants under field conditions and laboratory conditions have been classified into sensitive and tolerant species (Jacobson and Hill, 1970). The degree of sensitivity of a plant depends on its development stage, nutritional status and other ecological factors (Guderian, 1977). Many other factors such as stomatal resistance to the entry of gases have been held responsible for the expression of pollution response. It is a universal logic that stress can either be avoided or tolerated through physiological manipulation to toxic pollutants entering into the plant body (Levitt, 1980).

Singh and Rao (1983) have assigned more importance to foliar ascorbic acid, as it is multiplied to the sum of total chlorophyll and leaf extract pH. Ascorbic acid is a strong reductant. It activates many physiological and defense mechanisms and its reducing power has been known to be directly proportional to its concentration. It also influences resistance to adverse environmental conditions, including air pollution (Keller and Schwager, 1977).

Therefore, the APTI bio analysis is useful for the identification of suitable biomonitors (phytomonitors) for polluted urban environment. The species growing in such hostile roadside environment present the best material to ascertain the levels of sensitivity, tolerance and resistance. Raising such tolerant species in polluted habitats will lead to rapid amelioration of habitat to cope up with polluted environment. Such plants are shown to be effectively used as indicators of pollutant scavengers and serve as sink to air pollutants.

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# Respiratory Changes Uncovered by Mercuric Chloride in Freshwater Catfish, *Clarias Batrachus*

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## ABSTRACT

In this recent work we present the knowledge and adverse effects of man-made activities such as industrial development throughout the world. Industrial waste contains amount of heavy metals mix-up with the nearby water bodies and damage to tissue of fishes and finally causing death. Respiration is an important physiological body activity for each and every animal. Similar weighted catfishes *Clarias batrachus* were chosen for the study of respiration. They were found in the muddy fields of water which have barbles. The selected fishes were experimented with lethal concentration in the laboratory for two days. The concentration of mercuric chloride was imparted at 1.2ppm for 96 hours. Winkler's method was used to measure the respiratory mechanism (Welsh and Smith, 1959). In this investigation it was found that the gradual descending trend of oxygen consumption when exposed to Mercuric Chloride for 96 hrs.

**Key words:** -Mercuric chloride, *Clarias batrachus*, Oxygen consumption.

## I. INTRODUCTION

The consumption of oxygen in fish is one of the most important tests to observe the entry of toxicant in the body of fish. Use of recently developed chemicals and industrial wastes are well known for the adverse effects on the aquatic organisms. The toxicity of metal generally affects the central nervous system and extending towards the stress on physiological status of the fish. This physiological stress and status can be determined by the estimation of biochemical effects. This change in physiological form causes the increase in the consumption of the oxygen for more work by the body of fish finally which leads to imbalance in the natural status of fish.

In aquatic animals particularly in fishes, gills are the main respiratory organ. Water born toxic contaminants damages initially to gills of fishes. Saroja (1959) literature review found that in aquatic ecosystem when contaminated by toxic pollutants it relates with the concentration of pollutants to which that much attention has not given. In the present study focus was given on respiratory study through oxygen consumption rate of *Clarias batrachus* when exposed to mercuric chloride with different time period of 24hrs, 48hrs, 72hrs, and 96hrs.

## II. MATERIALS AND METHODS

All same sized (180-200gm) weight of healthy freshwater *Clarias batrachus* test fishes were collected from the fisher man, Nanded. In order to their good settlement, they were brought to the laboratory condition. Catfishes then were made to settle for four days and later they were used for experimental work. The fishes were offered the small pieces of earthworm, rice or wheat flour balls. The fishes were exposed to mercuric chloride concentrations.

The respiratory metabolic function was measured by “Winkler’s Method” (Welsh and Smith, 1959). For analysis of oxygen content from the sample, dark bottles having inlet and outlet for control separate bottles were used. The selected animals were kept in a chamber and sample was collected for the estimation of oxygen. Sufficient time was given to the animal for both control and experimental. Then the samples were collected and analyzed for the oxygen uptake the difference between initial and final oxygen content was determined.

Table-1. Total Oxygen Consumption and Rate of Oxygen consumption of catfish (*Clarias batrachus*)

Sr. No.	Consumption of Oxygen	Normal	Experimental			
			24hrs	48hrs	72hrs	96hrs
1	Total O <sub>2</sub> Uptake in CC of O <sub>2</sub> /Animal/hr.	3.17+0.34	2.82+2.37	2.19+0.25	1.71+ 0.19	1.05+0.15
2	Rate of O <sub>2</sub> Uptake in CC of O <sub>2</sub> /gm/hr. Wet Weight	0.23+0.05	0.21+0.005	0.16+0.004	0.13+0.002	0.07+0.003

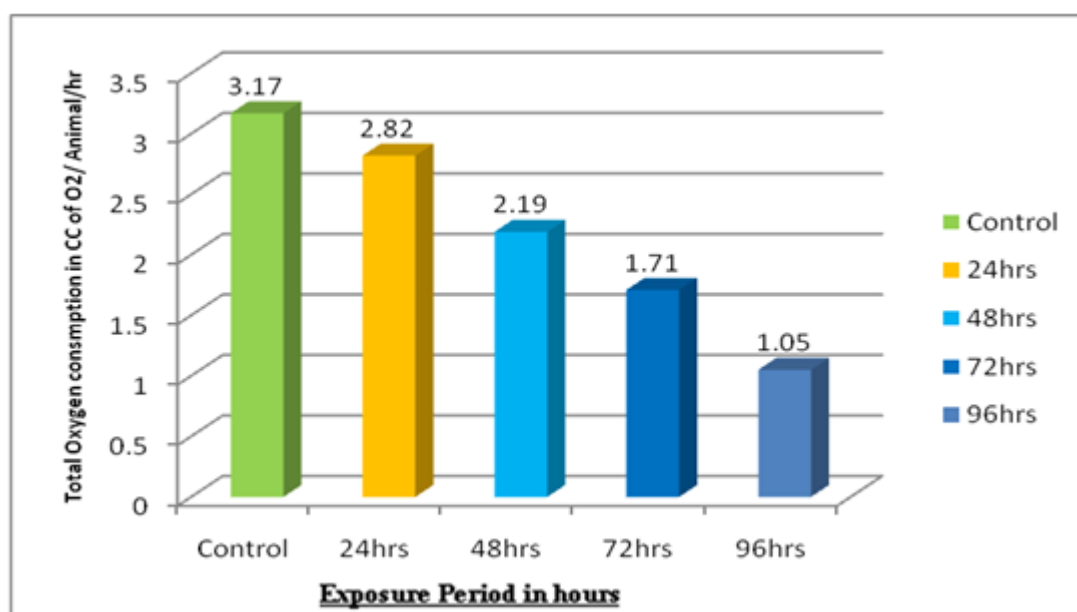


Fig. 1.1 Effect of Mercuric chloride on total oxygen consumption catfish (*Clarias batrachus*)

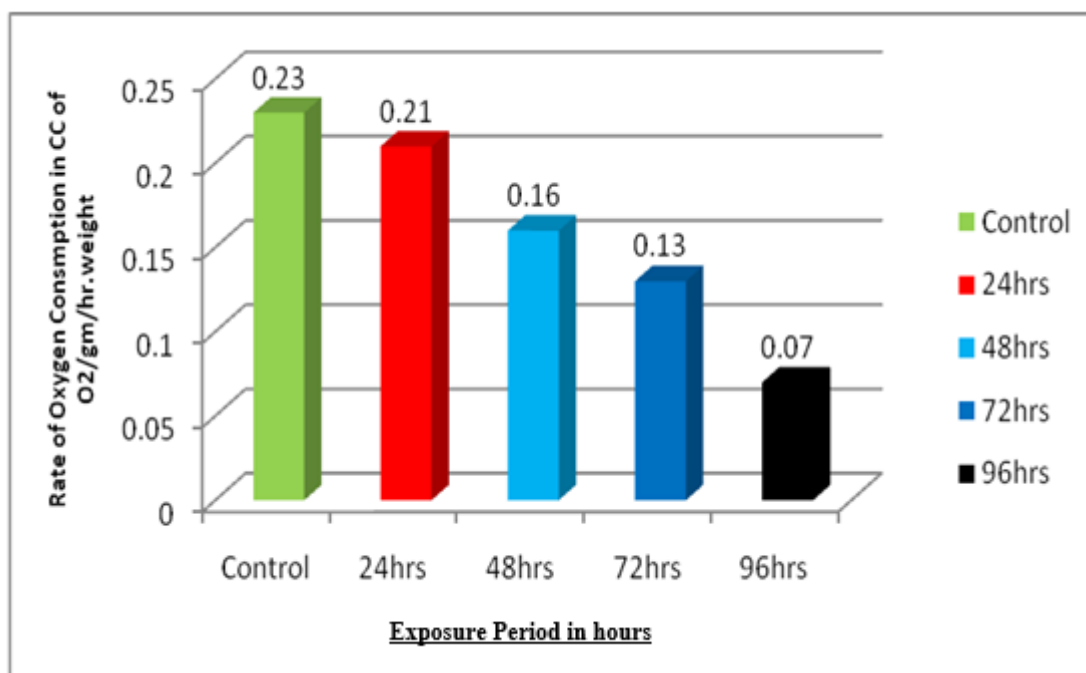


Fig 1.2-Effect of Mercuric chloride on rate of oxygen consumption in catfish (*Clarias batrachus*)

### III.RESULT

The freshwater experimented catfish *Clarias batrachus* showed fluctuation in oxygen uptake and oxygen consumption rate after treating with mercuric chloride up to 96 hours.

The present observation show that oxygen consumption of catfish due to mercuric chloride, it was 2.82, 2.19, 1.71 and 1.05 ml (C.C.) of O<sub>2</sub>/catfish/hr. at the time of 24, 48, 72 and 96 hrs respectively in experimented group. In control group oxygen consumption was 3.17 ml (C.C.) of O<sub>2</sub>/catfish/hr. which indicate descending order to compare with the normal group.

The rate of oxygen uptake was 0.21, 0.16, 0.13 and 0.07 ml (C.C.) of O<sub>2</sub>/animal/hr. wet. wt. of fish during 24, 48, 72 and 96 hours respectively there was reduced rate of oxygen consumption as compared with control. In control group rate of oxygen consumption was 0.23 ml (C.C.) of O<sub>2</sub>/animal/hr. wet.wt. of fish. Hence oxygen consumption observed descending trend in treated group up to 96 hours as compared with control.

### IV.DISCUSSION

As per the recent observation made here, the effect of mercuric chloride is showed clearly. As a result oxygen consumption and rate of oxygen consumption was declined due to the toxic effects of mercuric chloride on physiology of catfish *Clarias batrachus*<sup>3</sup>(Landis et al.,2002). The oxygen consumption was determined by the respiratory study. As per result it was found that the mercuric chloride was toxic. They have capacity to change the respiratory function of the body of catfish. It change the normal physiological working in respiration and oxygen consumption rate was reduced. Any change in oxygen consumption of catfish is for the reason that there was change in the aquatic environmental condition. It is often used to determinate metabolic fluctuation. Water contains mercuric chloride showed declined effect in oxygen consumption and rate of oxygen consumption<sup>4</sup> (Agarwal et al., 2000). Oxygen consumption and rate of oxygen consumption was found to be decreased in all the experimented groups.

The oxygen consumption decreased when time exposure period increased by 24 hours to 96 hours. The mercuric chloride after entering in the respiration system of catfish it became complicated. It varies from metal to metal and also from species to species<sup>5</sup> (Maula Reddy 1988). It is observed that there was oxidative respiratory dysfunction Delgado et al., (2006)<sup>6</sup>. Water pollutions are artificial process responsible for the threat of discharges from various sources (Vatakuru, 2005)<sup>7</sup>. The damage of organ depends upon the toxicants and the species of fish. Various toxicants dissolved in water and affect the fresh water aquatic life as well as marine water life Balaji M.(1991)<sup>8</sup>. When freshwater catfishes are exposed to pollutants in water, the oxygen consumption and oxygen consumption rate of fishes was found to be decreasing, as a result of depletion of dissolved oxygen content in water. This increase in BOD level, reduction oxygen consumption in *Channa punctatus* when exposed to metasytox Natarajan(1981)<sup>9</sup>. Another effect of pesticide was noticed that on fresh water fish *Channa punctatus* and reported that rate of respiration declined in the fresh water fish , Ali (1982)<sup>10</sup>. Verma and Dale (1975)<sup>11</sup> observed that oxygen consumption reduced due to the existence of suspended solid materials in the fresh water which would cause injury to aquatic animal and disturb normal life of fish. It is observed that the total oxygen uptake was reduced when exposed to concentration of 1.2 ppm of mercury chloride. The physiological disturbance of metabolic respiratory activity may be a sign of stress caused due to the pollutants (Newell, 1973)<sup>12</sup>. The different workers reported that there was adverse effect of heavy metals on respiratory metabolism of aquatic animals. The Similar changes were also observed by (Chinnayya, 1971)<sup>13</sup>, (Nagabhushanam and Diwan, 1972)<sup>14</sup> and (Nagabhushanam and Kulkarni,1981)<sup>15</sup>, there is significant drop in rate of oxygen consumption in fresh water fishes.

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# Recent Advances in Control of Fusarium Wilt of Tomato using Nanoparticles

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## ABSTRACT

Fusarium wilt of tomato is one of the severe diseases of the tomato crop causing the staggering losses. Fusarium wilt can cause yield losses of up to 80% in tomato plants. The disease can affect tomatoes at any growth stage, entering through the roots. The nanoparticles are recently employed for the control of this disease which is showing promising results. Nanoparticles are tiny particles with sizes ranging from 1 to 100 nanometers that have various applications in different fields, including agriculture. Nanotechnology can enhance agricultural productivity and sustainability by improving the delivery of agrochemicals, such as pesticides, fertilizers, bio-pesticides, nucleic acid pesticides, plant growth regulators etc. Nanoparticles can act as antifungal agents by directly killing or inhibiting the growth of fungi, or by delivering antifungal drugs. There are many types of nanoparticles that can be used as antifungal agents, such as metal, metal oxide, non-metal oxide, carbon-based, lipid-based, polymeric, composite, and quantum dot nanoparticles. The current investigation into this topic reviews the recent advances in the control of Fusarium wilt of tomato with the help of nanoparticles. Specifically effect of Copper and Silver nanoparticles on the growth of Fusarium was examined from different sources available and representative studies are taken into consideration.

**Keywords:** Nanoparticles, fungicides, Fusarium, tomato.

## I. INTRODUCTION

In recent years, nanoparticles have emerged as potential fungicides for the control of fungal plant diseases because they offer many advantages over traditional fungicides. Nanoparticles can also be used as nanopesticides, carriers for existing pesticides, or drug delivery agents. They can increase plant resistance to disease by deactivating microbes or activating plant defence mechanisms [1]. Nanoparticles can have antifungal activity by disrupting the cell membrane structure and inhibiting the normal budding process. Nanoparticles such as zinc oxide, magnesium oxide, iron oxide, silver and gold have antifungal activity [2]. Nanoparticles have better disease control properties than traditional pesticides due to their smaller size and higher surface-to-volume ratio. Green nanoparticles are cost-effective and easily synthesized from plant and microbial metabolites [3]. Silver nanoparticles have shown great potential for plant disease management against bacterial and fungal pathogens. However, they are associated with significant barriers such as soil interaction, production and toxicity [4]. Chitosan nanoparticles have significant antifungal properties. For example, they can control tomato root rot, *Botrytis* grape rot (grapes), *P. grisea* (rice plant), and *Fusarium* crown rot. However,

they are less effective against bacterial pathogens [5]. The current research review aims to take the account of studies that specifically deals with the control of *Fusarium* wilt of tomato plants. The nanoparticles examined were Copper and Silver as these two poses advantage over other types. Their modifications are also referred.

## II. THE HOST, TOMATO AND THE PATHOGEN, FUSARIUM

Tomato is a widely cultivated crop that originated in the South American Andes [6]. Tomatoes are rich in phenolic compounds, carotenoids, vitamins, minerals, proteins, amino acids, and glycoalkaloids, which have various physiological effects, such as anti-inflammatory, antimicrobial, vasodilatory, and cardio-protective [7]. Tomato plants are susceptible to several diseases caused by bacteria, viruses, and fungi, including wilt diseases caused by pathogenic fungi such as *Verticillium* and *Fusarium* species. *Fusarium oxysporum* is a soilborne fungal pathogen that can infect plants at all stages of growth through roots, causing necrosis and wilting symptoms in many crop plants, leading to significant economic losses [8]. *Fusarium oxysporum f. sp. lycopersici* (Fol) is the cause of *Fusarium* wilt of tomato, which is a major restrictive factor in tomato production [9]. It causes serious damage to both field and greenhouse-grown tomato plants. The main evidence of *Fusarium* wilt is browning of the vascular system [10]. The symptoms of *Fusarium* wilt of tomato caused by Fol include wilting and drooping of the lower leaves, accompanied by the loss of the green colour of the main veins of the leaves. Often, plants die before reaching the stage of flowering or fruiting. In old plants, the symptoms appear in the form of yellowing and wilting of the plant. These plants may get wilt on one side and that further spreads to all parts of the plant. Thus, it stops plant growth and eventually gets permanent wilt, causing a change in the colour of the leaves from normal green to brown [11]. Various cultural practices have been implemented to manage the spread of *Fusarium*, including the use of chemical fungicides, biocontrol agents, soil solarization techniques, mulching, crop rotation strategies, intercropping, and botanical extracts [12]. However, none of these methods have yet proven to be effective in controlling the spread of *Fusarium*.

## III. NANOPARTICLES AS FUNGICIDES

Nanomaterials are used as fungicides due to their antimicrobial properties. They have been found to effectively inhibit the growth of phytopathogenic fungi, such as *Fusarium oxysporum*, *Rhizoctonia solani*, and *Phytophthora capsici*. Nanomaterials like nano-sulfur and graphene oxide have demonstrated fungicidal efficiency by inhibiting fungal growth and causing damage to the fungal cell wall, leading to cytoplasmic leakage. Additionally, silver nanoparticles have been used to control powdery mildew disease, and copper nanoparticles have shown inhibitory effects on the growth of *Xanthomonas axonopodis pv. punicae*. The antimicrobial activity of nanomaterials is attributed to their ability to disrupt bacterial or fungal cell membranes, leading to leakage of cell components and inhibition of cellular activity.

### A. COPPER NANOPARTICLES (Cu/CuO NPs)

These nanomaterials are also effective against fungal pathogens, such as *Xanthomonas*, *Verticillium* and *Fusarium*. They can be used as alternatives to copper-based fungicides, which have environmental and health risks. They can also be combined with chitosan or silica to improve their dispersion and delivery. Due to their small size and high surface-to-volume ratio, copper nanoparticles exhibit enhanced antifungal activity compared to bulk copper compounds. They can penetrate and accumulate in fungal cells more effectively, leading to increased toxicity.

The study by Lopez (2021) found that copper nanoparticles (Cu-NPs) exhibited strong antifungal activity against *Fol*. The in vitro assays showed that Cu-NPs at different concentrations (0.1, 0.25, 0.5, 0.75, and 1.0 mg/mL) effectively inhibited the mycelial growth of *Fol*. Specifically, at a concentration of 0.5 mg/mL, Cu-NPs demonstrated a significant inhibitory effect on *Fol* growth, with a 67.3% reduction, outperforming a commercial fungicide based on copper hydroxide, which only showed a 15.6% inhibitory effect. This indicates the strong antifungal properties of Cu-NPs against *Fusarium oxysporum* [13].

Copper oxide nanoparticles were loaded with chitosan showed stronger antifungal activity at only 1 mg/L than commercial copper oxide-based fungicide at 2.5 g/L, and reduced *Fusarium* wilt disease severity by 91.5% in tomato plants. The physiological and biochemical parameters of tomato plants such as flowering, photosynthetic pigments, and defence enzymes also found to be enhanced indicating that they improved plant growth and resistance [14]. In another study, copper oxide nanoparticles were synthesized from *Cassia fistula* leaf extract. At the concentrations ranging from 5 to 300 µg/ml, they showed significant inhibition of *F. oxysporum* mycelial growth and spore germination in a dose-dependent manner. CuO-CFNPs also induced ROS (reactive oxygen species) generation, membrane disruption, and cell death in *Fusarium oxysporum*. Moreover, CuO-CFNPs reduced the disease incidence and severity of *Fusarium* wilt in tomato plants and enhanced their growth and fruit quality. CuO-CFNPs also increased the photosynthetic pigments, phenolic content, and antioxidant enzymes in tomato plants and fruits [15]. Nanocomposites like reduced Graphene Oxide-copper oxide nanoparticles (rGO-CuO NPs) showed a potent and long-lasting effect against three *Fusarium oxysporum* isolates. The nanocomposite at 1 mg/mL concentration protected the plants from fungal infection and enhanced their growth, flowering, and photosynthetic pigments. rGO-CuO NPs interacted with the fungal cell wall and membrane, creating pits and pores that disrupted the cell integrity and viability. rGO-CuO NPs also penetrated into the fungal cytoplasm and affected the subcellular organelles and DNA. No signs of phytotoxicity were observed in the treated plants [16].

**Table 1. Summary of various nanoparticles**

Material	Efficacy	Concentration	Delivery Method	Reference
Cu-NPs	67.3% inhibition of mycelial growth at 0.5 mg/mL	0.5 mg/mL	In vitro assay	Lopez et al. (2021)
CuO NPs loaded with chitosan	91.5% disease severity reduction at 1 mg/L	1 mg/mL	Foliar application	Mosa et al. (2023)
CuO-CFNPs ( <i>Cassia fistula</i> leaf extract)	Dose-dependent inhibition of mycelial growth and spore germination	150 - 350 µg/mL	Root dipping/Foliar spray	Ashraf et al. (2021)
rGO-CuO NPs (reduced Graphene Oxide-copper oxide)	Protected plants from fungal infection at 1 mg/mL	1 mg/mL	Root dipping	El-Abeid et al. (2020)
Ag NPs ( <i>Geranium</i> leaf extract)	94.6% inhibition of mycelial growth at 150 mg/L (in vitro)	150 mg/L	Inoculation	Macias Sanchez et al. (2023)
Ag-Cs NPs (chitosan coated silver)	Over 70% inhibition of mycelial growth at 1500 and 2000 ppm	1.5 - 2 mg/mL	Foliar application to tomato seedlings	Encinas Basurto et al. (2020)



## B. SILVER NANOPARTICLES (Ag NPs)

Silver nanomaterials have broad-spectrum antifungal activity against various phytopathogens, such as *Fusarium*, *Colletotrichum*, *Botrytis*, and *Phytophthora*. They can be synthesized using plant extracts or chitosan as stabilizers. They can also be doped with other metals, such as copper or titanium, to enhance their efficacy and stability. Ag NPs act by producing reactive oxygen species and free radicals, which cause protein denaturation, nucleic acid and proton pump damage, lipid peroxidation, and cell wall damage. Therefore, they alter the cell membrane permeability, causing cell death.

The silver nanoparticles synthesised by a green methodology using Geranium leaf extract as a reducing agent. In in vitro conditions, the Ag NPs inhibited the mycelial growth of Fol on potato dextrose agar (PDA) plates. The highest percentage of inhibition was  $94.6 \pm 0.1\%$  for 150 mg/L of Ag NPs after 7 days of incubation. While in in vivo conditions, the Ag NPs exhibited inhibitory activity on the surface growth of Fol on tomato fruits at all tested concentrations (10–150 mg/L). No increase in the inhibitory effect was observed as the concentration of the Ag NPs increased. The Ag NPs also showed no toxicity to the tomato fruits [17].

Silver nanoparticles coated with chitosan (Ag-Cs NPs) have antifungal activity against Fol. The Ag-Cs NPs were tested against *F. oxysporum* on potato dextrose agar at different concentrations (1000, 1500, and 2000 ppm). The results showed that the nanoparticles inhibited the mycelial growth of the fungus by more than 70% at the highest concentration, compared to the control without nanoparticles. The Ag-Cs NPs were applied to tomato seedlings at different concentrations (1000, 1500, and 2000 ppm) every 7 days for 30 days, with or without earthworm humus in the substrate. The nanoparticles did not show any toxic effect on the seedlings, and in fact enhanced their growth, especially at the highest concentration with humus. The nanoparticles also reduced the severity of the disease caused by Fol inoculation, as well as increased the catalase activity, an antioxidant enzyme involved in the plant's defence system [18].

## IV. DISCUSSION

Copper nanoparticles, copper oxide nanoparticles, and silver nanoparticles were all found to be effective in inhibiting the growth of *F. oxysporum*, a common fungal pathogen of tomato plants. The silver nanoparticles were found to be more effective than other nanoparticles at very low concentrations though the study is in vitro. It is also notable that modification of nanoparticles, done to enhance their stability, resulted in increased fungicidal activity. These studies suggests that nanoparticles have the potential to be a promising new approach for controlling fungal diseases in tomato plants. However, more research is needed to determine the long-term effects of nanoparticle use on plant health and the environment. It is important to note that the studies listed are all in vitro or greenhouse studies, and more research is needed to determine how effective these nanoparticles would be in field conditions.

## V. CONCLUSION

Fungal diseases are caused by different types of fungi that can infect the skin, mucous membranes, internal organs, or plant tissues. They can cause serious health problems and economic losses. Fungal diseases are difficult to treat because of the limited number of effective antifungal drugs, the emergence of drug-resistant strains, and the toxicity and side effects of conventional drugs. Nanoparticles can offer several advantages over conventional drugs for the treatment and prevention of fungal diseases, such as enhanced delivery, less toxicity,

increased antifungal activity, synergistic effects etc. Nanoparticles can improve the solubility, stability, bioavailability, and targeting of antifungal drugs, as well as protect them from degradation and elimination. Nanoparticles can also penetrate deeper into the infected tissues and cells, and release the drugs in a controlled and sustained manner. Nanoparticles can lower the required dose of antifungal drugs, which can reduce the cost and environmental impact of treatment. They can enhance the antifungal activity of existing drugs by increasing their contact with fungal cells, disrupting their cell wall and membrane, interfering with their metabolic pathways, and inducing oxidative stress and apoptosis. Nanoparticles can also act as antifungal agents by themselves, especially metal and metal oxide nanoparticles, such as silver, gold, zinc oxide, copper oxide, and titanium dioxide nanoparticles. Nanoparticles can act synergistically with other antifungal agents, such as natural compounds, peptides, antibodies, enzymes, and probiotics, to increase their efficacy and overcome drug resistance. Nanoparticles can also act synergistically with each other, such as bi- and tri-metal oxide nanoparticles.

Despite these benefits, nanoparticles have some disadvantages. While nanoparticles have the potential to reduce environmental impact, their long-term effects on soil health, water quality, and non-target organisms are still not well understood. More research is needed in this area. Some nanoparticles may persist in the environment potentially entering the food chain and posing risks to organisms at higher trophic levels. Nanoparticle synthesis and formulation processes can be expensive, which may translate to higher costs for farmers. This cost factor could limit widespread adoption, particularly in developing regions.

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# Quantum Chemical Study of Ferrites: Insights into Electronic Structure and Magnetic Properties

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## ABSTRACT

Ferrites, a class of magnetic materials composed of metal cations (typically  $\text{Fe}^{3+}$ ) and oxygen anions, have garnered considerable attention due to their exceptional magnetic properties and widespread applications. This research article embarks on a thorough exploration of ferrites through an advanced quantum chemical study, aiming to unravel the intricate electronic structure and magnetic behavior that underpin their unique characteristics. Leveraging state-of-the-art computational methods, including density functional theory (DFT) and ab initio calculations, this study delves into various ferrite compounds, encompassing spinel ferrites, garnet ferrites, and hexagonal ferrites.

The primary objective of this research is to provide a comprehensive understanding of ferrites at the molecular level, with a focus on their electronic structure and magnetic interactions. Ferrites play a pivotal role in a multitude of applications, ranging from microwave devices and transformers to magnetic recording media. However, to fully harness their potential, a nuanced understanding of their quantum mechanical properties is imperative. This study bridges the gap between experimental observations and theoretical predictions, offering a detailed examination of the electronic and magnetic aspects of different ferrite systems.

**Keywords:** Ferrites, Quantum Chemistry, Electronic Structure, Magnetic Properties, Density Functional Theory.

## I. INTRODUCTION

Ferrites, a class of magnetic materials composed of metal cations (typically  $\text{Fe}^{3+}$ ) and oxygen anions, have garnered considerable attention due to their exceptional magnetic properties and widespread applications.[1] This research article embarks on a thorough exploration of ferrites through an advanced quantum chemical study, aiming to unravel the intricate electronic structure and magnetic behavior that underpin their unique characteristics. Leveraging state-of-the-art computational methods, including density functional theory (DFT) and ab initio calculations, this study delves into various ferrite compounds, encompassing spinel ferrites, garnet ferrites, and hexagonal ferrites.[2]

The primary objective of this research is to provide a comprehensive understanding of ferrites at the molecular level, with a focus on their electronic structure and magnetic interactions. Ferrites play a pivotal role in a multitude of applications, ranging from microwave devices and transformers to magnetic recording media.

However, to fully harness their potential, a nuanced understanding of their quantum mechanical properties is imperative.[1-2] This study bridges the gap between experimental observations and theoretical predictions, offering a detailed examination of the electronic and magnetic aspects of different ferrite systems. The methodology employed in this research involves rigorous computational techniques to ensure accuracy in the depiction of ferrite properties.[3] The selection of appropriate exchange-correlation functionals, basis sets, and computational parameters is crucial for obtaining reliable results. By considering both bulk and surface properties of ferrite materials, the study captures the nuanced behavior of ferrites in diverse environments. The application of quantum chemical methods allows for a precise analysis of electron distribution, magnetic moments, and coupling constants within the ferrite structures. Moving beyond a conventional understanding of ferrites, this study explores the impact of external factors such as temperature, pressure, and doping on the magnetic properties of these materials. These factors influence the stability and magnetic ordering of ferrite systems, providing insights into potential avenues for tuning their properties for specific applications. The quantum chemical approach not only unravels the underlying principles governing ferrite behavior but also opens possibilities for tailoring these materials to meet the evolving demands of various technological domains.[4]

The methodology employed in this research involves rigorous computational techniques to ensure accuracy in the depiction of ferrite properties. The selection of appropriate exchange-correlation functionals, basis sets, and computational parameters is crucial for obtaining reliable results. By considering both bulk and surface properties of ferrite materials, the study captures the nuanced behavior of ferrites in diverse environments. The application of quantum chemical methods allows for a precise analysis of electron distribution, magnetic moments, and coupling constants within the ferrite structures.[5]

Moving beyond a conventional understanding of ferrites, this study explores the impact of external factors such as temperature, pressure, and doping on the magnetic properties of these materials. These factors influence the stability and magnetic ordering of ferrite systems, providing insights into potential avenues for tuning their properties for specific applications. The quantum chemical approach not only unravels the underlying principles governing ferrite behavior but also opens possibilities for tailoring these materials to meet the evolving demands of various technological domains.[4,5]

In conclusion, the quantum chemical study presented in this article contributes significantly to the body of knowledge surrounding ferrites. By elucidating the electronic structure and magnetic properties of different ferrite systems, this research lays the foundation for the optimization of these materials in a range of applications. As we delve deeper into the intricacies of ferrite systems, the potential for innovative applications and advancements in magnetic materials becomes increasingly promising, holding implications for fields such as information technology, telecommunications, and emerging quantum technologies.[5]

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## II. METHODOLOGY

In this study, we employed density functional theory (DFT) and ab initio calculations to investigate the electronic structure and magnetic properties of various ferrite systems. The choice of appropriate exchange-correlation functionals, basis sets, and computational parameters was crucial to achieving accurate results. We considered both bulk and surface properties of ferrite materials to capture their behavior in different environments.

The methodology employed in this quantum chemical study of ferrites is designed to provide a comprehensive understanding of their electronic structure and magnetic properties. Leveraging advanced computational techniques, including density functional theory (DFT) and ab initio calculations, our approach aims to capture the intricacies of different ferrite systems, such as spinel ferrites, garnet ferrites, and hexagonal ferrites.[7]

1. **Selection of Ferrite Systems:** The initial step involves the careful selection of ferrite systems for investigation. This includes spinel ferrites, which have a cubic crystal structure, garnet ferrites with a complex structure often used in magneto-optical applications, and hexagonal ferrites exhibiting hexagonal crystal symmetry. The diverse nature of these ferrites ensures a broad representation of structural and magnetic behaviours.[7]
2. **Computational Models:** To accurately simulate the electronic structure and magnetic properties of ferrites, we employ quantum mechanical calculations based on DFT. The choice of appropriate exchange-correlation functionals is crucial for obtaining reliable results. Commonly used functionals, such as the generalized gradient approximation (GGA) or hybrid functionals, are tested to determine their suitability for describing the electronic properties of ferrites.[8]
3. **Basis Sets:** The choice of basis sets is another critical aspect of our methodology. We employ a set of basis functions that adequately represents the electronic wave functions of the ferrite systems. The basis sets are optimized to strike a balance between computational efficiency and accuracy, considering the size and complexity of the ferrite structures under investigation. [7-8]
4. **Computational Parameters:** The accuracy of the quantum chemical calculations is contingent on the choice of appropriate computational parameters. These include grid density for integration, convergence criteria for self-consistent field (SCF) iterations, and other numerical parameters. Extensive benchmarking and validation are performed to ensure that the chosen parameters provide reliable and reproducible results. [7-8]
5. **Bulk and Surface Considerations:** Ferrite materials may exhibit different electronic and magnetic behaviours at the surface compared to the bulk. To capture these nuances, our methodology involves separate analyses of bulk and surface properties. Surface calculations are performed using slab models to mimic the exposed facets of ferrite crystals, enabling a more realistic representation of their behavior in practical applications.[8]
6. **Electronic Structure Analysis:** The electronic structure of ferrites is analysed by examining the distribution of electron density, orbital contributions, and band structures. This analysis provides insights into the nature of chemical bonding within the ferrite systems, elucidating how the arrangement of metal cations and oxygen anions influences their electronic properties. [8-9]
7. **Magnetic Properties Analysis:** Magnetic properties, including magnetic moments, magnetic coupling constants, and spin densities, are thoroughly investigated. The magnetic moments on individual metal sites and the overall magnetic ordering within the ferrite structures are critical parameters that define their

magnetic behavior. The impact of external factors, such as temperature and pressure, on magnetic properties is systematically explored.[9]

8. **Effect of External Factors:** The study goes beyond the intrinsic properties of ferrites by exploring the influence of external factors on their behavior. Temperature-dependent calculations are performed to analyse the thermal stability and magnetic transitions of ferrite systems. Pressure effects are investigated to understand structural changes and modifications in magnetic behavior under varying pressure conditions. Additionally, doping simulations are conducted to explore the impact of introducing different elements on the electronic and magnetic properties of ferrites. [9-10]
9. **Validation and Comparison:** The validity of our computational results is ensured through comparison with available experimental data and, where applicable, with results from other theoretical studies. Consistency between our predictions and experimental observations strengthens the reliability of the computational models and parameters used in this study.[10]

In summary, our methodology combines advanced quantum chemical calculations with a systematic exploration of different ferrite systems and consideration of external factors. The comprehensive analysis of electronic structure and magnetic properties provides a detailed understanding of ferrites at the molecular level, offering valuable insights for optimizing these materials in diverse technological applications. The subsequent sections of this research article will delve into the specific results obtained from our quantum chemical study and discuss their implications for the field of magnetic materials.

### III.DISCUSSION

Our quantum chemical calculations revealed key insights into the electronic structure of ferrites, elucidating the distribution of electron density and the role of different metal cations in determining the magnetic behavior. The analysis of magnetic moments, magnetic coupling constants, and spin densities provided a comprehensive understanding of the magnetic interactions within the ferrite structures. [10-11]

The quantum chemical study presented in this research offers profound insights into the electronic structure and magnetic properties of various ferrite systems, laying the groundwork for advancing our understanding of these materials and informing potential applications. The discussion below delves into key findings and their implications. [11-12]

1. **Electronic Structure Insights:** The analysis of the electronic structure reveals intriguing details about the distribution of electron density and the nature of chemical bonding within ferrite systems. In spinel ferrites, for instance, the cubic crystal symmetry leads to distinctive electronic features. Our calculations elucidate the covalent and ionic character of metal-oxygen bonds, highlighting the role of transition metal cations in shaping the electronic landscape. Understanding these electronic interactions is crucial for predicting the materials' behavior in various environments and applications. [11-13]

The exploration of garnet ferrites, with their complex structures, provides valuable insights into the interplay of metal cations and oxygen anions. The electronic structure analysis reveals the presence of different electronic states originating from the multiple crystallographic sites within the garnet structure. This complexity influences the materials' magneto-optical properties, making them suitable for applications in telecommunications and information storage.[14]

In hexagonal ferrites, the electronic structure analysis unveils the significance of crystal symmetry in dictating electronic properties. The hexagonal arrangement results in specific electronic features, impacting the

materials' conductivity and magnetic behavior. These insights into the electronic structure of different ferrite systems contribute to the fundamental understanding of their properties and pave the way for tailored applications in electronic and magnetic devices.[15]

**2. Magnetic Properties and External Factors:** Our study provides a comprehensive analysis of the magnetic properties of ferrites, including magnetic moments, coupling constants, and spin densities. Understanding the origin of magnetic ordering and the role of individual metal cations is crucial for harnessing these materials in practical applications.

The investigation into the effect of external factors, such as temperature, pressure, and doping, reveals intriguing dynamics. Temperature-dependent calculations show the thermal stability of ferrite systems and provide a roadmap for optimizing their performance across a range of operating conditions. Pressure effects, on the other hand, shed light on structural modifications and alterations in magnetic behavior under varying pressure conditions. The findings offer valuable insights for designing ferrite materials capable of withstanding diverse environmental conditions.[16]

Doping simulations introduce a new dimension to our understanding of ferrites. By substituting metal cations with different elements, we gain control over the electronic and magnetic properties. This opens avenues for tailoring ferrite materials to meet specific application requirements, such as enhancing magnetic resonance imaging (MRI) contrast agents or improving the performance of microwave devices.[17]

**3. Implications for Technological Applications:** The insights gained from this quantum chemical study hold significant implications for the technological applications of ferrites. By understanding the intricate electronic and magnetic properties, we can optimize these materials for specific functions. In the realm of electronics, the tailored design of ferrites based on electronic structure analysis allows for the development of more efficient magnetic devices, transformers, and microwave components.[18]

Furthermore, the magneto-optical properties of garnet ferrites make them promising candidates for applications in telecommunications and information storage. The ability to modulate these properties through a deeper understanding of their electronic structure positions garnet ferrites as key players in emerging technologies. [17-18]

Hexagonal ferrites, with their unique electronic features, are well-suited for applications requiring a combination of electrical conductivity and magnetism. The insights gained from our study provide a roadmap for leveraging hexagonal ferrites in diverse fields, from energy harvesting to data storage.[19]

**4. Future Directions:** While this study has provided valuable insights into the electronic and magnetic properties of ferrites, there are avenues for further exploration. Future research could delve into the dynamic behavior of ferrites under time-dependent conditions, such as magnetic field variations. Additionally, experimental validations of the theoretical predictions presented in this study would strengthen the reliability of the computational models employed.[20]

Exploring novel compositions and crystal structures within the ferrite family could uncover materials with enhanced or unique properties. The integration of machine learning techniques to predict new ferrite compositions with desired characteristics represents a promising avenue for future research.[21]

In conclusion, the quantum chemical study presented here advances our understanding of ferrites, offering a nuanced exploration of their electronic structure and magnetic properties. The insights gained have implications for diverse technological applications, from electronics to telecommunications. As we continue to unravel the complexities of ferrite systems, the potential for innovative materials and advancements in magnetic technologies becomes increasingly promising.[22]



**A.**

No more than 3 levels of headings should be used. All headings must be in 10pt font. Every word in a heading must be capitalized except for short minor words as listed in Section III-B.

- 1) Level-1 Heading: A level-1 heading must be in Small Caps, centered and numbered using uppercase Roman numerals. For example, see heading “III. Page Style” of this document. The two level-1 headings which must not be numbered are “Acknowledgment” and “References”.
- 2) Level-2 Heading: A level-2 heading must be in Italic, left-justified and numbered using an uppercase alphabetic letter followed by a period. For example, see heading “C. Section Headings” above.
- 3) Level-3 Heading: A level-3 heading must be indented, in Italic and numbered with an Arabic numeral followed by a right parenthesis. The level-3 heading must end with a colon. The body of the level-3 section immediately follows the level-3 heading in the same paragraph. For example, this paragraph begins with a level-3 heading.

**B. Figures and Tables**

Place figures and tables at the places where they needed. All tables should be in Classic 1 format with borders to heading and subheading columns. Large figures and tables may span across both columns. To do so select text above one column table and convert it in two column and then select text below one column table and convert it into two column. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. 1”, even at the beginning of a sentence. We suggest that you use border for graphic (ideally 300 dpi), with all fonts embedded) and try to reduce the size of figure to be adjust in one column. Figure and Table Labels: Use 8 point Times New Roman for Figure and Table labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader.

**IV. CONCLUSION**

This quantum chemical study offers valuable insights into the electronic structure and magnetic properties of ferrites, paving the way for a deeper understanding of their behavior at the molecular level. The findings presented herein contribute to the optimization of ferrite materials for diverse applications, ranging from magnetic storage devices to emerging quantum technologies. As we continue to unravel the complexities of ferrite systems, the potential for innovative applications and advancements in magnetic materials becomes increasingly promising. Although a conclusion may review the main points of the paper, do not replicate the abstract as the conclusion. A conclusion might elaborate on the importance of the work or suggest applications and extensions. Authors are strongly encouraged not to call out multiple figures or tables in the conclusion—these should be referenced in the body of the paper.

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# Survey of Haemoglobin Level in The Different Age Groups of Male and Female Human Beings from Shardchandra Arts, Commerce and Science College Naigaon Dist. Nanded

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## ABSTRACT

Deficiency of hemoglobin in red blood cells causes Anemia which is one of the most common health issues of the planet. Most common class of anemia is Iron Deficiency Anemia in which the iron content is fewer. Anemia occurs in male and female. Taking this in to consideration estimation of hemoglobin level among different age groups of students from Shardchandra Arts, Commerce and Science college Naigaon Dist. Nanded. Blood samples from 220 of different age groups (17-22 years) were collected and analyzed using AccuSure Hb Haemoglobin Test System, To see the impact of nutrition on hemoglobin, information from students were gathered through a Questionnaire. The results revealed that 0.56% had severe anemia while 12.88% had moderate and 42.66% had mild anemia. The remaining had normal values of hemoglobin. Fewer intakes of fruits, vegetables and meats are the main cause of anemia.

**Key words:** Iron Deficiency Anemia Cyanomethemoglobin Nutrition

## I. INTRODUCTION

Hemoglobin (Hb) is a complex protein that consists of heme group (iron) and globulin protein. Function of hemoglobin is to move oxygen to the body with the help of blood. It also carries carbon dioxide to the lungs from different parts of the body.

There are three main types of anemia Blood Loss Anemia. The second type of anemia occurs when the erythrocytes get demolish, it is known as Hemolytic Anemia. The third and the most common of anemia is Iron Deficiency Anemia [1]. About 50% of people in the world contain insufficient iron in their body due to which they are anemic and the main root of anemia is lack of nutrition [2]. Insufficiency of folic acid or vitamin B12 is also creating Iron Deficiency Anemia [3]Iron plays an important role because many enzymes in hemoglobin [4]. The reason of Iron deficiency (IDA) is fewer intakes of iron, poor digestion and nutritional problems [5]. IDA is most common in females, of folic acid. When the level of hemoglobin is low it results in many symptoms like fatigue, weakness and poor defense system [6] Nutritional deficiency of iron, not only produce anemia but also cause immunological disorders, dysfunction of neurons and also demolish work capacity. Insufficient intake of iron also generates some severe metabolic disorders and brings changes in behavior. Anemia is more commonly found in underdeveloped and developing countries like India [7]

Reported that under nutrition, low standard of living and age are main causes of anemia in male and female. As compared to males, females are more vulnerable to cause anemia. Aim of this study is to evaluate the hemoglobin level in male and female students Shardchandra Arts, commerce and Science College, Naigaon Dist. Nanded and determine the different aspects by which anemia occurs.

The male and female students have less awareness about anemia and their Hemoglobin level, so this study offered an opportunity to the male and female students to get their hemoglobin checked and to know about hemoglobin deficiency and get awareness about the balanced diet.

## II. METIRIALS AND METHODS

**Study Subjects:** In this study 220 blood samples were collected from the male and female students Shardchandra Arts, commerce and Science College, Naigaon Dist. Nanded Students U.G. of different age groups ranged from 17-22 years donated their blood for this study voluntarily.

**Sample & Data Collection:** Two drop of blood sample was drawn and quickly transferred into AccuSure Hb Haemoglobin Test System Data regarding eating habits was collected from the donors through a questionnaire.

## III.DISCUSSION

The hemoglobin level of male and female U.G. students in different age groups ranged from 17-22 years were found between 7.00 to 16.0 g/dl, as shown in Figure

Fig. 1: Hemoglobin level among different age groups Students U.G. Ranged from 17-22 years

**Table 1: Haemoglobin Frequencies**

Low Hb Level	N	Percentage
7.00 To 8.00	8	13.57%
8.00 To 9.00	10	17.35%
9.00 To 10.00	27	33.26%
10.00 To 11.00	46	54.64%
11.00 To 12.00	49	59.11%
Total	140	

Normal Hb Level	N	Percentage
12.00 To 13.00	33	16.56%
13.00 To 14.00	37	17.45%
14.00 To 15.00	12	5.66%
15.00 To 16.00	01	0.47%
Total	80	

### Recommendation:

Seminars or health check up care camp awareness about Hemoglobin should be arranged at college levels to give knowledge about the foods that are required to make Hemoglobin in the body. It is important to give awareness about daily requirement of iron supplements to increase Hb level.

Iron ability is affected by some important factors known as iron blockers which are calcium, teas, colas and coffee, so further study should also be carried on to find out those iron blocker which commonly more effected iron ability due to which Hb level gets low.

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# Microbiological Quality of Marketable Raw Mutton in Shirur Anantpal City and Its Public Health Significance

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## ABSTRACT

A study was conducted to assess the microbiological quality and prevalence Escherichia coli, Staphylococcus aureus and Salmonella species in sheep carcasses slaughtered at retail shops of Shirur Anantpal city in Maharashtra. In all 60 samples were collected from six different areas (A, B, C, D, E, and F) aseptically from thigh region of carcasses. The pH values of samples ranged from  $6.10 \pm 0.01$  to  $6.16 \pm 0.02$  and did not differ significantly. The percent moisture in these samples ranged from  $69.66 \pm 0.81$  to  $79.66 \pm 1.93$  and varied significantly. The microbial count also varied in different area. The highest microbial load was found in retail meat shops from D area while the highest coli form count was found in A area with prevalence of 83.33 %. For the areas it ranged from 16.66 % to 33.33 %. The Staphylococcus count was highest in A and B area with prevalence of 100 % in both the areas, while it ranged from 16.66 % to 33.33 % in rest of the areas. Salmonella was not found in any of the samples collected from different areas of Shirur Anantpal city.

**Keywords:** Sheep meat(Mutton).Meat Shop, Microbiological Quality

## I. INTRODUCTION

In Latur (Maharashtra) sheeps are slaughtered on daily basis in large numbers by the local butchers as a backyard enterprise without stunning and dressed in roadside shops or booths in presence of consumers. The lack of infrastructure facilities in the slaughter area, unhygienic conditions and poor handling of sheep carcasses between the production and retailing favor the contamination of mutton with saprophytic and pathogenic bacteria. During slaughtering, dressing and further processing, meat surface invariably comes in contact with contaminated tools and equipments and gets easily contaminated (Narasimha Rao and Ramesh, 1998). This causes considerable variations in the microbial quality as the carcasses are exposed to ambient temperature and unsanitary practices during processing and handling (Kakoti et al., 2003). The bacterial quality of meat and presence of E.coli, Salmonella and Staphylococcus aureus have been assessed by various researches (Das et al., 1990; Bhutia and Sen, 1992; Devgen and Gupta, 1992; Murlidhara Rao et al., 1993; Gill et al., 1994; Singh et al., 1996; Kumar and Bist, 2003 and Pal et al., 2003). However, scanty information is available on microbial quality of chevon sold in retail meat shops of Latur city. Therefore, the present study was undertaken to determine the bacterial quality of Mutton from public health point of view.

## II. MATERIAL AND METHODS

A total of 60 samples, consisting of 10 samples each from six different areas of city ( A, B, C, D, E and F) were collected from sheep meat shops from thigh regions of carcasses in a sterile container and transported immediately to the laboratory under chilled conditions. Ten gram of each samples were homogenized in 90ml of sterile Normal saline solution (NSS) in a sterilized tissue homogenizer for 5 min to get 1 :10 dilution. From this further serial dilutions were made for inoculation in the plate count agar. Appropriate dilutions were inoculated into media using standard spread plate technique to estimate total viable count (TVC) (APHA,1992). Following incubation, plates showing 30-300 colonies were counted and expressed as log<sub>10</sub> cfu/g. isolation of the organisms was made using general, selective and enrichment media and the isolates were identified on the basis of morphological, cultural and biochemical characteristics (Edward and Ewing, 1972; Cruickshank, et al., 1975).MacConkey agar and eosin methylene blue (EMB) agar were used for isolation of E. coli and Baird-Parker agar was used as a selective media for isolation of S. aureus. For isolation of Salmonella,25g sample was diluted in 225 ml buffered peptone water (pre enrichment broth) and incubated for 18 h at 37°C. Then 1 ml was transferred to 10 ml tetrathionate broth (enrichment broth) and incubated for 24 h at 42°C temperature. From this, a loopful growth was incubated to fresh tetrathionate broth as a second enrichment. Then this culture was streaked on brilliant green agar and incubated for 24 h at 37°C. The moisture and PH were also determined (AOAC, 1995). Data obtained during study were analyzed statistically (Snedecor and Cochran, 1989).

## III.RESULTS AND DISCUSSION

The pH value of the samples collected from different areas did not differ significantly. However, moisture in these samples ranged from  $69.66 \pm 0.81$  to  $79.66 \pm 1.93$  per cent, which varied significantly.

The mean values of TVC (log<sub>10</sub> cfu/g+SE) of meat samples were recorded (Table 1) to be  $6.24 \pm 0.05$ ,  $6.28 \pm 0.01$ ,  $6.35 \pm 0.03$ ,  $6.32 \pm 0.05$ ,  $6.30 \pm 0.02$  and  $6.21 \pm 0.01$  for the area A, B, C, D, E and F, respectively. These results are equivalent with the earlier results of Rathod et.al., (2004) who found SPC  $6.18 \pm 0.03$  log cfu/cm<sup>2</sup> in neck region of goat carcasses in Parbhani however Pal et al (2003) who found SPC  $6.18 \pm 0.02$  log cfu/cm<sup>2</sup> in neck region of goat carcasses in Pondicherry.y. However, Kumar and Bist (2003a) reported higher SPC (7.8 log cfu/g) in chevon. These counts exceeded the standards as prescribed by the Bureau of Indian standards (Anon, 1995) for raw goat meat, rendering the meat under study unsafe and unhygienic for consumption from public health point of view. The higher microbial load could be attributed to the unhygienic conditions and improper storage facilities at retail shops (Tiwari et al., 2002) The TVC revealed significant variations between the mean counts of samples from the six areas.

Escherchia coli counts in these samples were between  $0.55 \pm 0.31$  and  $3.70 \pm 0.13$  log 10 cfu/g. Similar observations were also reported by Pal et al. (2003) as  $2.24 \pm 0.22$  log 10 cfu/g. Highest E. coli was recorded in A area with prevalence (Fig. 1) of 83.33 %, while the lowest E.coli counts was recorded in the meat samples collected from area C and D with prevalence of 16.66% for both the areas.



Table 1. Microbiological and physicochemical qualities of Mutton sold in Shirur Anantpal

Sampling Area	pH	Moisture	TVC (log <sub>10</sub> cfu/g)	<i>E. Coli</i>		<i>S. aureus</i>	
				Count (log <sub>10</sub> cfu/g)	Prevalence %	Count (log <sub>10</sub> cfu/g)	Prevalence %
A	6.14± 0.02	65.30 ± 1.61	6.24 ± 0.05	3.70 ± 0.13	83.33	3.72 ± 0.13	100
B	6.15 ± 0.02	69.66 ± 0.81	6.28± 0.01	1.10± 0.50	33.33	3.77 ± 0.16	100
C	6.16 ± 0.02	64.47 ± 0.89	6.35 ± 0.03	0.55± 0.31	16.66	1.12± 0.52	33.33
D	6.13 ± 0.03	66.80 ± 1.33	6.32 ± 0.05	1.05± 0.50	33.33	1.10± 0.51	33.33
E	6.12 ± 0.02	79.66 ± 1.93	6.30 ± 0.02	0.55± 0.31	16.66	0.55± 0.85	16.66
F	6.10 ± 0.01	68.71 ± 0.95	6.21 ± 0.01	0.50± 0.30	16.66	1.08± 0.50	33.33

B and E area prevalence of 33.33%. Higher coliform counts in meat from local meat shops were also reported by Bhutia and Sen (1992) and Kumar and Bist (2003a). The mean contamination levels with staphylococcus aureus were 3.72± 0.13, 3.77± 0.16, 1.12± 0.52, 1.10± 0.51, 0.55± 0.85 and 1.08± 0.50 for areas A, B, C, D, E and F, respectively, which were lower than results (5.7 log cfu/g) obtained by Kumar and Bist (2003a). Areas A and B had the highest count with 100% prevalence while area C, D and F had 33.33% prevalence for *S. aureus*. Area D had least prevalence (16.16%) among all the six areas which is comparable with the results of Kumar and Bist (2003b). Such high prevalence of *S. aureus* in meat sold in local meat shops could be due to slaughtering of goats in pen space at ambient temperature and use of same wooden block / platform to make pieces without washing it with hot water. Unsanitary and unhygienic conditions in and around meat shops, use of contaminated water for evisceration, improper bleeding, slaughter without stunning and cross contamination of carcasses

with the gut contents might be the other contributing factors of presence of E.coli and S. aureus in meat sold in local meat shops.

None of the meat samples revealed the presence of Salmonella sp. These results are in agreement with findings of Singh et al. (1996) and Rajmallyah et al. (1989). However, Das et al. (1990) recorded 12% isolation of Salmonella from goat meat.

On the basis of present results, it was concluded that microbiological quality of chevon sold in the retail meat shops of Latur city is not satisfactory and in order to reduce the contamination of meat, strict hygienic measures are needed with constant microbial monitoring at specific sites in the meat production chain.

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# Comparative Analysis of Phantoms for Patient-Specific Quality Assurance in Advanced Radiotherapy Treatments

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## ABSTRACT

**Introduction:** The use of volume modulated arc treatment (VMAT) and flattening filter free (FFF) beams in LINAC-based stereotactic radiosurgery (SRS) or stereotactic body radiotherapy (SBRT) for delivering complex dose distributions while protecting normal tissue is increasing. This advanced treatment technique emphasizes the need for precise target localization and stringent quality assurance program in order to safely deliver dose to target. The study compared the three commercially available phantoms for patient-specific quality assurance (PSQA) for SRS, FSRT, and SBRT treatment plans.

**Materials & Methods:** The study retrospectively analyzed 20 stereotactic treatment plans generated in Eclipse treatment planning system, using VMAT delivery technology and 6xFFF X-ray beam energy from TrueBeam linac. The plans targeted volumes ranging from 1.1 cc to 68 cc. They included lung, cranial SRS or fSRT, pelvic, and bone metastases treatments. PSQA was performed using EBT-3 film, SNC ArcCHECK, and aS1200 EPID from Varian for each patient plan.

**Results:** The study analyzed gamma analysis passing rates for EBT-3 films and ArcCHECK, as well as Varian aS1200 EPID for different gamma criteria. EBT-3 films showed high passing rates at less stringent criteria, but deviated more as criteria became more stringent. ArcCHECK was found to be insufficient in representing dose distribution intricacy in certain plans. Varian aS1200 EPID produced high passing rates, closely matching EBT-3 film at less stringent criteria but deviating at more stringent criteria. Lower resolution detectors were unable to accurately detect dose distribution changes, while high resolution detectors were capable of detecting the difference.

**Conclusion:** The film dosimetry is suitable for stereotactic radiosurgery, but flat panel aSi based EPID systems are preferred for routine quality assurance and dose verification due to their efficiency and accuracy. The aS1200 EPID is highlighted as a valuable tool for PSQA in modern radiation therapy. While film dosimetry remains reliable for specialized treatments, EPID systems are considered a more practical and effective solution for everyday quality assurance in radiation therapy, with the ArcCHECK QA system also recommended for large target volumes.

**Keywords:** SRS, SBRT, Film dosimetry, ArcCHECK, EPID

## I. INTRODUCTION

In advanced radiotherapy, volume modulated arc treatment (VMAT) and flattening filter free (FFF) beams can be utilized by linear accelerator (LINAC)-based stereotactic radiosurgery (SRS) or stereotactic body radiotherapy (SBRT) to create complicated dose distributions that may be delivered fast while preserving normal tissue. Because of the small fractions, the effects of a geometric target miss might have a big influence on tumor management. Consequently, LINAC mechanical and dosimetric tolerances as well as a high level of target localization precision are required for the treatment delivery of LINAC-based SRS/SBRT programs. For instance, a LINAC executing stereotactic treatments typically has an isocenter stability tolerance of 1 mm.[1] SRS techniques are frequently used to treat small tumors located in different areas of the body. Quality assurance of the treatment plan before therapy is a crucial component of a patient's treatment process. A suitable detector capable of precisely detecting the dose distribution is required for identifying the characteristics of a SRS/SBRT treatment plan and the limitations of a LINAC discussed above. Small field dosimetry presents specific issues, such as the loss of lateral electronic equilibrium and volume-averaging effects when using detectors with volumes similar to the field size.[1,2]

Validating a treatment plan for a patient including film dosimetry or high-resolution detectors is essential. Film dosimetry is a cost-effective technology that offers better spatial resolution than ion chamber matrices and high-resolution diode arrays. Film dosimetry is laborious and time-consuming. Alternatives to film dosimetry include devices like the SNC ArcCheck and the Varian aS1200 Electronic Portal Imaging Device (EPID). Recently, patient-specific quality assurance devices have made significant advancements in both their design and the software utilized to assess the measured dose distribution. The study aims to assess the effectiveness of commercial PSQA devices in comparison to film dosimetry for evaluating SRS, FSRT, and SBRT treatment plans before treatment.

## II. METHODS AND MATERIAL

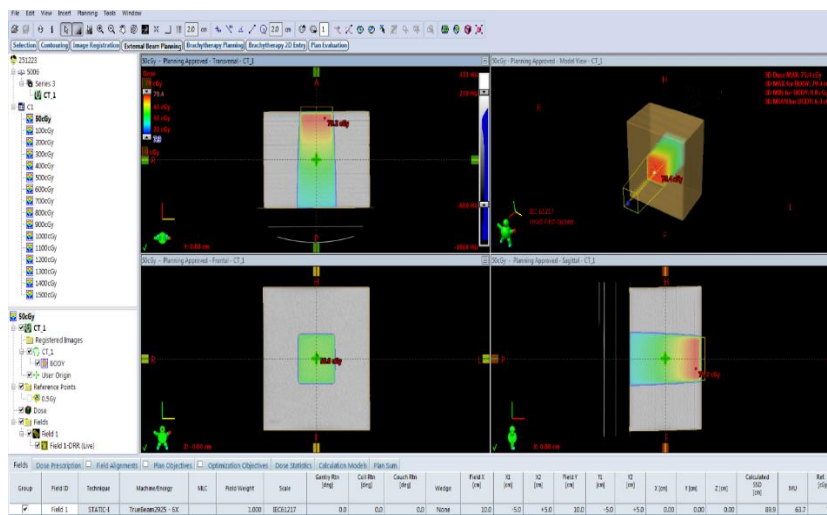
We retrospectively selected 20 stereotactic treatment plans, each with different target volumes. The treatment plans were developed in Eclipse treatment planning system (Version 13.6) utilizing volumetric modulated radiotherapy (VMAT) delivery technology. The X-ray beam energy utilized during planning comprised 6xFFF from TrueBeam (Siemens Healthineers Company) linac. The target volume sizes varied from 1.1 cc to 68 cc, with an average volume of 26.9 cc. Out of the 20 plans, there were 3 lung treatments, 9 cranial SRS or fractionated stereotactic radiotherapy (fSRT) treatments, 2 pelvic treatments, and 6 bone metastases treatments. Twenty plans were delivered over three distinct patient specific quality assurance (PSQA) devices: EBT-3 film, SNC ArcCHECK, and aS1200 electronic portal imaging device (EPID) from Varian.

### *Detectors:*

#### *EBT-3 film:*

The slab phantom was scanned with a Discovery RT CT-Scanner utilizing a 1.25mm slice thickness. The CT images were imported into Eclipse TPS (13.6) and the patient's plan was recalculated using the slab phantom. The dose was delivered to each film using 6 MV x-rays at a depth of 10 cm, source to film distance was 100cm, field size of 10cm x 10cm with 10 cm of backscatter as shown in figure 1. The film was scanned after 24 hours using an Epson 11000XL flatbed scanner from Seiko Epson Corporation in Suwa, Nagano, Japan. The scanning was done using the triple channel technique, 72 dpi resolution, and without any

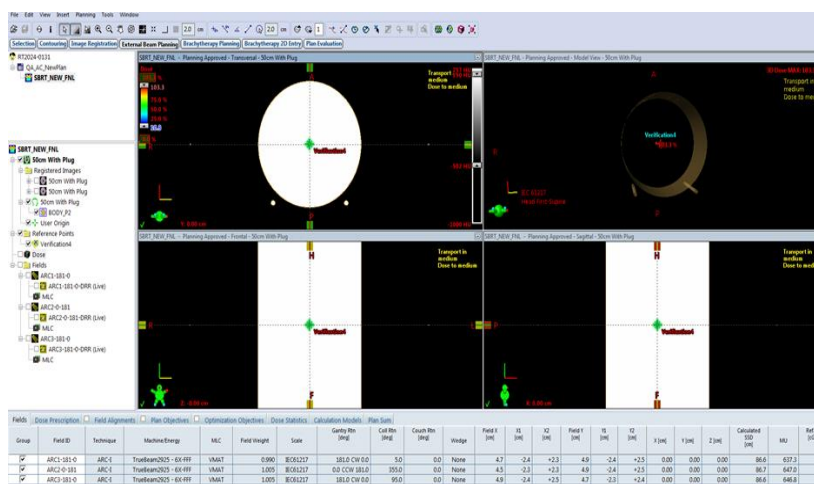
color changes. A calibration curve ranging from 50 cGy to 1500 cGy was established for the investigation. The calibration curve was generated with film dosimetry from SNC Patient QA software. The PSQA plan was executed on the same slab phantom and film positioned in the coronal plane relative to a 6 FFF X-ray beam from the TrueBeam linac. The .tiff format film image and dose distribution from the Treatment Planning System (TPS) were loaded into the SNC Patient QA software on the same plane as the film. A comparison was made between the planned TPS estimated dose and the delivered dose using gamma analysis.



**Figure 1.** Slab phantom with EBT-3 film at 10cm depth from phantom surface. The dose was normalised to isocentre point.

### A. SNC ArcCHECK

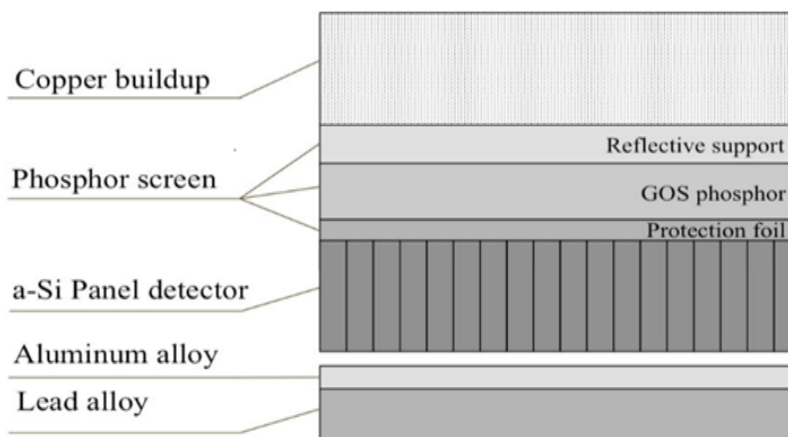
The ArcCHECK virtual CT provided by Sun Nuclear was used in the treatment planning system. The ArcCHECK was assigned a density of approximately 1.2 g/cm3, while the rods were given a density of 1.4 g/cm3. Figure 2 shows the virtual computed tomography used in the Eclipse Treatment Planning System. PSQA plans were calculated based on the treatment plan's intrinsic dose grid resolution and subsequently sent to SNC Patient software for evaluation. The SNC Patient application imports a 3D dose file and transforms it into a 2D format to be used as the reference profile in the gamma analysis.



**Figure 2.** Virtual ArcCHECK phantom in Eclipse TPS

## B. EPID

The Varian aS1200 Digital Megavolt Imager (DMI) EPID consists of a 43 cm × 43 cm array of amorphous-Silicon (a-Si) photodiode flat panel detector serving as the active layer. The design comprises a 1mm thick copper build-up layer, a phosphor screen scintillation layer composed of gadolinium oxysulfide (GOS), an amorphous silicon photodiode readout layer, and a 4mm thick backscatter layer constructed from aluminum and lead plates. Figure 3 displays a cross-sectional view of the pertinent layers of the Varian DMI panel.



**Figure 3. A cross-sectional view of the pertinent layers of the Varian aS1200 Digital Megavolt Imager EPID**

The pixel resolution is 1280 × 1280 pixels, with each pixel having an active area of approximately 0.113 mm<sup>2</sup>. The DMI panel can handle FFF beams with a high dosage rate and is capable of withstanding up to 7000 cGy/Min without experiencing saturation effects.[3,4] Couch rotation was set to zero, but all gantry and collimator rotation parameters were observed for each treatment plan. Portal dosimetry plans were generated and delivered utilizing 100 source-imager-distance as depicted in figure 4.



**Figure 2 EPID in planned position to carry out PSQA**

The portal dosimetry images were analyzed in Eclipse's Portal Dosimetry workspace using a 10% dose threshold and field + 2cm area of interest. Figure 5 displays an EPID analysis of a 2.6 cc target using 3%/3mm gamma criteria.

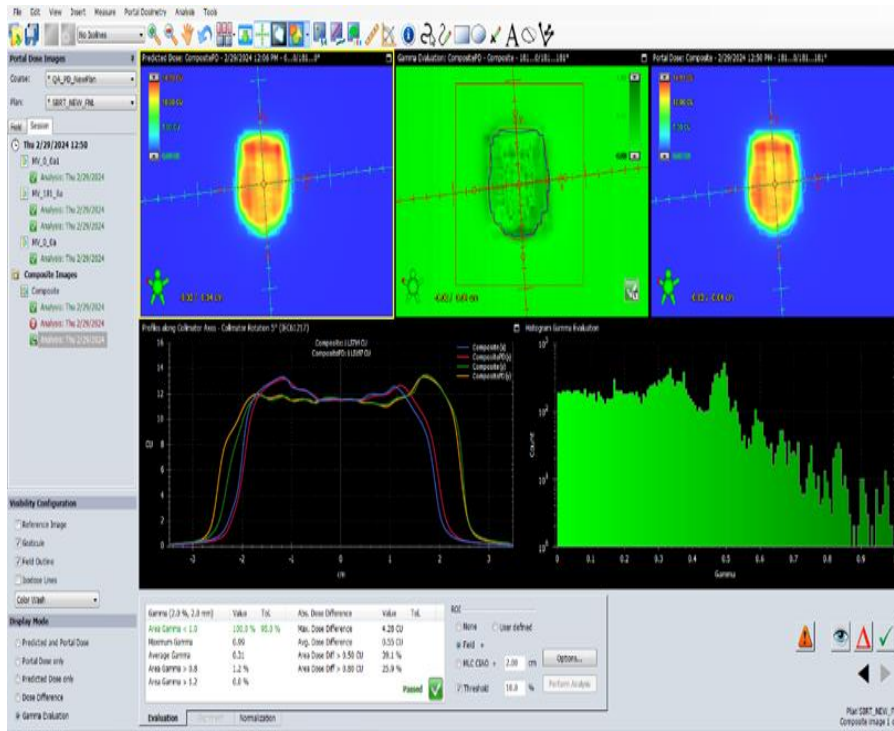


Figure 3 Portal dosimetry workspace in Eclipse TPS

### III.RESULTS AND DISCUSSION

All paragraphs must be indented. All paragraphs must be justified, i.e. both left-justified and right-justified.

#### A. Text Font of Entire Document

The entire document should be in Times New Roman or Times font. Type 3 fonts must not be used. Other font types may be used if needed for special purposes.

Recommended font sizes are shown in Table 1.

#### B. Title and Author Details

Title must be in 20 pt Times New Roman font. Author name must be in 11 pt Regular font. Author affiliation must be in 10 pt Italic. Email address must be in 9 pt Courier Regular font.

TABLE I AVERAGE GAMMA RESULTS FOR 20 PLANS ON EACH DEVICE.

	Patient specific quality assurance devices		
Gamma Criteria	EBT-3 Film	Arc CHECK	aS 1200 EPID
3%/3mm	98.66%	96.52%	99.13%
2%/2mm	92.48%	89.26%	94.42%
2%/1mm	86.26%	77.22%	76.87%
1%/1mm	70.23%	64.3%	70.17%

EBT-3 films average gamma analysis passing rates were found to be 98.66%, 92.48%, 86.26%, and 70.23% for 3%/3mm, 2%/2mm, 2%/1mm, and 1%/1mm gamma criteria. The ArcCHECK gamma analysis passing rates of 95.52%, 89.26%, 77.22%, and 64.3% for 3%/3mm, 2%/2mm, 2%/1mm, and 1%/1mm gamma criteria, respectively. The average gamma findings were within 2.2% agreement with the film at 3%/3mm criteria, but deviated more for more stringent criteria. The ArcCHECK was found to be insufficient to accurately represent the intricacy of the dose distribution in certain plans.

The Varian aS1200 EPID produced an average gamma analysis passing rates of 99.13%, 94.42%, 76.87%, and 70.17% for 3%/3mm, 2%/2mm, 2%/1mm, and 1%/1mm gamma criteria, respectively. These results agree with EBT-3 film within 0.5% for 3%/3mm and within 2 % for 2%/2mm, but begin to deviate for 2%/1mm and 1%/1mm. Lower resolution detectors generally failed to accurately detect changes in dose distribution, but high resolution detectors were capable of detecting the difference.

For the gamma criteria of 3%/3mm, 2%/2mm, 2%/1mm, and 1%/1mm, respectively, the average gamma analysis passing rates for EBT-3 films are 98.66%, 92.48%, 86.26%, and 70.23%, respectively, as indicated in the Results section. EBT-3 offers better spatial resolution compared to the SNC ArcCHECK and Varian's EPID devices, and it is not significantly affected by energy or dose rate variations. EBT-3 did not meet the 1%/1mm gamma requirements in this investigation. One potential explanation for this underperformance may be that film analysis methods might be susceptible to systematic mistakes. Lynch et al. studied how the optical density reading by flatbed scanners changes depending on the film's location and rotational rotation on the scanner.[5] The films showed up to 17% non-uniformity along the scanline and 7% perpendicular to the scanline when evenly irradiated and scanned at various points on the flatbed scanner. To make the most of the spatial resolution of EBT-3 film, a precise technique is needed to minimize errors in the study of dose distribution. The ArcCHECK body is cylindrical to ensure that the diodes are consistently perpendicular to the delivery angle, enhancing the detector's angular sensitivity. The diodes in the ArcCHECK are positioned 10 mm apart. This spacing may result in just one row of diodes being within the field for extremely tiny targets, which restricts the amount of data captured. For small targets only few row of diodes got direct irradiation. Diodes located outside the primary beam likewise show reduced responsiveness because of the low radiation exposure in that area. Mhatre et al. investigated the application of ArcCHECK for machine quality assurance and determined its suitability for advanced linear accelerator QA. [6] Portal Dosimetry using EPID is a convenient and reliable way for promptly confirming treatment plans prior to treatment. EPIDs were originally developed for verifying patient positioning and setup just before to the start of radiation treatment. [7] Soon after its introduction, it was found that the real-time portal images not only captured visuals but also included dose information, making analysis more efficient than traditional films. This resulted in its extensive utilization for regular quality assurance of linear accelerators and validation of dose administration for advanced treatment techniques like IMRT, VMAT, SRS, fSRS and SBRT. Flat panel EPID systems based on aSi are favoured for their rapid image acquisition, superior spatial resolution, sensitivity, small footprint, consistent long-term performance, and capability for dosage verification. The aS1200 EPID is a valuable tool for PSQA.[8]

#### IV. CONCLUSION

Film dosimetry based PSQA is suitable for stereotactic radiosurgery. However, for routine quality assurance and dose verification for advanced treatment techniques, flat panel aSi based EPID systems are preferred due to their efficiency and accuracy. The aS1200 EPID, in particular, stands out as a valuable tool for PSQA in modern



radiation therapy. Overall, while film dosimetry remains a reliable option for certain specialized treatments like SRS/SBRT, EPID systems offer a more practical and effective solution for everyday quality assurance in radiation therapy. When target volume is large ArcCHECK QA system can also be used to perform SRS, FSRS and SBRT PSQA.

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# Sensorial and Physicochemical Characterization of Milkshake Manufactured by Using Different Level of Jaggery

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## ABSTRACT

Today dairy industry is concerned in the product standardization by new specified products designed to contend with or to substitute present products based on their supremacy in its ease, price and worth, so the progress in product development. The milkshakes that are commonly sold in the Indian sub-continent consist of sweetened cold milk added with coloring and flavoring agents without freezing but vigorous shaking. Now-a-days, however in all parts of world, the production of various types of milk beverages is increasing rapidly and they are becoming more popular day by day.

**Keywords:** Sapota+custard apple, milkshake, Jaggery, fruit pulp.

## I. INTRODUCTION

In a tropical country like India, due to unfavorable climatic conditions and improper production and handling of milk, rapid deterioration of milk is a common feature. Therefore, the aim has always been to preserve all possible constituents of milk, so that 46% milk is used as fluid and remaining 54 % of milk in India is converted into various indigenous products like *khoa*, curd (*Dhai*), *makkhan*, ghee, etc and western dairy products such as ice-cream, cheese etc. *Milkshake* and *kulfi* are also one of the important milk products manufactured in India. [1]

This demand of dairy products increasing speedily due to rise in inhabitants, varying demographic prototype, socio-economic category, revenue circulation, perception of people. Day-by-day various type of milk product also consumed by the domestic sector. In present era consumers are more aware regarding functional non-nutritive products, more cautious towards fitness and fair nourishment and want better quality and suitable foodstuff (Kadav, 2001).

At present the dairy industry is both actively and articulately involved in product development. This includes new formulations and imitation products designed to compete with or replace existing products based on their superiority in convenience, cost and quality, so the progress in product development (Moorthy *et al.*, 1993). Hence present study was undertaken to reveal effect of different levels of jaggery with mixed fruit puree on sensory characteristics of milkshake.

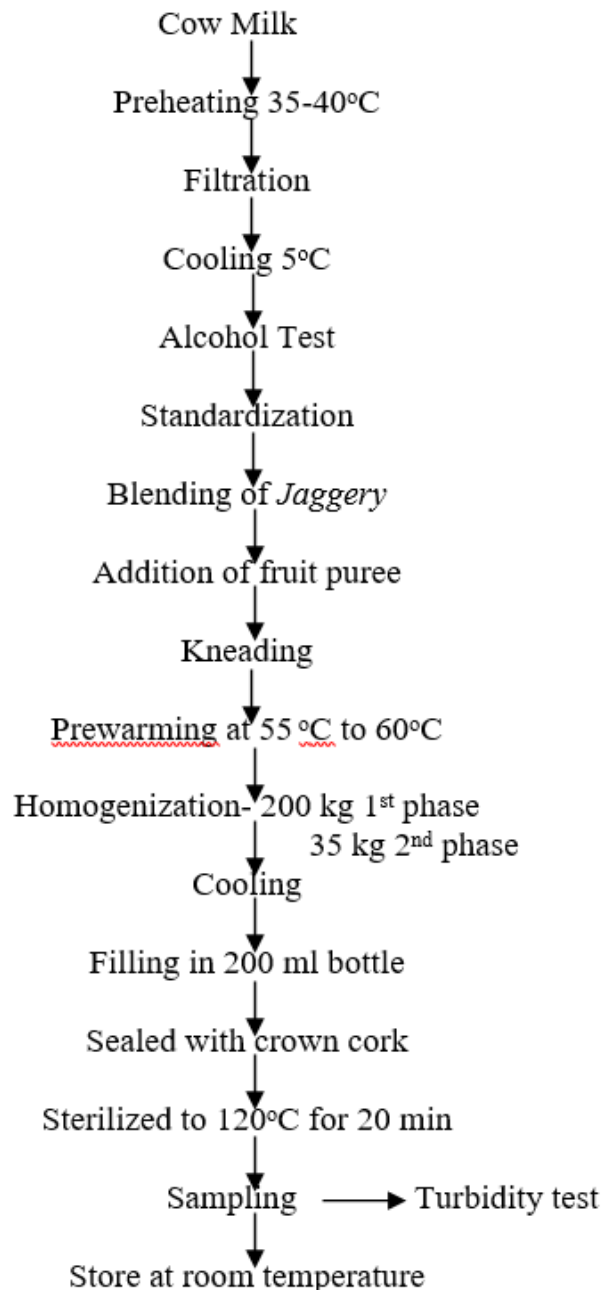
## II. METHODS AND MATERIAL

### Standardization of *milkshake* by blending of fruits pulp and *jaggery*

Technological modifications required during manufacture of *milkshake* from fruit pulp were studied and suitable steps of processing were decided in this part of research work. Pre-experimental trials were taken mainly to finalize the levels of pulp and *jaggery* to be added. During initial trials the milk got curdled beyond the 9 % puree and 9 % *jaggery* during sterilization of *milkshakes*.

### Preparation of Milkshake

#### Flow diagram



### Sensory evaluation of Milkshake

The sensory evaluation of *milkshake* was carried out by the panel of six semi trained judges by adopting 9 point Hedonic scale, given in IS: 1971 and referred by Gupta (1999).

### III.RESULTS AND DISCUSSION

#### Influence of *jaggery* level on sensory value of *sapota 50%+custard apple 50% (7% pulp) milkshake*

The values of Table 1 conclude that, average color and appearance value for various levels of *jaggery* on *milkshake* ranged from 7.80 to 8.00. The data shows that product prepared with 8 percent *jaggery* scored the highest score followed by 9 and 7 per cent. It was observed that addition of *jaggery* upto 8 per cent; increased the colour and appearance score of *milkshake*, however addition of *jaggery* beyond 8 per cent there was a decrease in the colour and appearance score of *milkshake*.

**Table 1: Effect of level of *jaggery* on sensory quality of *sapota 50% +custard apple 50% (7% pulp) milkshake***  
(Mean of three replication)

Sensory attributes	Level of <i>jaggery</i> (%)			SE	CD
	7	8	9		
Flavor	8.3	7.70	7.60	0.21	0.60
Taste	7.2	7.80	7.59	0.17	0.48
Body and texture	7.3	7.60	7.33	0.09	0.26
Colour and appearance	7.8	8.00	7.84	0.06	0.17
Overall acceptability	7.65	7.77	7.59	0.05	0.14
CD at P < 0.05					

Average values for flavor ranging 7.60 to 8.30. Score of flavor for product prepared with 7 percent *jaggery* scored the highest score. The product prepared with 9 percent *jaggery* scored lowest score followed by 8 and 7 percent.

Mean score for body and texture ranged from 7.30 to 7.60. The score of body and texture for product prepared with 8 percent *jaggery* scored the highest score. The product prepared with 7 percent *jaggery* scored lowest score followed by 8 and 9 percent. It was observed that addition of *jaggery* upto 7 per cent increased the body and texture score of *milkshake*; however by addition of *jaggery* beyond 7 per cent there was a decrease in the body and texture score of *milkshake*. Blends were categorized as like very much and like extremely

Table 1 show that the average values for taste characteristic of *milkshake* was rang in from 7.20 to 7.80. Product prepared with 8 % *jaggery* was significantly superior over rest of the treatments.

Table 1 concludes overall acceptability values of *milkshake* for different blends changing from 7.59 to 7.77. Average overall acceptability value for the product prepared with 7, 8 and 9 per cent *jaggery* was 7.65, 7.77 and 7.59 respectively. The product prepared with 8 percent *jaggery* (7.77) and was satisfactory by panel of judges such that mixing of 8 % *jaggery* in mixture was more satisfactory instead of other combinations.

#### Effect of level of *jaggery* on sensory quality of *sapota 50%+custard apple 50% (8% pulp) milkshake*

It is evident from Table 2 that, the mean colour and appearance score for different levels of *jaggery* on *milkshake* ranged from 6.30 to 7.59. The data shows that product prepared with 9 per cent *jaggery* scored the highest score followed by 8 and 7 per cent. It was observed that addition of *jaggery* upto 9 per cent; increased the colour and appearance score of *milkshake*.

**Table 2: Effect of level of *jaggery* on sensory quality of *sapota* 50% + *custard apple* 50% (8% pulp) *milkshake***  
(Mean of three replication)

Sensory attributes	Level of <i>jaggery</i> (%)			SE	CD
	7	8	9		
Flavor	7.00	7.50	7.54	0.17	0.48
Taste	6.90	7.60	7.51	0.22	0.61
Body and texture	8.00	7.30	7.07	0.27	0.77
Colour and appearance	6.30	7.30	7.59	0.39	1.08
Overall acceptability	6.80	7.42	7.43	0.20	0.57
CD at P<0.05					

Mean score for flavor ranged from 7.00 to 7.54. The score of flavor for product prepared with 9 per cent *jaggery* scored the highest score. The product prepared with 7 per cent *jaggery* scored lowest score followed by 8 per cent.

Mean score for body and texture ranged from 7.07 to 8.00. The score of body and texture for product prepared with 7 per cent *jaggery* scored the highest score. The product prepared with 9 per cent *jaggery* scored lowest score followed by 8 and 7 per cent. It was observed that addition of *jaggery* upto 7 per cent; increased the body and texture score of *milkshake*, however by addition of *jaggery* beyond 7 per cent there was a decrease in the body and texture score of *milkshake*. All the treatments were marked as, like very much to like to like extremely.

Table 2 show that the average values for the taste characteristic of *milkshake* was ranging 6.90 to 7.60. The product prepared with 8 percent *jaggery* was significantly superior over rest of the treatments.

From Table 2 it is concluded that the overall acceptability value of *milkshake* for different combinations changed from 6.80 to 7.43. The average value for overall acceptability for the product prepared with 7, 8 and 9 per cent *jaggery* was 6.80, 7.42 and 7.43 respectively. The product prepared with 9 per cent *jaggery* (7.43) was most satisfactory, so admixing of 9% *jaggery* in the mix was more tolerable than other blend.

**Influence of level of *jaggery* on sensory parameter of *sapota* 50%+*custard apple* 50% (9% pulp) *milkshake***

Table 3 concludes that, the average color and appearance values for altered levels of *jaggery* on *milkshake* ranging from 6.60 to 7.30. The statistics indicates product prepared with 9 per cent *jaggery* scored the highest score followed by 8 and 7 per cent. It was observed that addition of *jaggery* upto 9 per cent; increased the colour and appearance score of *milkshake*.

**Table 3: Influence of *jaggery* levels on sensory parameter of *sapota* 50% + *custard apple* 50% (9% pulp) *milkshake***  
(Mean of three replication)

Sensory attributes	Level of <i>jaggery</i> (%)			SE	CD
	7	8	9		
Flavor	6.9	7.2	7.34	0.12	0.36
Taste	6.6	7.0	7.28	0.19	0.54
Body and texture	6.9	6.8	6.94	0.04	0.12
Colour and appearance	6.6	6.8	7.30	0.20	0.57
Overall acceptability	6.72	6.95	7.21	0.14	0.39
CD at P<0.05					

Average values for flavor ranging 6.90 to 7.34. The product prepared with 9 per cent *jaggery* scored the highest score. The product prepared with 7 per cent *jaggery* scored lowest score followed by 8 and 9 per cent.

Mean score for body and texture ranged from 6.80 to 6.94. The score of body and texture for product prepared with 9 per cent *jaggery* scored the highest score. The product prepared with 8 per cent *jaggery* scored lowest score followed by 7 and 9 per cent. It was observed that addition of *jaggery* upto 9 per cent; increased the body and texture score of *milkshake*. All the combinations were marked, like very much to like to like extremely.

Table 3 shows that average values of taste characteristic of *milkshake* was 6.60 to 7.28. The product prepared with 9 per cent *jaggery* was significantly superior over rest of the treatments.

Table 3 determines the overall acceptability score of *milkshake* for combinations changed from 6.72 to 7.21. The average overall acceptability values for the product prepared with 7, 8 and 9 per cent *jaggery* was 6.72, 6.95 and 7.21 respectively. The product prepared with 9 per cent *jaggery* (7.21) was more satisfactory, so admixing of 9 per cent *jaggery* in the mixture was more satisfactory than rest of combinations.

#### IV. CONCLUSION

It is concluded from the study that Sapota+custard apple milkshake manufactured using 8% jaggery and 7% pulp was recognized by the all judges hence this combination got highest scored than rest of.

#### V. ACKNOWLEDGEMENTS

Authors are thankful to Department of Dairy Science, Yeshwant Mahavidyalaya, Nanded for providing chemicals and other facilities.

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# Studies On Preparation and Sensory Characterization of Phirni (Indian Rice Pudding) Blended with Different Level of Custard Apple Pulp

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## ABSTRACT

Phirni is a dairy dessert from north India made with ground rice /rice flour cooked in milk. It is served in traditional, eco-friendly earthen Pots, as it remains chilled for longer duration and has a particular pleasing taste. Phirni with fruity flavours like Custard apple Pulp was extremely soothing make it more delicious. Even with high sugar content the glycemic index of Custard apple is low (i.e. 54). Hence attempt have been made to study different level of Custard apple pulp concentration like T<sub>0</sub> (0%), T<sub>1</sub> (30%), T<sub>2</sub> (38%) and T<sub>3</sub> (46%). The panellists were preferred addition of 38%. (T<sub>2</sub>) Custard apple pulp in Phirni gives better quality product over control Sample.

**Keywords:** Custard apple, Phirni, Sensory evaluation, Overall acceptability.

## I. INTRODUCTION

Phirni is a classic creamy and sweet, is one of the most famous traditional dairy based dessert which is similar to rice kheer and rabri relished in Northern India, especially on festival and any special occasion. Usually it is served in traditional, eco-friendly earthen pots, as it remains chilled for longer duration and has a particularly pleasing taste. Phirni is usually prepared from rice paste (Granular form.), milk, sugar and flavouring agents and consistency by desiccation & consumed after brief cooling.

Phirni blended with Custard apple this is the combination of milk and fruity flavours extremely soothing make it more delightful. Even with high sugar content the glycemic index of Custard apple is low (i.e. 54.) making Suitable even for diabetic patients. Custard apple fruit has packed with many anti-oxidants like vitamin- C, Iron, Phosphorus, Potassium, and Magnesium which helps to fight free radicals in the body.

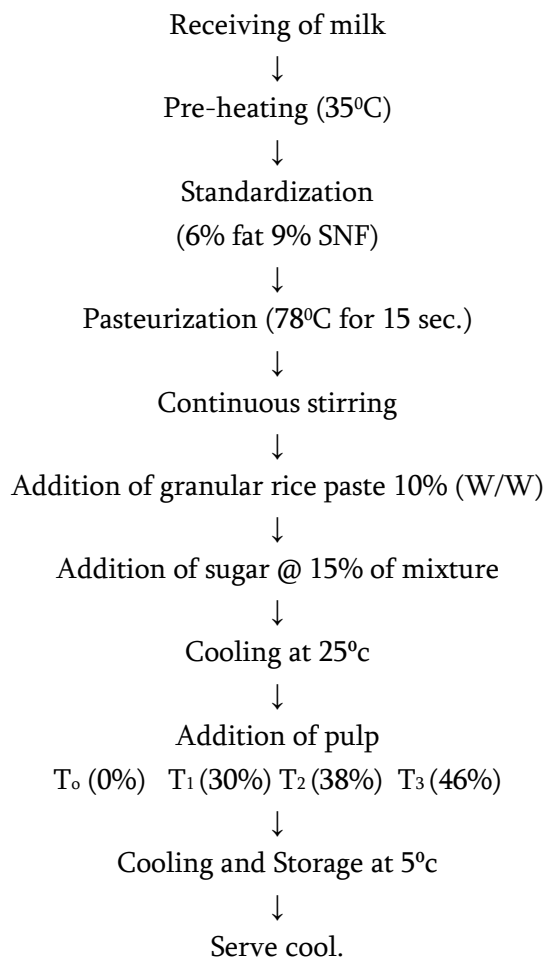
Recently certain dairy preparations was made to develop a product blended with Custard apple, viz. Custard apple rabri (Gite *et al.*, 2017), Custard apple *Basundi* (Bawale *et al.*, 2019), Custard apple ice-cream (Markam *et al.*, 2022) and found preparations blended with custard apple proves more nutritious and provide medicinal health benefits including the prevention and treatment of diseases.

## II. METHODS AND MATERIAL

### Standardization of Phirni by blending Custard apple Pulp -

Number of pre-trials was performed before finalizing the experimental samples. It was found that Custard apple pulp less than 30% blend was non-significant difference among the control sample by panellist.

### Method of manufacturing:



## III. RESULTS AND DISCUSSION

The sensory evaluations of the experimental samples were tested by the Panel of 5 trained judges by adopting a 9 point hedonic scale as described by Gupta (1976).

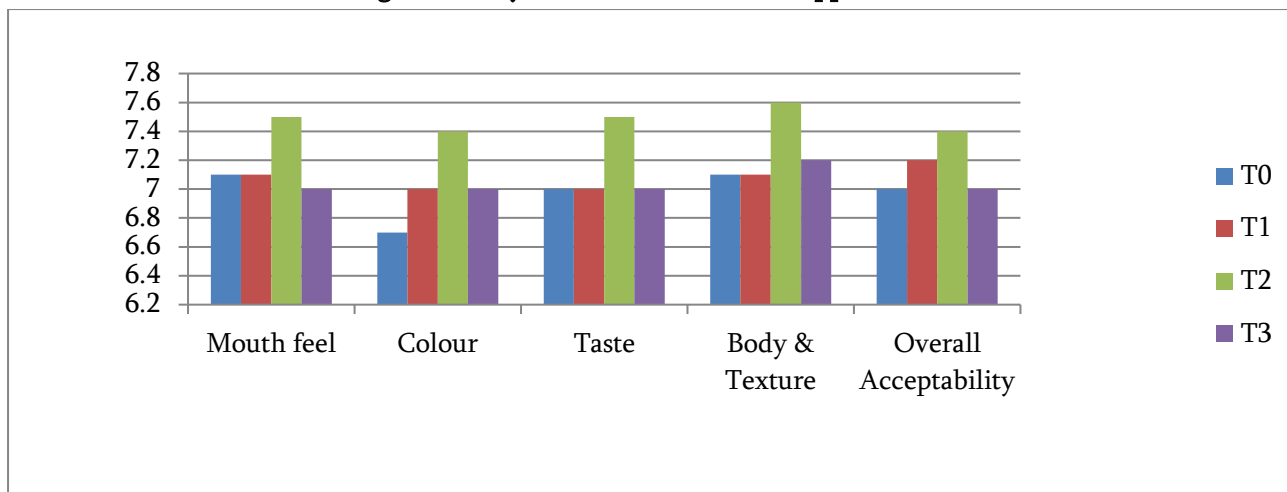
**Table 1: Average score for sensory evaluation of different attributes for Custard apple blended Phirni**

Treatments/ Attributes	Mouthfeel	Colour	Taste	Body and Texture	Overall acceptability
T <sub>0</sub>	7.1±0.06 <sup>b</sup>	6.7±0.44 <sup>NS</sup>	7.0±0.02 <sup>b</sup>	7.1±0.04 <sup>b</sup>	7.0±0.04 <sup>bc</sup>
T <sub>1</sub>	7.1±0.06 <sup>b</sup>	7.0±0.41 <sup>NS</sup>	7.0±0.07 <sup>b</sup>	7.1±0.11 <sup>b</sup>	7.2±0.08 <sup>ab</sup>
T <sub>2</sub>	7.5±0.00 <sup>a</sup>	7.4±0.20 <sup>NS</sup>	7.5±0.14 <sup>a</sup>	7.6±0.07 <sup>a</sup>	7.4±0.10 <sup>a</sup>
T <sub>3</sub>	7.0±0.07 <sup>b</sup>	7.0±0.21 <sup>NS</sup>	7.0±0.04 <sup>b</sup>	7.2±0.18 <sup>ab</sup>	7.0±0.02 <sup>c</sup>

All the values are given in mean ± s.e. Where n=4 , a-d values with the same superscript within the same column are not significantly different ( P>0.05). NS- Non-significant.



Fig.1: Sensory evaluation of Custard apple Phirni



### Effect of different level of custard apple pulp on Sensory score of developed Phirni

Judges were provided with samples to find out the order of quality attribute according to method, by providing the judges with 4 treated samples coded as T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub>, and T<sub>3</sub> in a series with a spoon and glass of water to cleanse the palate between analysis and examining the sensory parameters with 9 point hedonic scale and the findings were illustrated as

#### Mouthfeel

The score of Table 1 revealed that, average score of Mouthfeel for different treatment combinations were 7.1, 7.1, 7.5 and 7.0 for T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub> respectively. The data shows that product prepared with 38% Custard apple pulp scored highest score followed by 30% and 46%. It was observed that score of T<sub>1</sub> (30% pulp) and T<sub>0</sub> (0% pulp) Scores same.

#### Colour:-

In Table 1 it is recorded that the score of colour was non-significant and ranges from 6.7 to 7.4. In that the order was T<sub>2</sub> (7.4) > T<sub>1</sub> (7.0) > T<sub>3</sub> (7.0) > T<sub>0</sub> (6.72)

#### Taste

In this all treatment T<sub>0</sub>, T<sub>1</sub>, T<sub>2</sub> and T<sub>3</sub>, the treatment T<sub>2</sub> (7.5) is superior to other treatments. The T<sub>2</sub> (7.5), is significantly different ( $P > 0.05$ ) over T<sub>0</sub>

#### Body and Texture

The Body and texture of Phirni was significantly changed with levels of Custard apple pulp. In this parameter score ranges between 7.6 to 7.1, where the T<sub>3</sub> (7.6) is better score than the other treatments followed by T<sub>0</sub> (7.1), T<sub>2</sub> (7.1) & T<sub>3</sub> (7.2).

#### Overall acceptability

Overall acceptability means the directly relates to the interaction of food with consumers. In that the maximum score obtained by treatment T<sub>2</sub> (7.4) with a combination of 38% of custard apple pulp with respect to treatment of T<sub>0</sub> (7.0 with 0% pulp), T<sub>1</sub> (7.2 with 30% pulp) and T<sub>3</sub> (7.0 with 46% pulp).

#### IV. CONCLUSION

It is concluded from the present study that preparation of Phirni with 38% of Custard apple pulp (T<sub>2</sub>) Showing superior quality and it considered that the body and texture of Phirni is depends on the percentage of addition of different levels of Custard apple pulp.

Hence, the addition of 38% of Custard apple pulp in Phirni is gives better quality product with respect to 0% (T<sub>0</sub> treatment.) and it makes more nutritious and delicious product than the plain phirni.

#### V. ACKNOWLEDGEMENTS

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# Synthesis and Structural Characterization of $\text{Co}_{1-x}\text{Mn}_x\text{Fe}_2\text{O}_4$ Thin Films Deposited by Spray Pyrolysis

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## ABSTRACT

This study focuses on synthesizing and meticulously characterizing thin films comprised of  $\text{Co}_{1-x}\text{Mn}_x\text{Fe}_2\text{O}_4$  (CMFO) using chemical deposition methods employing spray techniques. The CMFO system, a ternary spinel ferrite, showcases intriguing structural attributes, rendering it highly promising for a spectrum of technological applications. Utilizing a cost-effective and scalable spray technique for deposition, the thin films offer precise control over thickness and uniformity. Structural analysis of the synthesized thin films was conducted comprehensively to elucidate their crystallographic properties. X-ray diffraction (XRD) was utilized to confirm the formation of the spinel structure and determine the crystallographic phases within the films. The outcomes validate the successful deposition of CMFO thin films with controlled composition. In summary, this investigation presents a methodical synthesis and detailed structural characterization of CMFO thin films deposited through spray techniques, enhancing our understanding of their structural properties and facilitating their potential applications across various technological domains.

## I. INTRODUCTION

CMFO is a ternary spinel ferrite, a type of compound that belongs to the family of mixed metal oxides. This specific compound is formed by combining cobalt (Co), manganese (Mn), iron (Fe), and oxygen (O) atoms in a particular crystal structure known as the spinel structure [1]. The subscript "1-x" in the formula indicates that the compound consists of a variable composition, where the value of "x" can be adjusted to achieve different stoichiometries within the Co-Mn-Fe-O system. This variability allows researchers to tailor the properties of CMFO for specific applications by controlling the relative amounts of cobalt, manganese, and iron. The spinel structure is characterized by a face-centered cubic (FCC) arrangement of oxygen ions, with metal ions occupying both tetrahedral (A) and octahedral (B) sites in the crystal lattice [2]. This unique crystal structure contributes to the interesting magnetic and electrical properties exhibited by spinel ferrites. CMFO has gained attention in various technological applications, including magnetic devices, sensors, catalysis, and other electronic applications. The tunable magnetic properties make it particularly attractive for use in magnetic storage, spintronic devices, and other emerging technologies that leverage magnetic functionalities. Researchers often explore different synthesis methods to fabricate thin films of CMFO, allowing for precise control over the material's properties [3]. Chemical deposition techniques, such as spray methods, offer a cost-effective and scalable approach to producing thin films with uniform thickness and desirable characteristics [4].

Structural characterization refers to the comprehensive analysis and understanding of the physical and chemical arrangement of atoms or molecules in a material. This characterization is crucial for gaining insights into the material's properties and behavior, which, in turn, can be valuable for various applications. Techniques used for structural characterization provide information about the crystal structure. In the context of materials science, structural characterizations often involve the x-ray diffraction techniques [5]. The synthesis and structural characterization of thin films play a pivotal role in the development of materials with tailored properties for diverse technological applications. Among the myriad of materials, CMFO thin films, belonging to the ternary spinel ferrite family, have garnered significant interest due to their intriguing magnetic and structural attributes. In this study, we explore the synthesis and detailed structural characterization of CMFO thin films using chemical deposition methods with a focus on spray techniques [6]. Ternary spinel ferrites have gained prominence owing to their versatile applications in sensors, catalysis, and magnetic devices. The ability to precisely control the composition and structure of thin films is crucial for tailoring their properties to meet specific application requirements. Chemical deposition methods particularly spray techniques; provide a cost-effective and scalable approach for the fabrication of thin films, offering advantages such as uniformity, simplicity, and adaptability to various substrate geometries [7].

## II. MATERIALS AND METHODS

### Co-Precipitation Method

- i. **Materials:** Cobalt chloride ( $\text{CoCl}_2$ ), Manganese chloride ( $\text{MnCl}_2$ ), Iron chloride ( $\text{FeCl}_3$ ), Ammonium hydroxide ( $\text{NH}_4\text{OH}$ ) and Deionized water
- ii. **Method:** Dissolve the appropriate amounts of cobalt chloride, manganese chloride, and iron chloride in deionized water. Adjust the concentrations based on the desired composition of CMFO. The general formula for the precursors is  $\text{Co(II)}$ ,  $\text{Mn(II)}$ , and  $\text{Fe(III)}$  salts. Combine the metal salt solutions while stirring continuously. The mixing ratio will determine the final composition of CMFO. Slowly add ammonium hydroxide solution to the mixed metal salt solutions while maintaining constant stirring. The addition of ammonium hydroxide leads to the precipitation of metal hydroxides. Continue stirring until a gel-like precipitate forms. This precipitate contains the mixed metal hydroxides. Allow the gel-like precipitate to age for a specific duration. Aging helps in the formation of well-defined particles and improves the homogeneity of the final product. Centrifuge the aged precipitate to separate the solid from the liquid phase. Wash the obtained solid with deionized water to remove impurities and excess ammonium ions. Dry the washed solid in an oven to remove any remaining water. Heat the dried precursor in a controlled atmosphere (e.g., air) at elevated temperatures (typically  $500\text{--}800^\circ\text{C}$ ) to initiate the solid-state reaction and form the desired spinel ferrite phase. Allow the sample to cool down to room temperature. Collect the synthesized CMFO powder [8]. Creating liquid samples of CMFO typically involves preparing a precursor solution and then converting it into the desired liquid form. The co-precipitation method, commonly used for powder synthesis, can also be adapted to produce liquid samples [9].
- iii. **Spray Pyrolysis technique:** Spray techniques are commonly employed for the deposition of thin films due to their simplicity, scalability, and ability to coat various types of surfaces, including complex geometries. The process involves spraying a solution or suspension of the desired material onto a substrate, where it

forms a thin film as the solvent evaporates. Here's a general overview of the steps involved in thin film preparation using spray techniques [4].

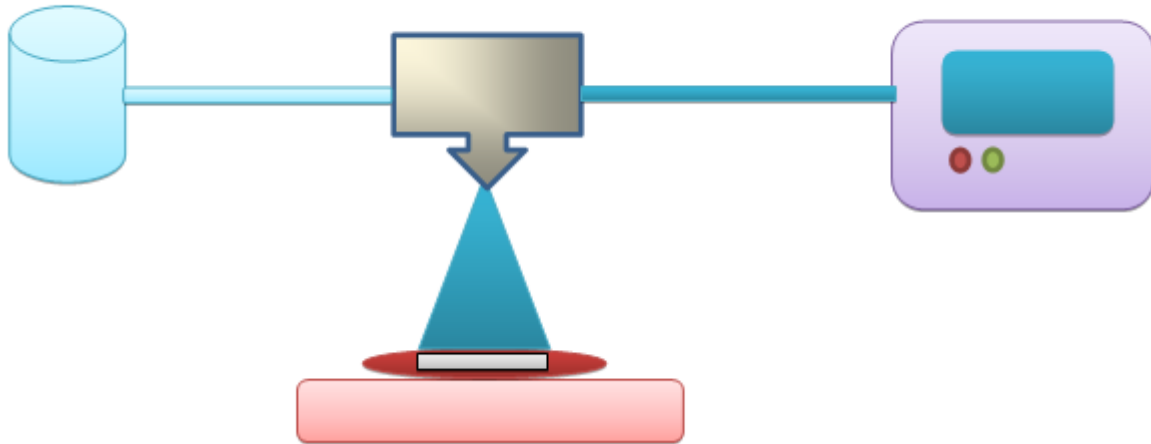


Figure 1. Spry Pyrolysis Techniques

- iv. **Structural characterization: X-ray Diffraction (XRD):** XRD is a widely used technique to determine the crystal structure of a material. X-rays are directed at a crystalline sample, and the resulting diffraction pattern is analyzed to identify the crystal lattice parameters, phases present, and the orientation of crystalline grains [10].

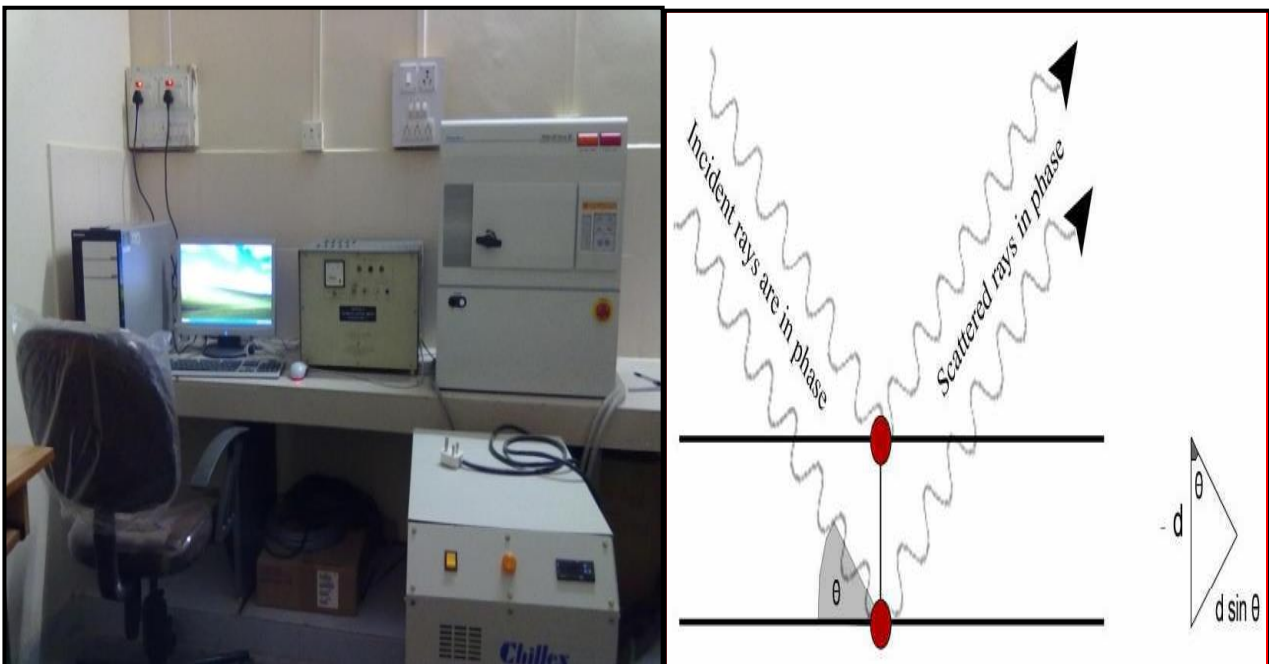


Figure 2. Rigaku make A8 advanced the X-ray powder diffractometer and Braggs X-ray diffraction pattern

### III.RESULTS DISCUSSION

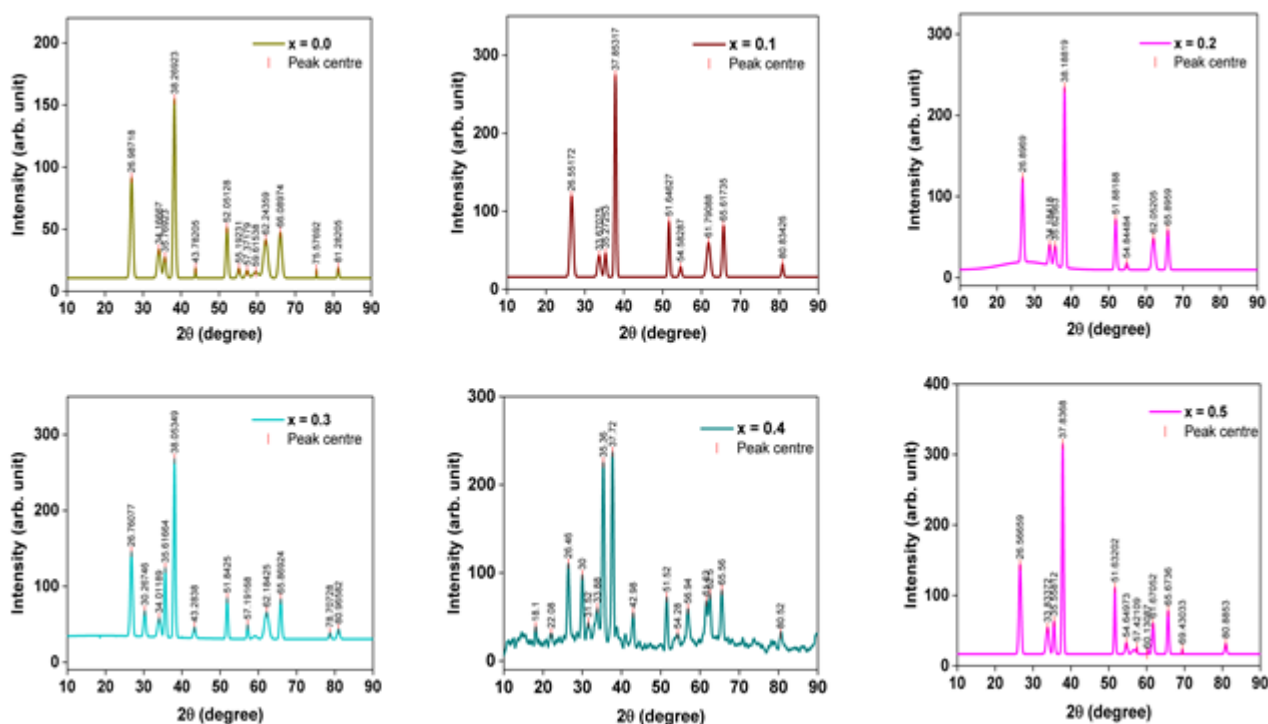


Figure 3 XRD pattern of the  $\text{Co}_{1-x}\text{Mn}_x\text{Fe}_2\text{O}_4$  varying ( $x = 0.0, 0.1, 0.2, 0.3, 0.4$  and  $0.5$ ) A, B, C, D, E and F respectively of the thin films

The X-ray diffraction (XRD) pattern presented in Figure 3 illustrates the structural characteristics of thin films composed of  $\text{Co}_{1-x}\text{Mn}_x\text{Fe}_2\text{O}_4$  with varying compositions ( $x = 0.0, 0.1, 0.2, 0.3, 0.4$ , and  $0.5$ ), denoted as A, B, C, D, E, and F, respectively. The XRD analysis is a powerful technique used to study the crystallographic structure of materials, providing information about their composition and crystallinity.

Examine the positions of diffraction peaks for each composition. Shifts in peak positions can indicate changes in the lattice parameters or crystal structure due to the substitution of Co with Mn in the ferrite structure. Compare the peak positions of A, B, C, D, E, and F to identify any systematic trends.

The intensity of diffraction peaks reflects the abundance of crystalline phases. Changes in peak intensity can signify variations in the crystallinity or the relative amounts of different phases in the thin films. Analyze whether there are noticeable differences in peak intensities among the samples.

Peak Broadening: Broadening of diffraction peaks can be associated with factors such as crystallite size, microstrain, or defects in the crystal structure. Investigate if there are changes in peak broadening as  $x$  varies, which may provide insights into the structural modifications induced by the manganese substitution.

New Phases: Look for the emergence of new diffraction peaks that are not present in the reference sample ( $x = 0.0$ ). The appearance of new peaks may suggest the formation of additional phases or crystal structures due to the introduction of manganese.

Crystalline Structure Identification: Based on the XRD pattern, attempt to identify the crystalline phases present in each composition. Utilize crystallographic databases or reference patterns for  $\text{Co}_{1-x}\text{Mn}_x\text{Fe}_2\text{O}_4$  to confirm the phases observed in the thin films.

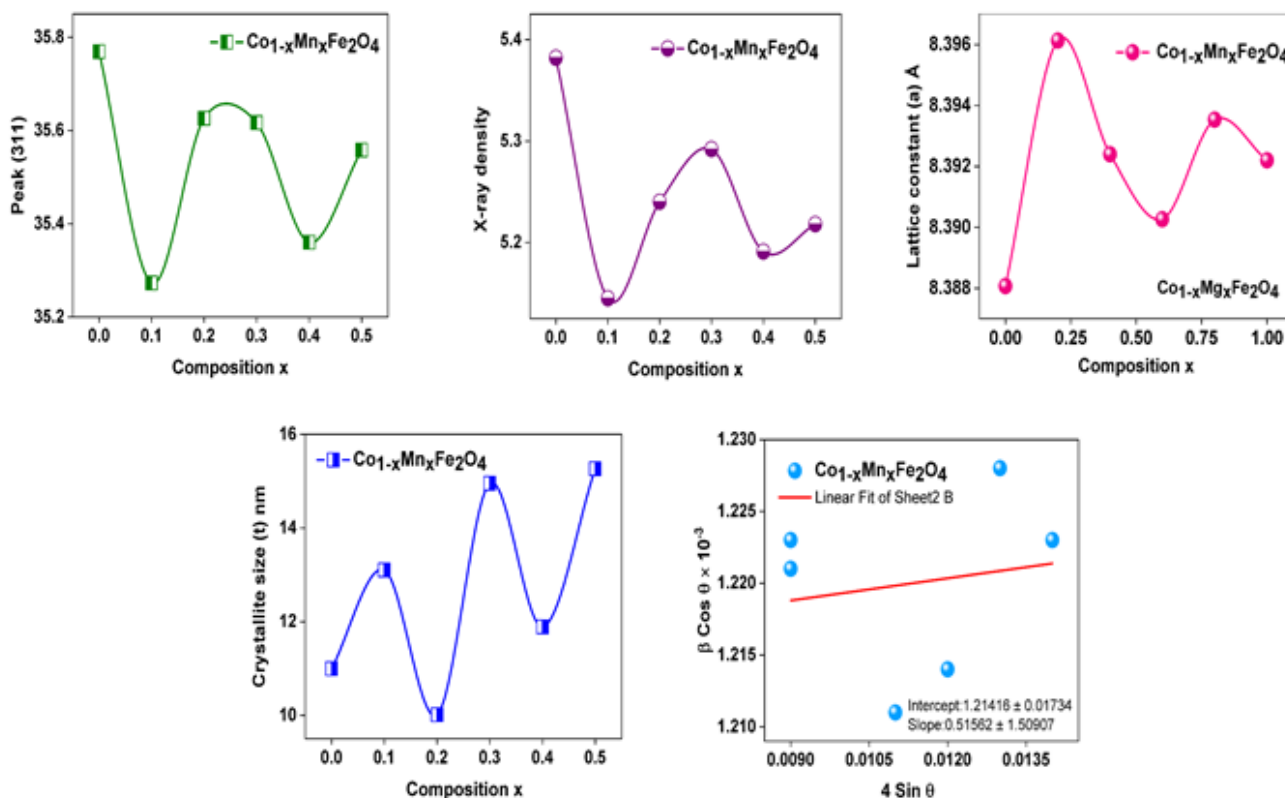


Figure 4 XRD pattern of the  $\text{Co}_{1-x}\text{Mn}_x\text{Fe}_2\text{O}_4$  various parameters (Peaks, Density, Lattice Constant, Crystal Size and W H Plot) A, B, C, D, and E respectively of the thin films

Figure 4 indicates that different parameters such as Peaks Density, Lattice Constant, Crystal Size, W-H (Williamson-Hall) Plot. Identify and analyze the positions and intensities of the diffraction peaks in the XRD pattern for each composition (A, B, C, D, and E). Note any shifts in peak positions, which could indicate changes in the crystal structure or lattice parameters due to the variation in composition. The density of the thin films provides information about their mass per unit volume. Changes in density may be indicative of variations in the packing arrangement of atoms in the crystal lattice or the introduction of foreign elements. The lattice constant is a fundamental parameter describing the size and shape of the crystal unit cell. Investigate any trends or variations in the lattice constant as  $x$  changes, indicating possible structural modifications due to manganese substitution. The XRD pattern can be used to estimate the crystallite size using techniques such as the Scherrer equation. Observe if there are trends in crystal size across different compositions. Changes in crystal size may be associated with alterations in the growth conditions or the presence of impurities. The Williamson-Hall plot is a graphical method used to analyze the contributions of different factors (strain and crystallite size) to the broadening of XRD peaks. Examine the W-H plot for each composition to understand the dominant factors influencing peak broadening and to quantify the crystallite size and strain.

#### IV. CONCLUSION

In conclusion, the X-ray diffraction (XRD) analysis of  $\text{Co}_{1-x}\text{Mn}_x\text{Fe}_2\text{O}_4$  thin films with varying compositions (A, B, C, D, and E) has provided valuable insights into their structural and characteristics. Peaks in the XRD

pattern were carefully analyzed for each composition, revealing any shifts in positions, changes in intensities, or the emergence of new peaks. The density measurements showed variations across different compositions, suggesting changes in the packing arrangement of atoms. These density changes may be attributed to the presence of manganese and its impact on the overall film structure. Trends in the lattice constant were observed, indicating potential modifications in the size and shape of the crystal unit cell due to manganese substitution. Crystal size calculations using the Scherrer equation revealed trends in crystallite size for different compositions. The Williamson-Hall plot analysis provided a deeper understanding of the factors contributing to peak broadening, including strain and crystallite size. The systematic investigation of the XRD parameters indicates that the substitution of manganese in  $\text{Co}_{1-x}\text{Mn}_x\text{Fe}_2\text{O}_4$  thin films has a significant impact on their structural properties. The findings contribute to our understanding of the structural modifications induced by varying manganese content, providing essential information for potential applications in electronic, magnetic, or spintronic devices. Based on the current study, potential avenues for future research could include a more in-depth exploration of the magnetic and electronic properties of the thin films, as well as the optimization of synthesis parameters to control and enhance specific material characteristics.

## V. ACKNOWLEDGEMENT

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# Level of Erythrocytes and Haemoglobin Is Influenced by Aluminum Sulfate in Freshwater Catfish *Clarias Batrachus*

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## ABSTRACT

Fishes are the main biotic components of any aquatic ecosystem hence they are selected for toxicological study. Heavy metals adversely affect many non-target species (Tilak and Satvardhan, 2002, Prashanth et al., 2005). The fishes are the main supply of cheap and healthy protein to a large percentage of the world's population.

The use of aluminum sulphate in industrial sectors disinfectant and antiseptic in medicines as an intermediate in production of other compounds. These chemicals cause the adverse effects on aquatic ecosystem has gained increasing attention in recent duration. The effect of the chemicals may be physiological, biochemical and pathological in nature (Stephenson, 1987). The changes produced by chemical may be complex, damage one or different organs, tissues or cells. Blood counts help evaluate diets because the number of erythrocytes responds more quickly to some dietary deficiencies than does the condition factor or growth rate. Alert biologists who might interpret observed anemia as indicator of poor nutrition could high mortalities attributed in part to adequate diets and metal toxicities in aquatic biodiversity.

**Keywords:** - Haemoglobin, Aluminum sulfate, *Clarias batrachus*.

## I. INTRODUCTION

Blood counts help evaluate diets because the number of erythrocytes responds more quickly to some dietary deficiencies than does the condition factor or growth rate. Alert biologists who might interpret observed anaemia as indicator of poor nutrition could avert high mortalities attributed in part to adequate diets and chemical toxicities in aquatic biodiversity. Aquatic ecosystems that run through agricultural or industrial areas have high probability of being contaminated by run off and ground water reaching the variety of chemicals and produce adverse effects on fish and aquatic fauna.

Blood is a redish coloured specialized connective tissue body fluid in every living organisms. In vertebrates, the main functions of Hb are transport of oxygen and carbon dioxide (Chandra et al., 2001) showed toxic effect of carbofuran on hematological parameters in *Cyprinus carpio*. Blood components includes, a liquid portion is called plasma and cellular portion that is called blood cells. It is a circulatory body fluid and circulates throughout the body of vertebrates. Fish blood acts as a medium for the translocation of chemicals, the medium to different organs or system of an animal (Krishna and Govil, 2004). In aquatic animals, the route of chemicals entry is through gills or mouth, so into blood and subsequently to different organs or body systems. Hence the impact of the toxic metals can be well understood by analyzing either blood or serum. Hematological studies

have long been considered as a valuable diagnostic tool in clinical biochemistry, genetics and in medical anthropology APHA, AWWA, WPCF (1976).

## II. MATERIALS AND METHODS

The present work was carried out at the laboratory of department of zoology, Yeshwant Mahavidyalaya, Nanded.(M.S), India. The fish, *Clarias batrachus* with average length of 17-20 cm and weight of 160-190 gm. were procured from local fish markets of Nanded. The fishes were brought to laboratory and were kept in the glass aquarium to observe any visible pathological symptoms. The fishes were firstly washed by tap water in aquarium of research laboratory. The fishes were bathed in 0.1% potassium permagnate solution and acclimatized under laboratory condition for two days. They were kept in large glass aquarium of 100 liters capacity. During acclimatization period water was changed daily. The fishes were fed of earthworm pieces and rice on alternate days.

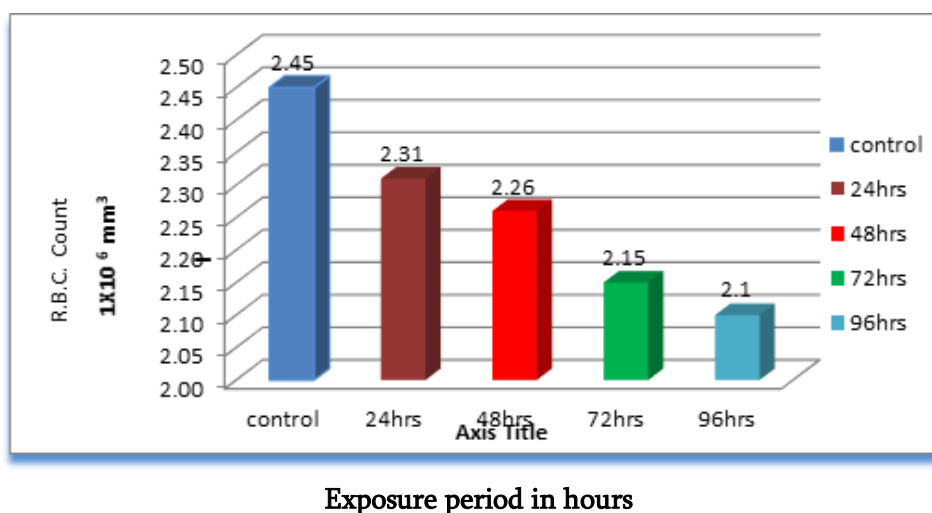
A stock solution of aluminum sulfate were prepared in laboratory after acclimatization, fishes were transferred to next glass aquarium, and the physico-chemical properties of test water were studied as per APHA (1998). They were divided into two groups. Each group contains 10 fishes in normal and experimented group. The fishes were exposed to aluminum sulfate for 24 hrs, 48hrs, 72 hrs, and 96 hrs. Blood parameters include hemoglobin analyzed in both normal and treated groups and then the treated groups compared with normal group.

## III. COLLECTION OF BLOOD

The blood was collected by cutting caudal peduncle using a sharp knife for hematological studies and also more blood collected from hepatic vein through syringe.

**Table-1-Levels of haemoglobin in *Clarias batrachus* exposed by aluminum sulfate**

Serial No.	Blood parameters	Control	24hrs	48hrs	72hrs	96hrs
1	R. B. C. Count $1 \times 10^6 \text{ mm}^3$	2.45+0.40	2.31+0.06	2.26+0.05	2.15+0.07	2.10+0.04
2	Hemoglobin gm./dl	7.08+0.05	6.04+0.36	6.03+0.32	6.02+0.36	5.03+0.36



**Fig.1. – Effect of aluminum sulfate on R.B.Cs. of *Clarias batrachus***

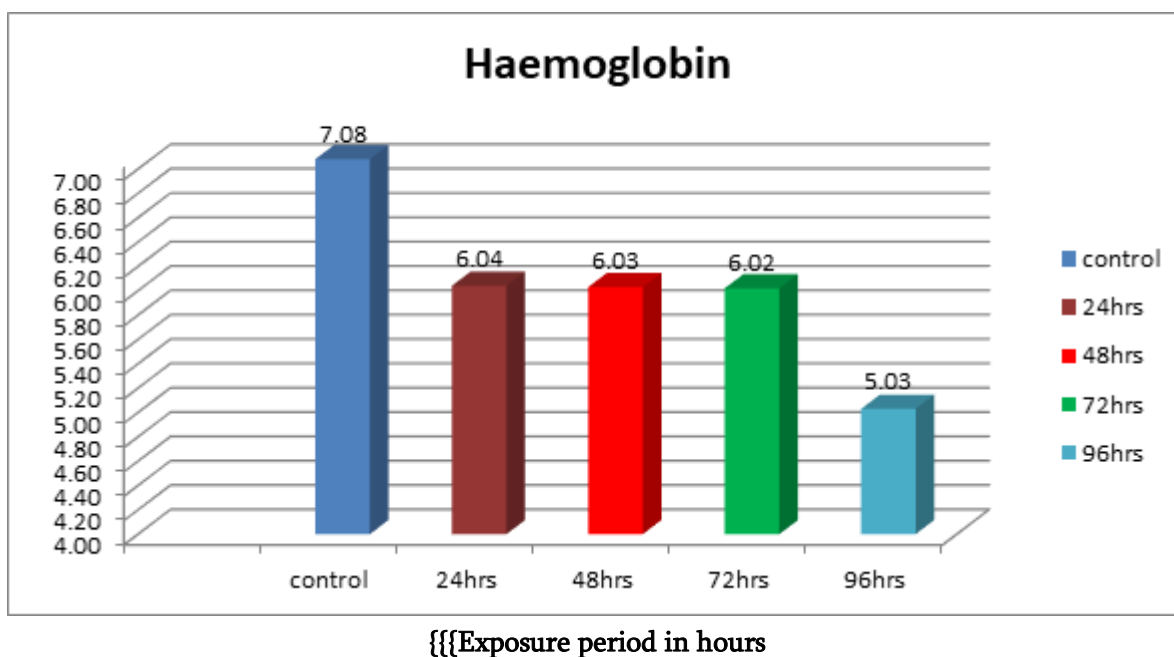


Fig.1. – Effect of aluminum sulfate on haemoglobin of *Clarias batrachus*.

#### IV. RESULT

In this investigation erythrocytes values were determined using different concentration of aluminum sulfate for different exposure time period using 10 fishes. The haematological values for 24 hrs. were highest followed by 48 hrs, 72 hrs and 96 hrs. for aluminum sulfate recorded as 2.31 ppm for 24 hrs., 2.26 ppm for 48 hrs., 2.15 ppm for 72 hrs. and 2.10 ppm for 96 hrs. The another blood cells includes leucocytes values determined at different time period using 10 fishes for aluminum sulfate recorded as 4.09ppm for 24 hrs., 3.85ppm for 48 hrs., 3.78 ppm for 72 hrs. and 3.69ppm for 96 hrs.

In this investigation haemoglobin values were recorded using different concentration of aluminum sulfate for different exposure time period using 10 fishes. The haemoglobin values for 24 hrs. were highest followed by 48 hrs, 72 hrs and 96 hrs. for aluminum sulfate recorded as 6.04 ppm for 24 hrs., 6.03 ppm for 48 hrs., 6.02 ppm for 72 hrs. and 5.03 ppm for 96 hrs.

The determination of values is great significance, since it provides fundamental data for the design of more complex model. The haemoglobin values were recorded for the determination of healthness of experimented fishes and effect of body exposed by chemical. The fishes *Clarias batrachus* exposed to aluminum sulfate showed decreases haemoglobin values with time period increases.

#### V. DISCUSSION

Any alteration in aquatic animal due to stress, infection or pollution affects the physiological, biochemical and behavioral activities of the living animals. The selected chemical was aluminum sulfate for the haematological study on fresh water fish *Clarias batrachus*. The aluminum sulfate showed adverse effect on aquatic organisms. It showed decreases in (Hb) count of *Clarias batrachus*. Reduction in haemoglobin values were reported up to 96 hours, transport of oxygen is done by the presence of hemoglobin in erythrocytes. Exchange of oxygen and carbon dioxide is one of the important functions of haemoglobin. The oxygen supply in the tissues and oxygen

demand of the tissues both appear to be the fundamental mechanism for the regulation section of erythropoietin, values of haemoglobin content was decreased. In recent study, the decrease in haemoglobin count during acute treatment might have resulted from severe anemic state of heamolysing due to the effect of aluminum sulfate (Romic and Romic,2003).

Some observations made by many authors, Vinodhini and Narayan (2009) found that the impact of toxic heavy metals on the hematological parameters in common carp (*Cyprinus carpio*) (Singare et al.,2011). The another observer Vutukuru (2005) showed acute effect of hexavalent chromium on survival and hematological parameters of the Indian major carp. A failure in red blood cells production and or due to increase in the erythrocyte destruction leads to reduction in R.B.Cs. Shobha Rani (1987) showed decreasing trend of total R.B.C. with increasing concentration and exposure time to monocrotophos on *Anabas testudineus* (Bloch). The decrease in Hb and R.B.Cs. number by the fenvalrate impact was attributed to symptoms leading to hypochromic microcytic anemia which is ascertained to iron deficiency and a consequent reduction in hemoglobin (Tilak and Satyavardhan2002). In present investigation Hb content decreased during 24, 48, 72 and 96 hours in fish *Clarias batrachus* exposed by aluminum sulfate.

The aluminum sulfate chloride showed alters in physiology and survival of aquatic animal under metabolic stress. This change in physiology and metabolic process depend upon the type of chemicals and species of animals observed by (Singare et al. 2011).

## VI. CONCLUSION

It is concluded that the level of R.B.C. and hemoglobin is decreased by aluminum sulfate in freshwater fish *clarias batrachus*.

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# Digital Library Software: A Study

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## ABSTRACT

Millions of dollars have been invested into the development of digital libraries. There are many Unanswered questions regarding their evaluation, in particular, from users' perspectives The richness in knowledge has changed access methods for all stake holders in retrieving key knowledge and relevant information. This paper presents a study of five open source DSpace, Greenstone, Eprints, libranix, Ganesha etc. digital library management software used to assimilate and disseminate information to world audience. The methodology followed involves online survey and study of related software documentation and associated technical manuals.

**Keywords:** Open source, Digital Library, Digital Library Management Software, Information Dissemination.

## I. INTRODUCTION

Digital library technologies are by now well established and understood throughout the higher education community and the creation of digital collections, either in the form of 'born-digital' materials or the conversion of standard library materials into digital form, is now a well-established part of the activities of most higher education institutions. Open source defines method of software development, that harnesses the power of distributed peer review and transparency of progress. This technique helps to provide better quality software's having higher reliability, flexibility with lower cost, and an end to the traditional vendor lock-in. The source code and rights that were normally reserved for copyright holders are now being provided under a free software license that permits developers / users to study, change, improve and at times also to distribute the software. Digital library refers to a collection that constitutes electronic resources, accessible through the World Wide Web. It often contains electronic versions of books, photographs, videos that are owned by a "physical" library. Open source digital library software presents a system for the construction and presentation of information collections. It helps in building collections with searching and metadata-bases browsing facilities. Moreover, they are easily maintained and can be augmented and rebuilt automatically. With many Open Source Software (OSS) applications now available for library and information management, Organizations now have novel options for acquiring and implementing systems.

## II. DIGITAL LIBRARY

The access point as well as the graphic records are in digital form when these digital libraries are connected via various networks, particularly the Internet, this is called virtual library.

Digital library is not only digitization of physical resources, but also thoughtful organization of electronic collection for better access. Such organization provides coherence to a massive amount of shared knowledge base. While the method of access provides convenient information retrieval for a wide range of global user. Essentially a digital library deals with organization and access of a large information repository. In all probability, digital libraries are likely to augment traditional libraries, such as an on-line card catalogue augments, rather than strictly replacing, a book collection. The reason for this could be that the digital medium tends to be better for searching and the physical medium better for reading. Lets us know about digital library and the skills required to build up digital collection.

According to Wiederhold "A digital library is popularly viewed as an electronic version of a library where storage is in digital form, allowing direct communication to obtain material and copying it from a master version."

Digital library is a combined technology and information resources to allow remote access, breaking down the physical barrier between resources".

Winensky viewed that "The digital library will be a collection of distributed information services, producers will make it available, and consumers will find it through the automated agents."

Digital library is a "Collection of digital object along with method for access and retrieval, (as far as users are concerned) and also for selection, organization, and maintenance (from the point of view of librarian). Ian Whitten.

The digital library is not merely equivalent to a digitized collection with information management tools. It is also a series of activities that brings together collections, services and people in support of the full life cycle of creation, dissemination, use and presentation of data, information and knowledge.

### Need of Digital Library:

Some of the common factor which are influencing to change to digital mode are the limited buying power of libraries, complex nature of recent document, storage problem etc. some other factors are:

1. **Information Explosion:** There is explosion of information generation and publication.
2. **Searching problem in traditional libraries:** In traditional libraries, it not easy to find the pinpoint information to the right user at the right time.
3. **Low cost of technology:** Technology needed for digital library is decreasing and efficiency is increasing.
4. **Environmental factors:** The use of electronic resources decreases the paper publishing and it automatically saves the trees.
5. **New generation needs:** Today users are demanding information in electronic form and minimum time.

### What is Open Source Software's?

DSpace, Greenstone, Eprints, Fedora are the software's available for digital information creation. These are the Open Source Software's (OSS). All are available free of cost on their respective websites, i.e. DSpace is available on <http://www.dspace.org> website.



**OSS: Commandments:**

As indentified by OSI (Open Source Initiative) there are ten criteria for a software product to be called open source. OSI also certifies a software license as an OSI certified license on the basis of ten commandments as detailed below:

- 1) **Free Redistribution:** The license shall not restrict any party from selling or giving away the software as a component of an aggregate software distribution containing programmes from several different sources. The license shall not require a royalty to other fee for such sale.
- 2) **Source Code:** The Programmes must include source code and must allowed distribution in source code as well as compiled form.
- 3) **Derived work:** The programme must allow modifications and derived works and must allow them to be distributed under the same terms as the license of the original software.
- 4) **Integrity of the authors source code:** The license may restrict source code from being distributed in modified form only of the license allows the distributions of “patch files” with the source code for the purpose of modifying the programme at build time.
- 5) **No Discrimination against persons or group:** In order to get the maximum benefit from the process, the maximum diversity of persons and groups should be equally eligible to contribute to open source.
- 6) **No Discrimination against field of Endeavour:** The license must not restrict anyone from making use of the programme in a specific field or Endeavour.
- 7) **Distribution of license:** The rights attached to the programme must apply to all to whom the programme is redistributed without the need for execution of an additional license by those parties.
- 8) **License must not be specific to a product:** The rights attached to the programme must not depend on the programmes being part of a particular software distribution.
- 9) **License must not restrict other software:** The license must not place restrictions on other software that is distributed along with the licensed software.
- 10) **The license must be technology Neutral:** No provision of the license may be predicted on any individual technology or style of interface.

**OSS for Developing Digital Libraries:**

With the advent of ICT content creation and content management are crucial components for the proper development of modern libraries. Capturing, Storing, Indexing, Preserving and redistributing digital content is a challenge of any Digital Library with ease-of-use and a web based user interface.

For establishing Digital Libraries some operational software is required for this purpose. A number of free digital library software like greenstone digital library software and Dspace Digital Library software are available for developing digital libraries, which aim to offer complete digital library solutions. Generally the emphasis is being given to use open source software package, which can offer the solution to construct customized applications for handling and providing access to digital collection available over the internet in digital library archives connected to web. Besides this supporting software is also required.

Following are some open source digital library software available, which can be used in digital libraries:

**1) Dspace Digital Library Software:**

Dspace is an open source software is freely downloadable from <http://www.dspace.org>. It is one of the most popular software for digital asset management system to capture, store, index, preserve, and redistribute the intellectual of university’s research faculty in digital formats developed jointly by MIT libraries and Hewlett-

packard(HP). It is available to research institutions worldwide as an open source system that can be customized and extended. It helps create, index and retrieve various forms of digital content. Dspace is adaptable to different community needs. Interoperability between systems is built-in and it adheres to international standards for Metadata.

Following are some salient features of Dspace.

- Submission facility allows scientists and researchers to upload digital documents from anywhere in the world.
- Workflow features allows moderation of the submitted documents.
- Uses persistent handles.
- Conform to the standards like Dublin Core and OAI-PMH V.2.0
- Security can be built at various levels to effect restricted access.
- Indian language based digital libraries can be built as it conforms to the UNICODE standard.

## 2) **Greenstone Digital Library Software:**

It is open source software available on <http://www.greenstone.org> under the term of the GNU General public license. Greenstone Digital Library Software was developed by the New Zealand Digital library project at the university of Waikato for building and distributing digital library collections. It has been developed for organizing information and publishing it on the Internet or on CDROM. By using this software Digital library collection will be developed. This is one of the multilingual software. In the software use the Dublin core metadata standards.

## 3) **GNU E-Print Archiving Software:**

The GNU E-print software is a free software which creates online archives. The default configuration is a repository of the research output of an academic institutions. It has been developed at the University of Southampton. Eprint is already established as the easiest and fastest way to set up repositories of open access research literature scientific date. Eprint is a major leap forward in functionality, giving more control and flexibility to repository managers, depositors, researchers and technical administrators. This software is available on <http://www.eprints.org>

## 4) **Ganesha Digital Library Software:**

GDL is an open source project initiated by KMRG ITB in 2000. It is the main engine of the Indonesian Digital Library Network (IDLN) for managing Metadata and full text of digital libraries in the network. The first development of the software funded by IDRC (International Development Research Centre) Canada, The latest development Version 4.2 is funded by the INHERENTDIKTI project. GDL can be downloaded free of cost at <http://dgl.ac.id/download/>

## 5) **Libraonix Digital Library System:**

This libronix DLS is available on the site <http://www.logos.com/products> One Technology for an integrated library, Successor to the logos library system, Modular Architecture, Internet Integration and global and multilingual these are the some important features of the libronix digital library software.

### III.CONCLUSION

The Digital Library Management software's (DLMS) present an easy to use, customizable architecture to create online digital libraries. With these institutions/organizations can disseminate their research work, manuscripts, or any other digital media for preservations and world over dissemination of digital items. The software's discussed above present different services and architectures. It is difficult to propose one specific DLMS system as the most suitable for all cases. The study can be used as a reference guide by any organization or institute to decide which one will be ideal for creating and showcasing their digital collection. The choice usually depends on type/format of material, distribution of material, software platform and time frame etc for setting up a Digital Library.

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# Study of Fish Markets in Dindori Tehsil of Nashik District, Maharashtra

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## ABSTRACT

Fish serve as an important delicacy throughout the world. In Maharashtra as well, fishes and other aquatic foods are preferred over other forms of meat. There is a great variety in terms of available fishes and the prices at which they are sold in different fish markets in Maharashtra. The current study was carried out in Dindori tehsil of Nashik district covering two major markets viz Dindori and Vani fish markets to answer the questions related to diversity of fishes, selling rates and consumer behaviours like preference and days of purchasing. The data was collected through questionnaire from December 2023 to February 2024. It was found that fish market system was observed which included various elements forming a chain. It was also found that Rohu and Catla were the most preferred Indian major carps in the market while eel and prawns were least available. The consumer behaviour is attributed to the size of the fish, availability of the fish and religious days and festivals.

**Keyword:** Fresh market, fresh water fish, Dindori, Vani, Nashik.

## I. INTRODUCTION

Fish has been consumed by Indians from centuries. India's fish consumption dates back to 2500 BCE <sup>(1)</sup> With a species count of over 33000, fishes serve as a major source of nutrients like proteins, oil and omega 3 fatty acids, playing vital role in maintaining ecological balance and also supporting fishery industries across the world by strengthening economy <sup>(2)</sup>. India is the third largest fish producer and second largest producer in aquaculture in the world and contributes 8% to the global fish production <sup>(3,4)</sup>. Fisheries sector contributes 1.1% to the Indian GDP and 6.72% to the agricultural GDP <sup>(5,6)</sup>. As the people are becoming more health conscious, the demand of a protein rich food has increased and fishes are the best source to fulfil this requirement that resulted in rise in fish consumption. It is significantly giving growth to the fish market <sup>(2)</sup>. As far as Indian states are concerned, Andhra Pradesh stands first in fish production ahead of West Bengal and Gujrat <sup>(7,8)</sup> 72.1% of the total population of the country includes fish into their diet and among the Indian states, Tripura stood first in having the highest population eating fish while Haryana the least <sup>(9)</sup>.

Fishes are aquatic vertebrates which are cold blooded and having good source of proteins, vitamins and minerals. They also play a vital role in maintaining the ecological balance. The fishes also support highly benefitting industry as well. Fish market can be defined as a place where selling and buying of fish and fish products take place by fishermen, wholesalers, retailers, consumers. Crawford fish market is the biggest fish

marke in India <sup>(10)</sup>. Fish production is an integral part of the marketing process as fish and fishery products are highly traded commodities. Fish waste from fish markets is also having high economic importance <sup>(11)</sup>. Dindori tehsil, as it is having six dams, is known for its fish markets. It also serves as the tehsil with two large fish markets i.e. Dindori and Vani, has good opportunities for fishermen, wholesalers, retailers and consumers in the near vicinity. Here in Dindori tehsil, a large of customers visit fish markets and consume fishes. The current study is an attempt to document the marketing system, availability of fishes and consumer behavior with reference to days to eat and preference of fish etc. This is the first report on fish market systems in Dindori tehsil of Nashik district.

## II. MATERIALS AND METHODS

### Study Area:

Dindori, a tribal tehsil of Nashik district, is famous for its suitable climate for agricultural practices and also it is also known for its highest number of dams i.e 6. The study was carried out in Dindori tehsil of Nashik district wherein two large fish markets serve the purpose of selling and buying fishes and other aquatic foods at Dindori (20.202454 ° N, 73.832098 ° E,) and Vani (20.329885 ° N, 73.896712 ° E ).

### Data Collection:

The data required to come to definite conclusion was obtained through surveys of fish markets by administering a structured questionnaire. All the fish traders in Dindori and Vani fish markets were informed about the purpose of this study and their participation was optional. Oral consent was obtained from each of the participant. The questionnaire was prepared in local language Marathi which included questions like diversity of fishes available, where they get fishes from, how is the behaviour of consumers etc. In Dindori Tehsil, there are two weekly fish market located at Dindori and Vani. Before selection as study area a discussion was made with retailers, traders and local workers based on market history number of fish retailers, duration of marketing season and time. The data was collected for a period of three month from December 2023 to February 2024.

## III.RESULT AND DISCUSSION

Fish like rohu, catla and mrigal were sold in large quantity because of having good demand. During the time of survey it was observed that the supplies of Indian major carps were good and their demands were high in the two markets. A strong network has developed with brokers and traders, intervening between farmers at one end and the consumers at the other end. There were 22 retailers found to sell fish in Dindori fish market and 20 in Vani fish market. It was found that 15 retailers were fishermen in Dindori fish market and 10 retailers are fishermen in Vani fish market. From the survey, it was found that about 70% retailers used their own money for fish trading while the rest i. e. 30% received loan from friends and relatives without paying any interest. During the survey it was also found that some of the local agents do not invest any capital rather they act as a commission agent. At 2-5 % commission for sending the fish to the markets. It was reported that the retailers of Nashik district typically operate with capital of around rupee 2000 to 10000 per day whereas the whole - salers possess more capital around rupee 15000 to 20000 per day.

Sr.No	Fishes Name		Rate per kg
	Local Name	Scientific Name	
1	Catla	<i>Catla catla</i>	INR 200
2	Rohu	<i>Labeo rohita</i>	INR 200
3	Mrigal	<i>Cirrhinus cirrhosus</i>	INR 200
4	Chopada	<i>Pangasius pangasius</i>	INR 200
5	Eel	Anguilliformes	INR 280
6	Cat fish	Siluriformes	INR 200
7	Tilapia	<i>Oreochromis niloticus</i>	INR 200
8	Small fish		INR 120
9	Rukhchar	<i>Pampus chinensis</i>	INR 200
10	Prawn	<i>Dendrobranchiata</i>	INR 800

**Table 1: Fishes commonly available in Dindori and Vani fish market**

**Price of fish:** - A total of 15 retailers were interviewed for market survey stated that price of fish depend on market structure, species and size of fishes. They also noted that price varies according to freshness, supply and demand of fish. There are generally seasonal variations in prices with the highest in summer and the lowest in winter. Table 1 shows that Indian major carps were sold at higher prices than exotic fish. Consumers or local traders are not willing to pay high prices for exotic fish due to less demand or taste of the fish. Market price for rohu is 200rs per kg of fish. The followed by catla and mrigal 200 rs per kg of fish. Among the exotic fish the highest price of was found for eel 280 rs per kg and lowest for the common small species of fish was 120 rs per kg.

In the present study of fish markets of Dindori and Vani the fishes were sold as per their size and demand. The fishes were charged a price range between INR 200-280 per kg. Fishery sector is one of the important sectors and provides livelihood to millions of people in the country, much care is needed to sustain. It has been seen, through ages, that much emphasis has been given on pre-harvest fish phase that means on increase of total yield of the fishes. Post-harvest fish phase despite being more important for majority of stakeholders is very poor and is paid less attention. According to Mohan, 2020<sup>(13)</sup> fish traders, the people especially involved in fish procuring and fish selling activities in local fish markets, are less educated or illiterate. They are not skilled enough to handle the problems of post- harvest operations that are the main causes of fish degradation. Sivagnanam, 2016<sup>(14)</sup> observed that inadequate infrastructure facilities in fish markets may be another reason for fish degradation and hence the fish loss. Although fish traders are aware about causes of post- harvest fish loss but are least bothered about expertise and technology knowledge required to overcome the problems. During survey of fish markets, it became evident that the personal and fish hygienic conditions are very poor and supportive to microbial growth, another reason for fish degradation. Halasz *et. al.*<sup>(17)</sup> 1994 observed that ambient temperature is one of the important factors responsible for spoilage and degradation of fishes. The high ambient temperature leads the formation of biogenic amines during post-harvest handling operations. According to Getu *et al.* 2015<sup>(15)</sup> the biogenic amines formation into the tissues and their subsequent decarboxylation reactions collectively cause fish spoilage that in turn decrease the nutritional values and price of the fish. Fresh fish are extremely perishable and are subject to change in ambient temperature and microbial growth. Being highly perishable, the fish requires appropriate handling, processing, storage, transport, and distribution facilities. Das *et al.*<sup>(16)</sup> 2013 while studying the fish consumers' behavior at selected fish markets of

Tripura identified several problems faced by fish farmers during purchase of fish which detains consumption of fish below desired level. Besides the factors like fish price (level and fluctuations), non-availability of fresh fish and preferred species, the study has identified poor marketing facility and unhygienic condition of market premises which, according to them, not only discourage people to purchase fish but also may cause health hazards.

Sr No.	Retailers response to	Dindori (22)	Vani (20)
1	Consumers preferring large sized fish	70-75%	70-75%
2	Consumers preferring any sized fish	30-35%	25-30%
3	Consumers asking for a specific fish	60-70%	55-60%
4	Consumers buying any available fish	10-20%	10-20%
5	Consumers inquiring which fish to purchase	15-20%	10-15%
6	Consumers having knowledge of fresh and stale fish	70-75%	70-80%
7	Consumers buying fish on Week days	80-85%	80-85%
8	Consumers buying fish on Religious days or Festival days	10-15%	10-15%
9	Consumers bargaining while buying	20-30%	20-30%

**Table 2: Responses of Retailers in Dindori and Vani fish markets**

When the retailers were asked some questions related to consumers buying patterns, their likes and dislikes, when do they prefer purchasing fishes etc. the exact figure was not met. The data resulted in responses like 70 to 75% of the buyers preferred large sized fish in both the fish markets. After asking the reason, it was noticed that large sized fish have less bones inside them or there is only a single but large bone. There were 30 to 35% and 25-30% buyers who had no preference as far as size was concerned in Dindori and Vani respectively. This may be due to they were 'first time buyers' or 'not frequent buyers'. A large number of the visitors (80-85%) coming to fish markets in Dindori and Vani fish markets buy fish on Week days i.e. on Saturday and Sunday it was also found that very less number of people i.e. 10-15 % come to buy fish on Religious days or festival days like Mondays, Thursdays, Ganesh Chaturthi and other festivals.

### IV.OBSERVATIONS







## V. ACKNOWLEDGEMENT

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## VI. CONCLUSION

Through this study of fish markets from Dindori tehsil, the authors conclude that a considerable amount of fish sellers were fishermen. It was also concluded that these markets are dominated by fresh water fishes. This may be due to Dindori tehsil are has 6 dams in around it. As Vani and Dindori are famous pilgrimage centers, the fish eating population on festivals and religious days was very less compared to other days. It can also be concluded that these markets have a decent amount of fish diversity sold as per the demands of the customers.

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# Study on Aquatic Biodiversity and Its Conservation from Banshelki Dam, Udgir Dist.Latur (M.S.)

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## ABSTRACT

Banshelki Dam is the fresh water Dam of village Banshelki, near Udgir. It is the good source of biodiversity of aquatic animals in Udgir taluka. About 50 species of plankton, 36 species of crustaceans, are found in the Dam. A total of 100 species of fishes, 20 species of prawns/shrimps and 15 species of crabs are recorded from Dam. The Dam serves many species of aquatic birds during winter season. There are 05 species of amphibians and 15 species of reptiles and 6 species of mammals are found in the Dam.

The fish production is fluctuating from year to year. The fish production was higher during 2018-19 and lowest was observed during 2019-2020. The highest crabs were observed to be 1 mt. during 2019-20. The minimum growth rate was observed in the year 2018-19.

**Keyword:** Aquatic biodiversity, conservation, Banshelki Dam

## I. INTRODUCTION

Aquatic biodiversity can be defined as the variety of life and the ecosystem that make up the fresh water and marine water of the world, and their interactions. It is the varied and differences among living organisms of terrestrial, marine and other aquatic ecosystems and the ecological complexes associated with them. It includes genetic diversity within and between species of ecosystems (Jena and Gopalkrishnan, 2012). Biodiversity is not only the richness of species it is also their genetic variety and the multiple habitats and ecosystems in which the plants and animals lives.

Aquatic biodiversity is the rich and wonderful variety of plant and animals. It consists of phytoplankton, zooplankton, aquatic plants, insects, fishes, bird's mammals and many more. Many species of animals and plants live in water fishes spend all their live under water, where as others, like toads and salamanders may use surface waters only during the breeding season. Aquatic biodiversity is greatest in tropical latitudes. About 22000 species of fishes have been recorded in the world, of which about 11% are found in Indian waters. Out of the 22000 species; 73 (3.32%) belong to the cold fresh water regime, 544 (24.73%) to the warm fresh waters domain, 143 (6.50%) to the brackish waters and 1440 (65.45%) to the marine ecosystem (Venkatraman and Raghunatha, 2015). Adequate protection of ecosystem is necessary for survival of all species and proper care is needed to overcome anthropogenic stresses.

Banshelki dam is one of the major sources of aquatic biodiversity in Taluka Udgir. The water depth varies during different seasons of the year. The physical parameters like temperature varied from 15.5 to 30° C. The salinity varied from 30.0 put during 2018-19. Similarly and reduced to  $0.30 \pm 0.25$  ppt during 2019-20 the

transparency has varied from 0.2 to 1.2 m during 2018-19 and reduced to  $50 \pm 20$  cm to  $60.5 \pm 10$  cm during 2019-20

Due to anthropogenic pollution, human activities, reduction salinity and excessive growth of fresh water weeds, some fish species and crustaceans are disappearing from the Dam.

## II. MATERIALS AND METHODS

For study aquatic biodiversity, dam is divided in to four sectors depending on the survey and estimation of fish production and water characteristics. Namely site A, B, C and D. the secondary data of plankton, fishes, amphibians, reptiles, birds and mammals were collected from Dam Development Authority and fishermen. In the present paper a comparative analysis of aquatic biodiversity from 2018-2019 to 2019-2020 has been discussed.

## III.RESULT AND DISCUSSION

**Plankton:** The occurrence of plankton community of Banshelki Dam is considerably rich. Here found 25 species of phytoplankton and 15 faunal groups consisting of 80 species have been encountered from the Dam. Diatoms constitute a dominant group of phytoplankton where as the copepods are the chief elements among the zooplankton. The highest occurrence of phytoplankton found during March-May and the lowest occurrence found during November. The reverse condition was observed on the occurrence of zooplankton. The highest density of zooplankton abundance were observed during November and the lowest was found during April-May.

**Zooplankton:** The highest density of zooplankton abundance were observed during November and the lowest was found during April-May.

**Benthos:** The micro benthos are the animals which measures below 0.5 mm in size. Macro benthos are the organism which measures more than 0.5 mm in size. There are several micro and macro benthos found in Balshelki Dam such as sponges, polychactes, mollusca and echinodermata etc.

**Fishes:** The most important group of fishes found in Dam is shown in Table-2. The higher diversity and abundance of fish fauna supported by the Dam is evidence by a total of 25 species of fish recorded from it. Beside 02 species of prawns and 02 species of crabs.

The fish production was fluctuating from year to year due to several factors like salinity, pollution, overexploitation etc. The total fish, shrimp and crab landing was highest during 2019-2020 and the lowest during 2018-2019.

### **Amphibians and reptiles:**

There are 03 species of amphibians and 04 species of reptiles found in Dam. Few species of turtle are observed during December to March.

### **Avian fauna:**

The Dam serves as a beautiful aquatic birds home during winter season. Some migratory birds rest and breed in the Dam. Many birds visit the Dam for feeding and breeding during November to January in every year. The highest number of birds were found during 2018-2019 and the lowest no. of birds found during 2019-2020.

**Mammals:**

There were no species of mammals found in the Banshelki Dam.

**Conservation and Measures:**

To improve the present status of fisher resources of Banshelki Dam and to conserve the biodiversity the following measures should be taken.

- Collection of fish and shrimp seeds from the Dam should be stopped.
- Dredging operation shall be done continuously, to avoid the siltation and decrease in the depth of the dam.
- To avoid soil erosion plantation should be done.
- To avoid soil pollution, along the periphery of the Dam, the interference of population should be minimizing.
- General awareness programme should be conducted among the local fisherman to avoid overfishing and over exploitation.
- The release of untreated sewage water into Dam should be avoided to stop pollution of Dam.
- Efforts should be made to create an awareness of the local people for the environment and the ecosystem.
- Awareness camps should be conducted at the village level for management of the Dam.

**IV. CONCLUSION**

Observation is the management of resources such as water so as to eliminate waste. A related and complementary concept is sustainability. Continuous loss of biodiversity affects the capacity and long term stability of ecosystems in performing its important functions. The species diversity has a major role to play in shaping the ecosystem in a changing environment. Natural resources are classified as either renewable or non-renewable. Living resources animals and plants can produce or renew themselves, minerals and fuels cannot. Although protecting uncultivated land from poachers and loggers can sometimes as difficult.

The preserves protect endangered species and offered natural laboratories for research. Fisheries as well as wild life parks help to increases and conserve the environment for the future. The root causes of the degradation of the Dam were due to siltation, reduction in salinity, decline in fish landing, poor discharge of flood water leading to water logging in the peripheral land areas, soil erosion etc. The ecosystem approach is strategy for the integrated resource that promotes conservation and sustainable use in the equitable way.

Major groups	Group forms	No. of species	Genera	Family
Phyto Plankton	Euglenophyceae	02	-	-
	Baeillariophycease	15	-	-
	Chlorophyceae	08		
Zooplankton	08 groups	40	-	-
Protozoa		08	05	03
Porofera	Demospongia	05	03	02
Coelenterata	Anthozoa	03	02	01
Platyhelminthes	Trematoda	04	02	02

Nematoda	-	08	04	03
Annelida	Polychacto	15	06	03
Arthropoda	-	-	-	-
Crustacea	Stomatopoda	02	01	01
	Decapoda	02	02	01
Mollusca	Gastropoda, Bivalvia	04	03	02
Echinodermata	-	01	01	01
Protochordata	-	01	01	01
Piscees	-	25	12	08
Amphibia	-	03	02	01
Reptilia	-	04	02	01
Aves	-	30	08	05
Mammualia	-	-	-	-

**Table 01 Species Richness of Selected Groups of Aquatic Organims in Banshelki Dam**

Name of the groups	Composition in %
Mullets	6.05
Prawn	4.19
Hilsa	1.20
Threadfins	3.75
Catfish	5.40
Siluriformes	2.50
Sciaenids	2.25
Misc	10.72

**Table 02 Common important Group of Fishes found in Banshelki Dam**

Group	Order	Family	Genera	Species
Pises	Clupleoformes	Notopteridae	Notopterus	Notoptenus
	Cyprinidae	Cyprinidae	Cyprinus	Carpio
			Catla	Catla
			Cirrihina	Mrigala
			Rasbera	Daniconus
			Chela	Phulo
			Labeo	Rohita Bata
	Siluriformes	Siluridae	Wallago	Attu Pabda Callichrous
	Channiformes	Chaniidae	Channa	Straitus marulius Orientalis
	Perciformes	Bagridae	Mystus	Seenghala cavassius

**A Check List of Fishes Classification**

Phylum	-	Chordata
Sub phylum	-	Gnathostomata
Supper class	-	Pisces
Class	-	Teleostomii
Sub class	-	Clupleofrmes
Family	-	Notopteridae
Genus	-	<i>Notopterus</i>
Species	-	<i>notopterus</i>
	-	<i>chitala</i>
Order	-	Cypriniformes
Family	-	Cyprinidae
Genus	-	<i>Cyprinus</i>
Species	-	<i>carpio</i>
Genus	-	<i>Catla</i>
Species	-	<i>catla</i>
Genus	-	<i>Cirrihina</i>
Species	-	<i>mrigala</i>
Genus	-	<i>Rasbora</i>
Species	-	<i>daniconius</i>
Genus	-	<i>Chela</i>
Species	-	<i>phula</i>
Genus	-	<i>Labeo</i>
Species	-	<i>rohita</i>
	-	<i>Bata</i>
Genus	-	<i>Puntius</i>
Species	-	<i>Sarana</i>
	-	<i>ticto</i>
Genus	-	<i>Garra</i>
Species	-	<i>mullya</i>
Genus	-	Siluriformes
Species	-	Siluridae
Genus	-	<i>Wallago</i>
Species	-	<i>attu</i>
Genus	-	<i>Ompak</i>
Species	-	<i>callichrous</i>
	-	<i>pabda</i>
Genus	-	Channiformes
Species	-	Chaniidae
Genus	-	<i>Channa</i>
Species	-	<i>straitus</i>
	-	marulius



	-	Orientalis
Genus	-	perciformes
Species	-	Bagridae
Genus	-	<i>Mystus</i>
Species	-	<i>seenghala</i>
	-	<i>cavassius</i>

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# Toxic Effects of Detergent On the Fish, *Oreochromis Mossambicus*

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## ABSTRACT

Toxic effects of the detergent "Nirma" on this fish, *Oreochromis mossambicus* were studied. LC50 value was found to be 90 ppm and 70 ppm, for the exposure periods 12 hr and 24 hr, respectively. Rate of oxygen consumption was found to be increasing with the increase in the detergent concentration and increasing with the increase of exposure period. Haemoglobin content was found to be decreasing with the increase of detergent concentration and decreasing with increase of exposure period. Glucose level in the blood was found to be increasing with the increase of detergent concentration and decreasing with the increase of exposure period. Glycogen content in the liver and muscle was found to be decreasing with the increase of detergent concentration and decreasing with increase of exposure period.

**KEY WORDS:** Toxic Effect, Detergent, Fish

## I. INTRODUCTION

Quality of water is of major importance in the aquacultural practices. Synthetic detergents and industrial effluents are known to alter the physicochemical properties of water and make fish life more difficult<sup>1-3</sup>. As fishes are important source of proteins in a nation's diet, the need for understanding toxicity of the detergents to the fish is of greater importance. The use of synthetic detergent is increasing rapidly by propagation of electric washing machine. The main ingredient (alkyl benzene sulfonate) runs into the natural waters and cause severe damage by its direct action and also by accumulation. The synthetic detergents are cleaning materials which are based on a non-soap surface active agent. These agents may be anionic, cationic or non-ionic in nature. Out of these agents, the cationic ones are the most harmful. The synthetic detergents are slowly biodegradable and leading to the increased concentrations in the environment. Detergents had replaced soap products for cleaning purposes. It is estimated that 40 % of the pollutants entering the freshwater environment are coming from the waste water from detergent washing operations. The interrelationship between blood glucose and hepatic glycogen has been studied earlier<sup>4</sup>. Long-term effects of bleached craft effluents on carbohydrate metabolism and hepatic xenobiotic biotransformation enzymes in fishes have been studied in detail<sup>5</sup>. The hardness of water due to an anionic detergent was proved earlier<sup>6</sup>. Though investigations were made on the toxicity of detergents on marine organisms<sup>7</sup> no report is available on the fresh water organisms.

## II. MATERIAL AND METHODS

The LC50 value of the detergent "Nirma" for the fish, *Oreochromis mossambicus* was determined at 12 and 24 hours. Fishes were exposed to sublethal concentrations of the detergent for 1, 2, 3 and 4 hours to study the effects on the rate of oxygen consumption and 12 and 24 hours for blood glucose level and glycogen content in the muscle and liver. Glucose in the blood was estimated by following O-Toluidine method<sup>8</sup> ; Haemoglobin by Cyanide method<sup>8</sup> ; and glycogen by Anthrone method<sup>9</sup>

## III. RESULTS AND DISCUSSION

Living organisms usually respond to any change which alters the normal conditions existing in the environment. They face stress and respond to overcome the stress by adjusting physically and physiologically<sup>10</sup>. In the present study, the rate of oxygen consumption was observed as increased with the increase in the concentration of the detergent (Table 1). The detergent polluted water would have retarded the gaseous exchange by absorption of the detergents on the gill surface as observed with the crude oil<sup>11</sup> . Haemoglobin content of the fish was observed to be decreased with the increase in the concentration of the detergent (Table 2). As the detergent is toxic to fish, it would have affected the red blood corpuscles of the blood. This might have resulted in the the increase of the haemoglobin content, thus the fish would have taken in an increased amount of oxygen due to stress condition<sup>12</sup>. It was reported that the increase in blood glucose level contribute an active flux of metabolites<sup>13</sup>. Elevated glucose levels in the present observation (Table 3) reflect an increase in the rate of transportations of glucose probably from liver muscle, where high energy demand was met due to brisk and erratic movements observed in the fish. Glycogen content in liver and muscle of the fish was observed as decreased with the increase of the concentration of the detergent (Tables 4 and 5). The significant reduction of glycogen content in the liver and muscle might due to increased glycogenolysis to meet the excess energy demands imposed as the severe anaerobic stress of detergent intoxication<sup>14</sup>. The reduction in the glycogen content of the liver and muscle together with the rise of blood glucose level in the fish might be due to the inhibitory effect of this detergent on the corticosterone synthesis and the inhibition of the thyroid gland activity. Reduced corticosterone concentration in the adrenal might have affected the activity of glycogenesis by which the liver glycogen concentration was reduced<sup>15</sup> . Decrease in glycogen content in the tissues of experimental fish suggests its utilization by the anaerobic glycolysis to meet the energy warranted by the toxic environment<sup>16</sup>. Muscle glycogen showed significant decrease since liver glycogen levels were reduced considerably and hence muscle was forced to depend on its own reserves to meet the energy requirement. This marked glycogenolysis in muscle and liver of the fish was probably caused by a stress induced increase in circulating catecholamines<sup>17</sup> . It is thus concluded that the detergent promotes a massive utilization of carbohydrate reserves from liver and muscle in order to meet the increased energy requirements of enhanced metabolic activity which the detergent causes. This indicates that the fish treated with the detergent even at the sublethal concentrations is not able to maintain a normal physiological balance compared to the control.

**Table1: Rate of oxygen consumption in the fish *mossambius*.**

Concentration of Detergent	Exposure Period & Rate of O <sub>2</sub> Consumption (mg/gm/h)			
	1 Hours	2 Hours	3 Hours	4 Hours
Control	0.020	0.050	0.055	0.064
7 ppm	0.050	0.057	0.063	0.071
14 ppm	0.060	0.064	0.071	0.077
21 ppm	0.070	0.081	0.085	0.092
28 ppm	0.091	0.098	0.104	0.114
35 ppm	0.107	0.110	0.113	0.122

**Table2: Haemoglobin content (gm %) in the blood of fish**

Exposure Period	Concentration of the detergent in ppm					
	Control	7	14	21	28	35
12 hr Hb	11.70	10.30	9.72	8.90	8.28	7.20
24 hr HB	10.70	9.50	8.80	7.40	6.70	6.00

**Table3: Glucose level of blood content (gm %) in the blood of fish**

Exposure Period	Concentration of the detergent in ppm					
	Control	7	14	21	28	35
12 hr Hb	97.5	108.7	114.1	121.2	127.0	135.8
24 hr HB	48.3	60.8	84.1	91.2	96.6	102.0

**Table4: Glycogen content in liver (gm %) in the blood of fish**

Exposure Period	Concentration of the detergent in ppm					
	Control	7	14	21	28	35
12 hr Hb	0.351	0.326	0.319	0.314	0.308	0.302
24 hr HB	0.322	0.300	0.289	0.285	0.279	0.273

**Table5: Glycogen content in Muscle (gm %) in the blood of fish**

Exposure Period	Concentration of the detergent in ppm					
	Control	7	14	21	28	35
12 hr Hb	0.159	0.152	0.142	0.132	0.121	0.114
24 hr HB	0.151	0.144	0.139	0.126	0.118	0.110

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# Ichthyofaunal Diversity from Murambi Reservoir of Beed District, Maharashtra

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## ABSTRACT

Ichthyofaunal Diversity from Murambi Reservoir is constructed on Rena River. Reservoir has Chief Source of Water From Surrounding Villages vz Poos, Javalgaon, Limbgaon, Salunkwadi, Pimpri, and Murambi of Ambajogai Tahasil. The Present Investigation deals with Ichthyofaunal Diversity. Total 21 Species Of Fishes Were Recorded belongings to Five Orders and Ten Families.

**Keywords:** Fish Diversity, Productivity.

## I. INTRODUCTION

Murambi reservoir is located in Ambajogai Tehsil of Beed District, Maharashtra. Site situation of the reservoir is Longitude 76°30'30" and Latitude 18°42'00" with the catchment area near about 73.42 sqkm. Murambi reservoir is constructed on Rena River. The reservoir has chief source of water from Poos, Jawalgaon, Limbgaon, Salunkwadi, Pimpri and Murambi of Ambajogai Tehsil.

According to Johal and Jha (2007) periodic Ichthyofaunal investigation is useful for understanding Fish Diversity and profit. Majority of the Indian reservoirs being in tropics have high productivity and the capacity to produce fish (Piska, 1998). Beed district is blessed with number of small sized reservoirs which are being used for fisheries and other purposes.

The present investigation deals with Ichthyofaunal diversity of Murambi Reservoir of Beed District, Maharashtra.

## II. MATERIALS AND METHODS

Fishes were collected with the help of local fishermen. The identification of fishes was done with the help of standard scientific literature (Talwar and Jhingrn, 1991). Identification of fishes was followed by systematic arrangement into orders and families.

## III. RESULTS AND DISCUSSION

### Table: Checklist of fishes from Murambi Reservoir

Class : Pisces

Subclass : Teleostei



**Order : Osteoglossiformes**

**Family : Notopteridae**

1. Notopterus notopterus (Pallas)
2. Notopterus chitala (Hamilton)

**Order : Cypriniformes**

**Family : Cyprinidae**

3. Catla catla (Hamilton)
4. Labeo rohita (Hamilton)
5. Labeo calbasu (Hamilton)
6. Cirrhinus mrigala (Hamilton)
7. Osteobrama belkeri (sykes)
8. Chela phulo (Hamilton)
9. Puntius sarana sarana (Hamilton)
10. Ctenopharyngodon idella (Valenciennes)
11. Cyprinus carpio communis (Linnaeus)
12. Hypophthalmichthys molitrix (Valenciennes)

**Order : Cyprinodontiformes**

**Family : Poeciliidae**

13. Gambusia affinis (Baird and Girard)

**Order : Siluriformes**

**Family : Siluridae**

14. Wallago attu (Schneider)

**Family : Bagridae**

15. Mystus seenghala (Sykes)

**Family : Clariidae**

16. Clarius batrachus (Linnaeus) Order : Perciformes Family : Channidae

17. Channa marulius (Hamilton)

18. Channa punctatus (Bloch)

**Family : Ambassidae**

19. Chanda nama (Hamilton)

**Family : Gobiidae**

20. Glossogobius giuris (Hamilton)

**Family : Mastacembelidae**

21. Mastacembelidae (Lacepede)

Results of present investigation reported that the dominance of order Cypriniformes with 10 species belonging to it. Next dominant order was Perciformes with 5 fish species followed by Siluriformes with 3 fish species. While order Osteoglossiformes and Cyprinodontiformes having 2 and 1 fish species respectively out of 21. The common species in the catches were *Catla catla*, *Labeo rohita*, *Cirrhinus mrigala*, *Cyprinus carpio communis*, *Ctenopharyngodon idella* and *Wallago attu*.

Niture (2017) reported 16 species of fishes belonging to 5 orders and 8 families from Pimpri reservoir of Udgir, District Latur, Maharashtra. Chalak et.al. (2018) investigated 24 fish species belonging to 4 orders and 11 families in Dharmapuri reservoir in Beed District, Maharashtra.

Pawar (2014) confirmed the occurrence of 42 species of fish belonging 29 genera, 15 families to 9 orders. The order Cypriniformes was dominated with 20 species to be followed by order Siluriformes with 8 species in Majalgaon reservoir from Beed, Maharashtra.

Paliwal et.al. (2013) listed 35 fish species from 6 orders of 16 families from Itiadoh reservoir, District Gondia, Maharashtra.

Laxmappa et.al. (2014) observed total 30 species belonging to 12 families and 22 genera. Order Cypriniformes was dominant with 13 species followed by Perciformes (8 species), Siluriformes (6 species), Anguilliformes and Synbranchiformes having only one species in Kolisagar reservoir in Mehbubnagar District, Telangana.

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# Some Fixed Point Results in Non-Expensive Multivalued Mappings

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## ABSTRACT

### I. INTRODUCTION

In complete metric spaces Banach fixed point theorem extended and generalized indifferent ways. By Rakotch [ 12, 13 ], Edelstein [ 6, 7 ], Kasahara [ 8 ], on certain subset of the Banach space one of generalization is for non-expansive single valued maps. They are not necessarily unique for example in Krik [ 9 ] and Browder [ 1,2,3 ], several authors established fixed point theorems for non-expansive multivalued maps on certain subset of Banach space.

Consider  $\rho_A$  denote Hausdooff metric on space of all non-empty bounded subsets of a metric space  $(X, \rho)$ . Let  $M: X \rightarrow 2^X$ , where  $2^X$  is set of all non-empty subsets of  $X$  with bounded subsets as values is said to be contractive if and only if,

$$\rho_A(M(x), M(y)) \leq l \rho(x, y), \quad \forall x, y \in X$$

Where  $l$  is Lipschitz constant and  $0 \leq l < 1$

If  $l = 1$  then  $M$  is said to be multivalued non-expansive mapping.

Lami Dozo [ 10 ], Nadler [ 11 ] and many others for these maps provided fixed point theorem under certain conditions

For multivalued map  $M: X \rightarrow 2^X$  of  $x \in M(x)$  then  $x \in X$  is called a fixed point. Tarafdar and Husain [ 14 ] proved a fixed point theorem on compact interval of the real line and introduced notion of non-expansive type multivalued map. In this section we prove fixed point theorems for contractive type multivalued and non-expansive type maps.

### II. FIXED POINT OF CONTRACTIVE TYPE MULTIVALUE MAPS

Let  $S$  be a non-empty subset of metric space  $(X, \rho)$ . The map  $M: S \rightarrow 2^X$  is called non-expansive if  $x \in S$ ,  $u_x \in M(x) \exists v_y \in M(y), \forall y \in S \ni \rho(u_x, v_y) \leq \rho(x, y)$

Further, if  $\rho(u_x, v_y) \leq l \rho(x, y)$

for some fixed  $l$  and  $0 \leq l < 1$ , then it is called contractive type map.

Clearly, each contractive type map is non-expansive type mapping.

**Example 2.1 :** Let  $S = X = R$  with usual metric  $\rho$ .

Define  $M(x) = \left\{ x - \tan^{-1} x, \frac{x}{2} - \tan^{-1} x \right\}, \forall x \in X$

Then  $M$  is non-expansive type multivalued mapping and not contractive type.

$\therefore$  if  $u_x = x - \tan^{-1} x \in M(x)$  then,

$$u'_x = 1 - \frac{1}{1+x^2}$$

By mean value theorem,

$$\varrho(u_x, v_y) = |u_x, v_y| \leq \left| 1 - \frac{1}{1+\lambda^2} \right| |x - y| < |x - y| = \varrho(x, y)$$

Where  $x < \lambda < y$ .

Also, if  $u_x = \frac{x}{2} - \tan^{-1} x \in M(x)$ . Then ,

$$\varrho(u_x, v_y) \leq \left| \frac{1}{2} - \frac{1}{1+h^2} \right| |x - y| < |x - y| = \varrho(x, y), \quad \text{where } x < h < y.$$

$\therefore M$  can not be contractive type mappings.

**Example 2.2 :** Consider  $X = \mathbb{R}^2$  with the usual Euclidean metric  $\varrho$ .

For  $S = \{x = (x_1, x_2) \in X / x_1, x_2 \geq 0\}$

Define  $M(x) = \left\{ \pm \left[ \frac{x_1}{2}, \frac{x_2}{2} \right], \pm \left[ \frac{x_1}{3}, \frac{x_2}{3} \right], \dots \right\} \in 2^X$ , for all  $x \in S$

Then  $M$  is a contractive type multivalued mapping with  $l = \frac{1}{2}$ .

Consider  $u_x = \left[ \frac{x_1}{n}, \frac{x_2}{n} \right] \in M(x)$

where  $n \geq 2$  then any  $y \in S$ .

Let  $u_y = \left[ \frac{y_1}{n}, \frac{y_2}{n} \right] \in M(y)$ .

$$\text{Clearly } \varrho(u_x, u_y) = \sqrt{\frac{1}{n^2} [(x_1 - y_1)^2 + (x_2 - y_2)^2]} \leq \frac{1}{2} \varrho(x, y)$$

This is also true for  $n \leq -2$ .

**Example 2.3 :** Let  $X = \mathbb{R}$  with the usual metric  $\varrho$  and  $S = [0, 1]$ .

Let  $M(x) = \left[ \frac{x}{3}, \frac{x}{2} \right]$ ,  $x \in S$  is a contractive type mapping with  $l = \frac{1}{n}$  for  $n$  is positive integer greater than or equal to 2.

### III.SOME RESULTS

**Theorem 3.1 [ 2 ] :** Let  $S (\neq \phi)$  be closed bounded convex subset of Banach space  $X$ . Suppose  $M: S \rightarrow 2^S$  is a compact valued, non expansive type mapping. Then there exist sequence  $\{x_n\}$  is  $S$  and  $u_n \in M(x_n)$  such that.

$$\lim_{n \rightarrow \infty} \|x_n - u_n\| = 0$$

**Theorem 3.2 [ 10 ] :** Let  $S (\neq \phi)$  subset of Banach space  $X$  which satisfies Opial's condition  $M: S \rightarrow 2^S$  is a compact valued, non expansive type mapping. Consider  $\{x_n\} \subset S$  be a sequence which converges weakly to an  $x \in S$  and if  $y_n \in x_n - M(x_n) \ni \{y_n\}$  converges to  $y \in X$  then  $y \in x - M(x)$ .

**Theorem 3.3 :** Let  $S (\neq \phi)$  weakly compact convex subset of Banach space  $X$  which satisfies Opial's condition. Then each compact valued non expansive type mapping  $M: S \rightarrow 2^S$  has a fixed point .

Proof : Obviously,  $S$  is a bounded and closed convex subset of  $X$  then by theorem 3.1 there exist a sequence  $\{x_n\}$  in  $S$  such that

$$\|Z_n\| = \|x_n - u_n\| \rightarrow 0 \text{ as } n \rightarrow \infty, u_n \in M(x_n)$$

$S$  being weakly compact then we find  $\{x_n\}$ , weakly convergent subsequence of  $\{x_n\}$ .

Consider  $x_i = w - \lim_m x_m$

Clearly  $x_i \in S$  and  $y_m = x_m - u_m$ , where  $u_m \in M(u_m) \Rightarrow y_m \rightarrow 0$ .

By theorem 3.2 there exists a fixed point  $x_i \in M(x_i)$

**Theorem 3.4** [ 2 ] : Let  $S(\neq \phi)$  be a weakly compact bounded convex subset of a Banach space  $X$  has weakly continuous duality mapping. Then all compact valued, non expansive type mapping  $M$  of  $S$  into  $2^S$  has a fixed point.

**Theorem 3.5** [ 10 ] : Let  $S(\neq \phi)$  be a closed bounded convex subset of a reflexive Banach space ( In particular, uniformly convex space )  $X$ , satisfies Opital's condition. Then all compact valued, non expansive type mapping  $M$  of  $S$  into  $2^S$  has a fixed point.

**Theorem 3.6** [ 8 ] : Let  $S(\neq \phi)$  be a bounded closed convex subset of a reflexive Banach space  $X$ . Consider the relation  $" / "$  is uniformly approximately symmetric. Then all compact valued non-expansive type mapping  $M$  of  $S$  into  $2^S$  has a fixed point.

**Theorem 3.7** [ 1 ] : Let  $S(\neq \phi)$  be a bounded closed convex subset of a Hilbert space  $X$ . Then all compact valued, non-expansive type mapping  $M$  of  $S$  into  $2^S$  has a fixed point.

#### IV. MAIN RESULT

**Theorem 4.1** : Let  $S(\neq \phi)$  be a closed subset of a complete metric space  $(X, \rho)$  and  $M: S \rightarrow 2^S$  multivalued contractive type mapping with closed subset of  $S$  as value. Then there exists point  $x \in S$  such that  $x \in M(x)$ .

Proof : Let  $x_0 \in S$ , where  $x_0$  be arbitrary but fixed.

Consider  $x_1 \in M(x_0)$  and  $\rho(x_0, x_1) > 0$

If there exists  $n_0$  such  $x_1$ , then  $x_0$  is a fixed point of  $M$ ,

$\because M$  is contractive type mapping.

$\exists x_2 \in M(x_1) \exists \rho(x_1, x_2) \leq l \rho(x_0, x_1)$  for  $0 \leq l < 1$

By induction and definition of contractive type mapping.

We get a sequence  $\{x_n\}$  such that,

$x_{n+1} \in M(x_n)$  and  $\rho(x_n, x_{n+1}) \leq l \rho(x_{n-1}, x_n)$  for all  $n \geq 1$ .

which gives,

$\rho(x_n, x_{n+1}) \leq l^n \rho(x_0, x_1)$  and for  $m > n$  we have

$$\rho(x_n, x_m) \leq \frac{l^n}{1-l} \rho(x_0, x_1)$$

$\because 0 \leq l < 1$ , we have  $\rho(x_n, x_m) \rightarrow 0$  as  $m, n \rightarrow \infty$

By completeness of  $X$ , we find  $r \in X$  with

$$\lim_n x_n = r$$

$$\because M(S) = \bigcup_{x \in S} M(x) \subset S \text{ and } x_0 \in S$$

We have  $x_n \in S, \forall n$ .

$\because$  Sequncenc  $\{x_n\}$  is in closed set  $S$ , we get  $r \in S$

Also,  $x_n \in M(x_{n-1})$  and  $M$  being contractive type mapping gives  $v_n \in M(r)$  such that,

$$\rho(x_n, v_n) \leq l \rho(x_{n-1}, r)$$

By triangle inequality

$$\rho(r, v_n) \leq \rho(r, x_n) + l \rho(x_{n-1}, r).$$

Which implies  $\rho(r, v_n) \rightarrow 0$  as  $n \rightarrow \infty$ .

As  $v_n \in M(r)$  and  $M(r)$  is closed

we get  $r \in M(r)$

$\therefore r$  is a fixed point of  $M$ ,

If we take  $S = X$  in above theorem we get,

**Theorem 4.2 :** All multivalued contractive type mapping  $M: X \rightarrow 2^X$  with closed subsets of  $X$  as values has a fixed point.

## V. CONCLUSION

In this paper, we derive fixed point results in multivalued mappings theorems with different sufficient conditions and discuss generalization of some known results help the researchers to improve and expand results.

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# Microbiological Quality of Chevron Sold in Udgir City in Latur District of Marathwada Region

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## ABSTRACT

A study was conducted to assess the microbiological quality and prevalence Escherichia coli, Staphylococcus aureus and Salmonella sp. in goat carcasses slaughtered at retail shops of Udgir city in Latur District of Marathwada region of Maharashtra. In all 60 samples were collected from six different areas (A, B, C, D, E, and F) aseptically from thigh region of carcasses. The pH values of samples ranged from  $5.64 \pm 0.04$  to  $5.96 \pm 0.05$  and did not differ significantly. The percent moisture in these samples ranged from  $68.66 \pm 0.44$  to  $76.25 \pm 1.05$  and varied significantly. The microbial count also varied in different area. The highest microbial load was found in retail meat shops from C area while the highest coliform count was found in A area with prevalence of 83.33 %. For the areas it ranged from 16.66 % to 33.33 %. The Staphylococcus count was highest in A and B area with prevalence of 100 % in both the areas, while it ranged from 16.66 % to 33.33 % in rest of the areas. Salmonella was not found in any of the samples collected from different areas of Udgir city.

**Keywords:** Goat meat (Chevon), Meat Shop, Microbiological Quality

## I. INTRODUCTION

In Udgir (Maharashtra) goats are slaughtered on daily basis in large numbers by the local butchers as a backyard enterprise without stunning and dressed in road side shops or booths in presence of consumers. The lack of infrastructure facilities in the slaughter area, unhygienic conditions and poor handling of goat carcasses between the production and retailing favour the contamination of chevon with saprophytic and pathogenic bacteria.

During slaughtering, dressing and further processing, meat surface invariably comes in contact with contaminated tools and equipments and gets easily contaminated (Narasimha Rao and Ramesh, 1998). This causes considerable variations in the microbial quality as the carcasses are exposed to ambient temperature and unsanitary practices during processing and handling (Kakoti et al., 2003). The bacterial quality of meat and presence of E.coli, Salmonella and Staphylococcus aureus have been assessed by various researches (Singh et al., 1996; Kumar and Bist, 2003 and Pal et al., 2003 ). However, scanty information is available on microbial quality of chevon sold in retail meat shops of Latur city. Therefore, the present study was undertaken to determine the bacterial quality of chevon from public health point of view.

## II. MATERIAL AND METHODS

A total of 60 samples, consisting of 10 samples each from six different areas of city ( A, B, C, D, E and F) were collected from goat meat shops from thigh regions of carcasses in a sterile container and transported immediately to the laboratory under chilled conditions. 10 gram of each samples were homogenized in 90ml of sterile Normal saline solution (NSS) in a sterilized tissue homogenizer for 5 min to get 1:10 dilution. From this further serial dilutions were made for inoculation in the plate count agar. Appropriate dilutions were inoculated into media using standard spread plate technique to estimate total viable count (TVC) (APHA, 1992). Following incubation, plates showing 30-300 colonies were counted and expressed as log<sub>10</sub> cfu/g. Isolation of the organisms was made using general, selective and enrichment media and the isolates were identified on the basis of morphological, cultural and biochemical characteristics (Edward and Ewing, 1972; Cruickshank, et al., 1975). MacConkey agar and eosin methylene blue (EMB) agar were used for isolation of *E. coli* and Baird-Parker agar was used as a selective media for isolation of *Streptococcus aureus*. For isolation of *Salmonella*, 25 g sample was diluted in 225 ml buffered peptone water (pre enrichment broth) and incubated for 18 h at 37°C. Then 1 ml was transferred to 10 ml tetrathionate broth (enrichment broth) and incubated for 24 h at 42°C temperatures. From this, a loopful growth was incubated to fresh tetrathionate broth as a second enrichment. Then this culture was streaked on brilliant green agar and incubated for 24 h at 37°C. The moisture and pH were also determined (AOAC, 1995).

Data obtained during study were analyzed statistically (Snedecor and Cochran, 1989).

## III. RESULTS AND DISCUSSION

The pH value of the samples collected from different areas did not differ significantly. However, moisture in these samples ranged from  $64.47 \pm 0.89$  to  $78.66 \pm 1.05$  per cent, which varied significantly. The average values of TVC (log<sub>10</sub> cfu/g  $\pm$  SE) of meat samples were recorded (Table 1) to be  $6.24 \pm 0.05$ ,  $6.28 \pm 0.01$ ,  $6.35 \pm 0.03$ ,  $6.32 \pm 0.05$ ,  $6.30 \pm 0.02$  and  $6.21 \pm 0.01$  for the area A, B, C, D, E and F, respectively. These results are equivalent with the earlier results of Rathod et al., (2004) who found SPC  $6.18 \pm 0.03$  log cfu/cm<sup>2</sup> in neck region of goat carcasses in Parbhani however Pal et al (2003) who found SPC  $6.18 \pm 0.02$  log cfu/cm<sup>2</sup> in neck region of goat carcasses in Pondicherry. However, Kumar and Bist (2003a) reported higher SPC (7.8 log cfu/g) in chevon. These counts exceeded the standards as prescribed by the Bureau of Indian standards (Anon, 1995) for raw goat meat, rendering the meat under study unsafe and unhygienic for consumption from public health point of view. The higher microbial load could be attributed to the unhygienic conditions and improper storage facilities at retail shops (Tiwari et al., 2002) The TVC revealed significant variations between the mean counts of samples from the six areas.

*Escherchia coli* counts in these samples were between  $0.50 \pm 0.30$  and  $3.70 \pm 0.13$  log 10 cfu/g. Similar observations were also reported by Pal et al. (2003) as  $2.24 \pm 0.22$  log 10 cfu/g. Highest *E. coli* was recorded in A area with prevalence (Fig. 1) of 83.33 %, while the lowest *E. coli* counts was recorded in the meat samples collected from area C and D with prevalence of 16.66% for both the areas. B and E area prevalence of 33.33%. Higher coliform counts in meat from local meat shops were also reported by Bhutia and Sen (1992) and Kumar and Bist (2003a). The mean contamination levels with *Staphylococcus aureus* were  $3.71 \pm 0.13$ ,  $3.77 \pm 0.16$ ,  $1.13 \pm 0.52$ ,  $1.1 \pm 0.51$ ,  $0.55 \pm 0.85$  and  $1.08 \pm 0.50$  for areas A, B, C, D, E and F, respectively, which were lower than results (5.7 log cfu/g) obtained by Kumar and Bist (2003a).



Table 1. Microbiological and physicochemical qualities of Chevron sold in Udgir

Sampling Area	pH	Moisture	TVC (log <sub>10</sub> cfu/g)	<i>E.Coli</i>		<i>S. aureus</i>	
				Count (log <sub>10</sub> cfu/g)	Prevalence %	Count (log <sub>10</sub> cfu/g)	Prevalence %
A	5.80 ± 0.02	65.30 ± 1.61	6.24 ± 0.05	3.70 ± 0.13	83.33	3.72 ± 0.13	100
B	5.84 ± 0.03	68.66 ± 0.44	6.28 ± 0.01	1.10 ± 0.50	33.33	3.77 ± 0.16	100
C	5.96 ± 0.05	64.47 ± 0.89	6.35 ± 0.03	0.55 ± 0.31	16.66	1.12 ± 0.52	33.33
D	5.89 ± 0.04	66.80 ± 1.33	6.32 ± 0.05	1.05 ± 0.50	33.33	1.10 ± 0.51	33.33
E	5.87 ± 0.04	76.25 ± 1.05	6.30 ± 0.02	0.55 ± 0.31	16.66	0.55 ± 0.85	16.66
F	5.80 ± 0.02	68.71 ± 0.95	6.21 ± 0.01	0.50 ± 0.30	16.66	1.08 ± 0.50	33.33

Mean ± SE with different superscripts in a column differ significantly (P<0.05)

Areas A and B had the highest count with 100% prevalence while area C, D and F had 33.33% prevalence for *S. aureus*. Area D had least prevalence (16.16%) among all the six areas which is comparable with the results of Kumar and Bist (2003b). Such high prevalence of *S.aureus* in meat sold in local meat shops could be due to slaughtering of goats in pen space at ambient temperature and use of same wooden block / platform to make pieces without washing it with hot water. Unsanitary and unhygienic conditions in and around meat shops, use of contaminated water for evisceration, improper bleeding, slaughter without stunning and cross contamination of carcasses with the gut contents might be the other contributing factors of presence of *E.coli* and *S.aureus* in meat sold in local meat shops.

None of the meat samples revealed the presence of *Salmonella* sp. These results are in agreement with findings of Singh et al. (1996) and Rajmallyah et al. (1989). However, Das et al. (1990) recorded 12% isolation of *Salmonella* from goat meat.

On the basis of present results, it was concluded that microbiological quality of chevon sold in the retail meat shops of Latur city is not satisfactory and in order to reduce the contamination of meat, strict hygienic measures are needed with constant microbial monitoring at specific sites in the meat production chain.

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# Studies on Significance of Environmental Audit in Accreditation of Educational Institutions

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## ABSTRACT

As the process of development is an inevitable phenomenon the emergence of environmental issues along with development become a major challenge for the human society. The environmental issues viz., resource depletion, loss of biodiversity, declination of forest cover, global climate change, environmental pollution are increasing day by day. To meet the challenges regarding the environmental problems emerged out with developmental process there is an urge of inculcation of ethics and values for conservation of environment amongst the stakeholders of every organization. In this perception the adoption of practices in accordance with the protection and conservation of environment in educational institutions campus are also become an integral part.

In accordance with existing environmental policies and regulation of India, the National Assessment and Accreditation Council, (NAAC) has also focused the attention on approach of the higher educational institutions towards the protection and conservation of environmental of their campus. During accreditation process the NAAC has given a special weightage for environmental consciousness of educational institution. The present paper is an attempt to historical background for the introduction of environmental audit, its objectives and advantages for the educational institutions for making their campus environment friendly.

**Key words:** Climate change, environmental audit, NAAC, sustainable development

## I. INTRODUCTION

In the rapid pace of industrialization and urbanization the emergence of various environmental issues and its severity become a major challenge to human society. In order to minimize and mitigate the harmful impacts of environmental problems there is a need to assess and adopt environment friendly lifestyle. The status of environmental aspects of each premises is an important aspect for the sustainable development. In this context the approach and practices adopted for the betterment of environmental condition by the educational institutions in their campuses are also become an important tool to against the battle of environmental degradation.

In the 21<sup>st</sup> century the concept of environmental audit an educational institution has been becoming a paramount important for self-assessment of the institution which reflects the role of the institution in mitigating the present environmental problems. Many institutions undertake a good number of practices for

the conservation of environment but are not documented due to lack of awareness regarding its importance in accreditation process.

## II. HISTORICAL BACKGROUND

The concept of Environmental Audit has been introduced in United States in the early 1970s by few industries in accordance with Clean Air and Clean Water Act. The process of this audit initiated from response of commercial policies of US to natural requirement and not from the local authorities. Afterwards, these policies. The Stockholm conference, 1972 has brought kind attention of human society towards the deterioration of the environment and urged to adopt steps for protection and conservation of environment. The United Nations Conference on Environment and Development (UNCED), also known as Earth Summit Rio-1992 held at Rio de Janeiro, Portuguese from 3rd to 14th June 1992 inspired the countries on the globe to review their environmental stand to act effectively to save the earth with sustainable approach. The environmental issues were thoroughly discussed and consensus has been made to for the adoption of national strategy for sustainable development.

## III. ENVIRONMENTAL AUDIT OF EDUCATIONAL INSTITUTIONS

In accordance with provision laid down in Articles 48 A and 51 A (g) of Indian constitution, the Government of India has proclaimed the National Environment Policy 2006 and made green audit mandatory to each industrial unit.

The process of environmental audit was finalized by Supreme Audit Institution (SAI) according to the guidelines given in Manual of Standard Orders (MSO) issued by Authority of the Controller and Auditor General of India 2002. The Supreme Audit Institution of India is the highest national Institution of auditing in the country. By realizing the need of responsibility towards environment, NAAC, an autonomous body under UGC has added the concept of environmental audit in accreditation methodologies of universities and colleges. It is a useful tool for a higher educational institution to determine how and where they are using the most energy or water or resources; the college can then consider how to implement changes and make savings. It can also be used to determine the type and volume of waste, which can be used for a recycling project or to improve waste minimization plan. It can create health consciousness and promote environmental awareness, values and ethics. It provides staff and students better understanding of green impact on campus. As environmental sustainability is becoming an increasingly important issue for the nation, the role of higher educational institutions in relation to environmental sustainability is more prevalent.

In order to promote the higher educational institutions for adopting practices to protect the environment; NAAC has given a weightage to environmental consciousness of institutions. In accreditation process the Criterial VII namely Institutional Values and Best Practices includes the Environmental Consciousness and Sustainability aspect for 30 marks.

## IV. OBJECTIVES OF ENVIRONMENTAL AUDIT IN EDUCATIONAL INSTITUTIONS

- To awake the stakeholders regarding the importance of environmental audit to maintain ecofriendly environment in campus.

- To inculcate the ethics and values among the students, teachers, employees and management of an educational institutions for protection and conservation of environment.
- To prepare a baseline data to enable organization to plan for environment management.
- To identify the natural resources and components of ecosystem in campus.
- effects of an organizational activities on environment.
- To enlist the use of resources and its disposal practices adopted by the institute.
- To address the efforts taken by organization towards betterment of environment.
- To set out the standard procedures for disposal of all types of harmful wastes.
- To focus the energy consumption and practices adopt for its optimal use.
- To identify the energy efficient techniques adopted by the institutions.
- To minimize the consumption of water use and monitor its quality on regular basis.
- To develop the commitment amongst the student, staff and management towards the conservation of environment.
- To develop the environment conservation policy of institutions.

In NAAC accreditation process the various aspects related to environmental consciousness of institutions is incorporated under best practices. The institutional environment and energy initiatives are confirmed through Green audit, Energy audit, Environment audit, Clean and green campus recognitions / awards, beyond the campus environmental promotion activities.

The Institutional facilities for alternate sources of energy viz. Solar energy, Biogas plant, Wheeling to the Grid and energy conservation measures including sensor-based energy conservation and use of LED bulbs/ power efficient equipment is emphasized.

The facilities in the Institution for the management of degradable and non-degradable waste viz. Solid waste, Liquid waste, Biomedical waste, E-waste, Waste recycling system, Hazardous chemicals and radioactive waste management is enlisted in audit report.

The more emphasis has given on water conservation facilities available in the institutions viz. Rain water harvesting, Borewell /Open well recharge, Construction of tanks and bunds, Waste water recycling, Maintenance of water bodies and distribution system in the campus

The green campus initiatives include Restricted entry of automobiles, Battery-powered vehicles, Pedestrian-friendly pathways, Ban on the use of Plastics, Landscaping with trees and plants

## **V. ADVANTAGES OF ENVIRONMENTAL AUDIT OF EDUCATIONAL INSTITUTIONS**

- It would help to understand the availability and importance of available resources of campus for making environment green and clean.
- It helps to create an awareness amongst the stakeholders for the protection and conservation of environment.
- It helps to identify the existing environmental issues concerned with the institutions and aids to adopt proper techniques to resolve it.
- It assists to minimize the burden on available resources in campus.
- Empower the institutions to design an environment policy consonance with their environmental aspects.

- It will build a confidence amongst the stakeholders of organization to frame a better environmental performance.
- It represents a good image of institution through its clean and green campus.
- It helps to NAAC peer team to understand the environmental consciousness of institution.
- The ranking of institutions will help to uplift the morals of the stakeholders.

## VI. CONCLUSION

As the assessment and accreditation of holistic development of educational institutions is an important process; the aspects envisaged in its procedure focused the steps taken for the protection and conservation of environment. The environmental audit helps to benchmark the status of environmental consciousness of institute and its importance in the process of accreditation.

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# Effect of Temperature On the Silk Potential of Silkworm, *Bombyx Mori* in Climate Change

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## ABSTRACT

Among all the environmental factors temperature is one of the most important factor that determines the climate of a region. The variation in rearing temperature of silkworm is an important aspect for understanding the basic events of the performance of silk worm in the formation of cocoon. The two parameters weight of silk gland and weight of cocoon shell were taken for observation. Five series of experiment were made at different temperature ranges like 15, 20, 25, 30 and 35°C. Weight of silk gland of Vth instar larvae increases with the temperature variation from 15 to 25°C, the weight increased from 0.132 to 0.267gm. respectively and above 25°C it shows gradual decreases. With the increase in temperature from 15 to 25°C, the weight of cocoon shell increases slowly from 0.124gm at 15°C to 0.192gm at 25°C. Further increase in temperature above 25°C caused gradual decrease in the weight of cocoon shell. It was observed that 25°C is the optimum temperature for the rearing of silkworm. The present work deals with the survival of silkworm at different temperature to find out the most suitable temperature range for the Sericulture.

**Key words:** Temperature, silkworm, silk gland, cocoon shell.

## I. INTRODUCTION

Sericulture is well known for its low investment quick and high return which make it an ideal small scale industry. *Bombyx mori* is domesticated monophagus multi voltine race for this region. Among all environmental factors temperature is one of the most important factor that determines the climate of a region. Temperature plays a major role on growth and productivity in silkworm (Benjamin and Jolly, 1986). Fluctuation of temperature during different stages of larval development was found to be more favorable for growth and development of larva than constant temperature (Anonymous, 1975). Therefore, this research work on the effect of temperature provide most suitable temperature range for Sericulture. The result of this study is important from academic as well as applied point of view.

## II. MATERIALS AND METHODS

For the study of the effect of temperature the two parameters weight of silk gland and weight of cocoon shell were taken to observe the effect of temperature five series of experiments were performed at different temperature regimes like 15, 20, 25, 30 and 35°C in BOD incubator. There was 25±10°C, 80±5% RH and 12±1

hours light a day was assumed as control. Experiment of different temperature were chronically conducted in the BOD incubator separately one after another. The whole grainage operation was performed as par standard. (Krishnaswami *et al*, 1973). During the study an ideal rearing condition was maintained in the laboratory. The temperature, relative humidity and photoperiod were maintained at  $26\pm 10C$ ,  $80\pm 5\%$  RH and  $12\pm 1$  hours light a day, respectively in the laboratory. For estimating the weight of silk gland 8th Day of Vth instar larva was taken. For the weight 9 silk glands (three batches of three silk glands in each batch) were taken. Three replicates of each experiment were made. To observe the weight of cocoon shell, the weight of 20 normal cocoon shells from each batch were recorded separately on the 5th day of spinning. Three replicates of each experiment were made. The Data obtained were analysed statistically by oneway ANOVA

### III.RESULTS AND DISCUSSION

The variation in rearing temperature influenced the weight of silk gland in Vth stage larvae of *Bombyx mori*. With the increase in temperature from 15 to 25 $^{\circ}C$ , the weight of silk gland increases from 0.095gm to 0.136gm and from 0.132 to 0.267gm in fourth and fifth stage, respectively. Further increase in rearing temperature above 25 $^{\circ}C$  weight of silk gland shows gradual decrease in both stages (Table 1).

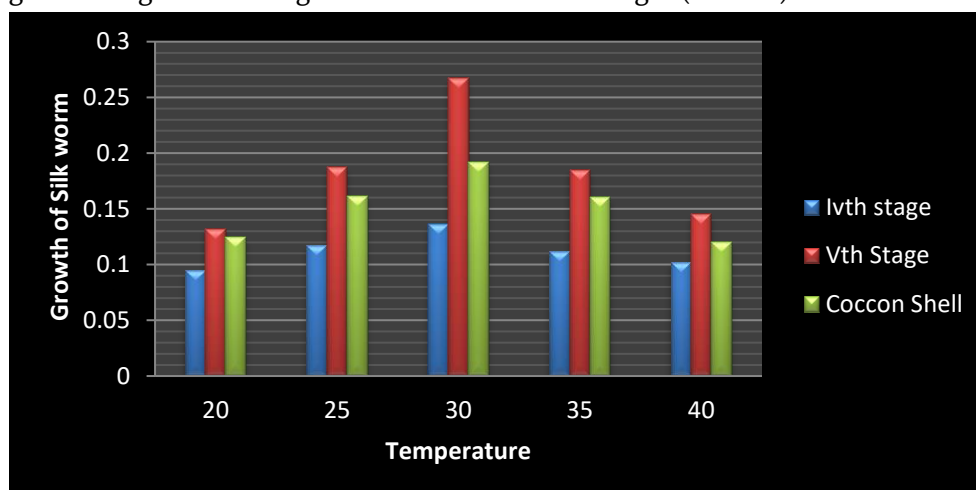


Table No: 1

Temperature	20	25	30	35	40	F = ratio n1 = 4 n2 = 10
Weight of Silk gland of IVth instar larvae (gm)	0.095	0.117	0.136	0.112	0.102	0.691
SD±	± 0.050	± 0.002	± 0.002	± 0.004	± 0.050	
Weight of Silk gland of Vth instar larvae (gm)	0.132	0.187	0.267	0.185	0.145	7.94
SD±	± 0.060	± 0.004	± 0.010	± 0.005	± 0.040	
Weight of Cocoon shell(gm)	0.124	0.161	0.192	0.160	0.120	3.31
SD±	± 0.040	± 0.003	± 0.002	± 0.002	± 0.050	

Each value represents the mean  $\pm$ SD of three replicates.

Estimation of the weight of silk gland has very important parameter for the cocoon production. Weight of cocoon shell also increases with increase in temperature from 15 to 25 $^{\circ}C$ . Observation shows that weight increased from 0.124gm to 0.192gm at the temperature from 15 to 25 $^{\circ}C$ , respectively. Temperature fluctuation



caused reduction of the silk production and weight of silk gland (Hsich *et al*, 1995). The refrigeration period of *B. mori* eggs also influence the weight of silk gland (Pandey and Upadhyay, 1999). The effect of seasonal variation on the production of cocoon and shell ratio has been evaluated by (Thiangerajan *et al*, 1993). Temperature variation in *Bombyx mori* also noticed by (Mishra and Upadhyay, 1995). The difference in temperature and relative humidity was found to influence the temporal aspects of spinnings as well as the quality of cocoon spun (Ramachandra *et al*, 2001). The investigation showed that adult of *B. mori* were died when kept at 40±50C and unable to lay eggs. At 10±10C they exhibit diapause mechanism and delayed in egg laying. (Dinesh *et al*, 2013). The study also revealed that irrespective of genotypes the values for these traits were marginally higher in spring than summer season (Bashir *et al*, 2014). Recent study was carried out to see the influence of varying temperature and suggested that appropriate temperature for silkworm *Bombyx mori* rearing was 250C (Sisodiya and Santosh, 2017). Thus on the basis of above discussion and present observations, it may be inferred that along with other factors temperature notably influenced the weight of silk gland and cocoon shell in *Bombyx mori*.

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# A Study of Gangakhed Town Bore-Wells Water Sample Analysis for Drinking Purposes, Maharashtra

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## ABSTRACT

The Gangakhed town Bore-wells water sample from Ward No.01 analysed for drinking purposes in this paper discussed. The different physical properties of water samples are studied like colour, hardness, and present minerals. In Oct 2020 month, We took a sample of water and compare to WHO criteria (world health organisation), ISI (Indian Standards Institute) and ICMR (Indian Council of Medical Research).

**Keywords:** for Drinking, World, human population, nitrate sickness, radiological.

## I. INTRODUCTION

Generally human body water level for about 60-70% is present. So water level up in the human body essential for survive in daily life. In earth about 71 % water roofed are present and about 97% earth water not useful for drinking purpose for living animal and human which available in the oceans and seas, so maximum water resources contain saline water. The briny water is not use direct for drinking, for agriculture, and for industries. The remain about 2.059% is locked in giant glaciers. As a result, 1-2 per cent of water is suitable for drinking, agriculture, and industry. So the demands of water system are increasing due to increase in human population and expand of industrial area. The industry waste water is more polluted and limited storage of water is polluted by sewage. Polluted Water and impurities responsible for to change taste, change odour, change colour, increase toxicity and harmful to human health. So water impurities responsible for undesirable effects on physicochemical properties, bacteriological and radiological.

Thus the number also as excellence of unpolluted water system is of important import for the safety of manhood. The water superiority elements provided for drinking water by many specialists are projected in the current study as shown below **Table 1**.

Parameter	ISI		ICMR		WHO	
	P	E	P	E	P	E
<b>PHYSICAL</b>						
Colour	10	50	5	25	5	25
Taste and odour	Unobject -		Unobject -		Unobject -	
Turbidity	10	25	5	25	5	25
<b>CHEMICAL</b>						
pH	6.5-8.5	6.5-9.2	7-8.5	6.5-9.2	7-8.5	6.5-9.2
TDS	-	-	-	-	500	1500
Total Hardness	300	600	300	600	-	-
Calcium	75	200	75	200	75	200
Magnesium	30	100	50	150	50	150
Copper	0.05	1.5	1.0	3.0	1.0	1.5
Iron	0.3	1.0	-.3	1.0	0.3	1.0
Manganese	0.1	0.5	0.1	0.5	0.1	0.5
Chlorides	250	1000	250	1000	200	600
Sulphates	150	400	200	400	200	400
Nitrates	45	-	20	50	-	100
Fluorides	0.6-1.2	-	1.0	2.0	0.5	1.0-1.5
Phenolic Substances	0.001	0.002	0.001	0.002	0.001	0.002
<b>TOXIC</b>						
Arsenic	0.05	-	-	0.2	-	0.2
Cadmium	0.05	-	-	0.05	-	0.05
Cyanide	0.05	-	-	0.01	-	0.05
Lead	0.1	-	-	0.1	-	0.1
Selenium	0.01	-	-	0.05	-	0.01
Zinc	5	10	-	-	-	-
Mercury	0.01	-	-	-	-	-
P = Permissible limit						
E = Excessive limit						
Note - All units except pH are in mg/L, otherwise stated.						
* - Now BIS						

## II. MATERIALS AND PROCEDURES

Ward No. 01 Gangakhed, Parbhani district, Maharashtra (India) has been chosen as the research zone for October 2020. The water tasters were gathered in sterile glass flasks ranging in size from 100 to 1000 ml. For all systematic measurements, APHA (1985) was used.

## III. RESULT AND ARGUMENT

Table 2 shows the results of the examination of Ward No. 01 of Gangakhed town Bore-wells water. The study found that sour taste is below 4 P<sup>H</sup> and bitter taste is over 8.5 in the water test. The P<sup>H</sup> range of 6.5 to 8.5 has no direct opposing special impacts on fitness, but the higher the P<sup>H</sup>, the lower the germicidal potential of chlorine. The formation of trihalomethanes at higher pH levels is known to cause cancer in humans. in a digital pH metre, electrodes 335 model No. The pH is determined using conventional instruments.

PARAMETER	BW-I	BW-II	BW-III	BW-IV	BW-V	BW-VI	BW-VII	BW-VIII	BW-IX	BW-X
PHYSICAL										
Colour	16	12	16	08	20	10	12	18	20	10
Taste and odour	UO	UO	UO	UO	UO	UO	UO	UO	UO	UO
Turbidity	14	10	14	06	17	09	11	15	13	08
CHEMICAL										
PH	6.9	8.5	7.5	8.4	6.3	6.2	7.2	7.8	7.8	8.3
TDS	270	150	160	170	210	180	200	130	180	220
Total Hardness	170	205	192	180	185	200	250	165	130	230
Calcium	52	68	63	55	56	20	36	48	60	40
Copper	18	28	20	28	16	22	15	25	30	27
Iron	0.2	0.2	0.2	0.4	0.4	0.3	0.4	0.3	0.3	0.3
DO	08	7.5	6.9	06	7.8	08	06	7.8	6.5	07
Manganese	0.08	0.01	0.02	0.06	0.09	0.04	0.01	0.02	0.03	0.05
Chlorides	180	227	175	220	160	180	210	177	235	200
Sulphates	126	155	160	110	138	120	180	145	173	90
Nitrates	35	28	24	35	32	22	20	40	28	27
Fluorides	0.015	0.25	0.18	0.3	0.019	0.3	0.2	0.35	0.4	0.5

UO- Unobjectionable.

In acceptable constraints, the rate of turbidity and total solids are likewise sufficient. The colloidal solid that causes turbidity provides adsorption sites for compounds that are harmful or generate unpleasant tastes and odours in biological entities that are dangerous. Because of the adsorptive properties of some colloids, sterilisation of murky waters is difficult, and the solid may only partially shield organisms from disinfectants. Light saturation and photosynthetic response should be limited in common water resources caused to turbidity brown colour to water and in streams and lakes due to turbidity brown colour to water. Total solids resolve is active to measure the fitness of possible source of water for numerous usages. The standard of overall hardness for capable water tasters fall in allowed limit. Hardness of water is critical in causal the capabilities of water in both home and industrial applications. According to the ISI, ICMR, and WHO, the general range for hardness is between 300 mg/L and 500 mg/L. The flavour of completely soft water is undetectable. Hardness up to 500 mg/L, on the other hand, can be regarded if adjusted to reported in soft waters area more incidences of cardiovascular problems. The proportion of calcium in hard water is higher, which is good for children's growth.

Chloride concentrations range from 250 mg/L to 1000 mg/L. (Excessive). When Chloride concentration is greater than 250 mg/L with sodium exert saline taste, although chlorides concentration over 250 mg/L are not hurtful, Their presence provides an off-putting flavour to the water, rendering it unfit for drinking purposes from a visual standpoint. Phosphorus is required for biotic life in surface waters, yet an excess of phosphorous aids in the growth of nuisance algae(Eutrophication), according to the current research. Phosphates are not present in any of the water samples that were obtained. Sulphate concentrations in natural resources range from 200 mg/L to 400 mg/L. Purifying effect is caused by the addition of  $\text{Na}_2\text{SO}_4$  and  $\text{MgSO}_4$ . The values compared by regular chemical technique and the alimentary canal cause disorder due to more conc. of  $\text{Na}_2\text{SO}_4$  in water. 250 mg/L in waters recommended upper boundary is suggested for human ingesting. The values fall inside a certain range, Phosphates are not toxic and do not create a direct fitness risk to humans or other organisms, according to the current studies.

In ground water a few minerals contain nitrates. The significant source of nitrated is nitrogenous substances like in chemical fertilizers, sewage, decayed vegetables, industrial wastes etc. Many ground waters have high levels of nitrates owing to nitrate leaching with percolating water, and sewage ground water can also be poisoned. Septic tank wastes and other waste are unlikely to contain nitrates. The presence of higher levels of

nitrate in ground water is a sign of internal water contamination. Nitrate poisoning is harmful to animals, including humans. Due to a lower amount of oxygen in the blood, newborns' skin turns blue. As a result, nitrate sickness has been named "BLUE BABY." When nitrate levels in drinking water exceed 45 mg/L, a condition known as 'methemoglobinemia' develops in babies.

#### IV. CONCLUSION

All physico-chemical properties of water superiority found well within the boundary. The values of the findings correspond to ISI, ICMR, and WHO standard values. Chemical factors like as turbidity, taste, odour, & colour are well within acceptable limits, according to the results. Therefore as per specifications all Gangakhed town Bore-wells water is fit for drinking purposes.

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# The Study of Physico-Chemical Parameters of Fresh Water Body Sakol, Dam, Sakol Dist. – Latur (M.S) India

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## ABSTRACT

The present work is carried out to study the physico- chemical parameters of Sakol Dam in Latur district of Maharashtra. The study is of monthly variation in the physical and chemical parameters such as Air temperature, Water temperature, Turbidity, pH, TDS, Do, Co<sub>2</sub>, Alkalinity, Chloride, Salinity and Hardness. These quality was Investigated for a period of 12 months (one year) January 2023 to December 2023. The result revealed that the different months showed fluctuations in physico- chemical parameters.

**Keywords-** Physico- chemical parameters, sakol dam monthly variation.

## I. INTRODUCTION

Water is an inorganic chemical substance. Water is a vital for all known from of life, one of the most precious natural resources. Only 2.7% of the total water is fresh water of which only 1% is ice free water in rivers and lakes. The water is unique substance because of its unique characteristics is its excellent dissolving capacity. The term water quality is used to describe the physical, chemical and microbiological properties of water that determine its quality for a regular Utility.

The Sakol Dam is earth fill dam on local river Udgir, Latur district in state of Maharashtra India. This Dam official name is Sakol Dam (D02924). The Hight of the dam above lowest foundation is 17.65 m (57.9 ft) while the length is 1.425m (4,675ft) the volume content is 371km<sup>3</sup> (89 cu mi) and grass storage capacity is 12,689,00 km<sup>3</sup> (3,044.25 cu mi) and total water storage capacity 10,950 km<sup>3</sup> (2,360 cu mi). To check the water quality is important for preserve and protect the natural ecosystem. The analysis of physico-chemical parameters of water is essential for the best use like irrigation, drinking, household purpose, industrial processing and fish culture.

## II. MATERIALS AND METHODS

The investigation work of Sakol dam water was carried out from January 2023 to December 2023. The physical parameter of water sample like air temperature, water temperature, pH, TDS, Turbidity was carried by digital standard instrument and chemical parameter like O<sub>2</sub>, Co<sub>2</sub>, alkalinity, chloride, salinity and hardness was carried out by standard titration method. The water sample collected in two liters plastic can, brought to laboratory and analyzed by standard methods. The water sample was taken in 300 ml capacity BOD bottle and

fixed on the spot. The results were calculated as per standard formula and methods APHA (1985), (Kodarkar, A.D Diwan, N. Murugan, K.M Kulkarni and Anuradha Ramesh).

### III.RESULTS AND DISCUSSION

Monthly Variation in Physico-Chemical parameters is presented in Table.

Table .1

Month	Temp				pH		TDS	
	Air		Water		Spot A	Spot B	Spot A	Spot B
	A	B	A	B				
Jan	32	32	26	26	8.5	8.3	340	344
Feb	32	32	28	28	9.5	9.4	350	340
March	34	34	28	28	9.3	9.5	340	340
Apr	34	34	26	27	9.6	9.5	360	360
May	35	34	25	25	9.8	9.6	350	340
June	32	33	26	28	9.7	9.8	330	334
July	27	26	24	24	9.7	9.5	340	340
Aug	30	29	26	25	9.6	9.7	340	340
Sept	28	28	23	24	9.7	9.6	350	340
Oct	27	28	24	24	9.6	9.6	340	340
Nov	29	29	24	25	9.5	9.6	350	350
Dec	30	30	24	26	9.6	9.7	350	340



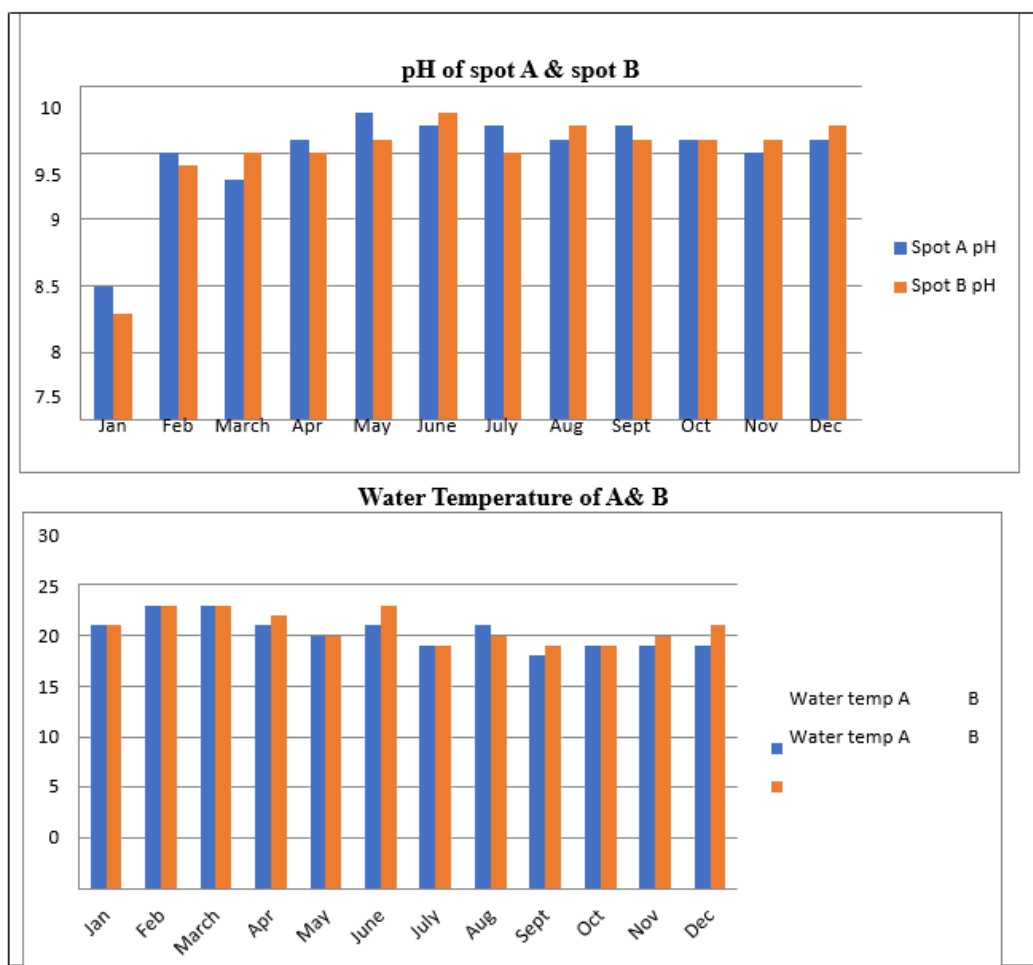
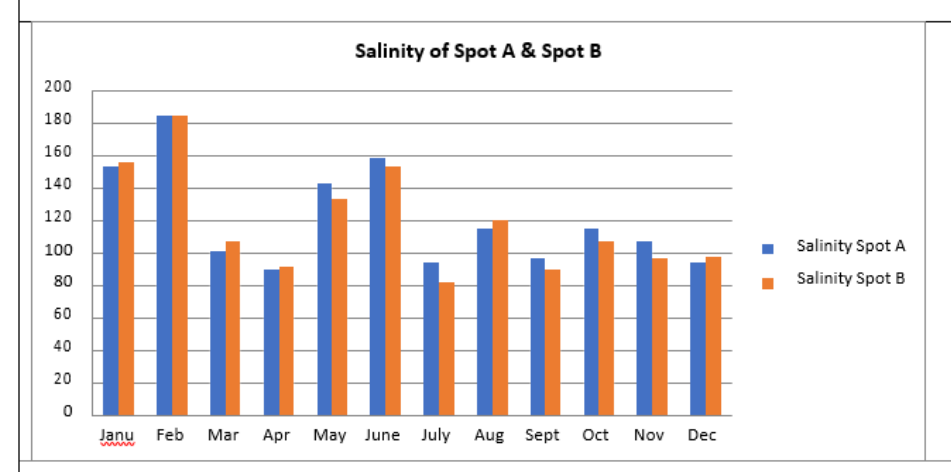
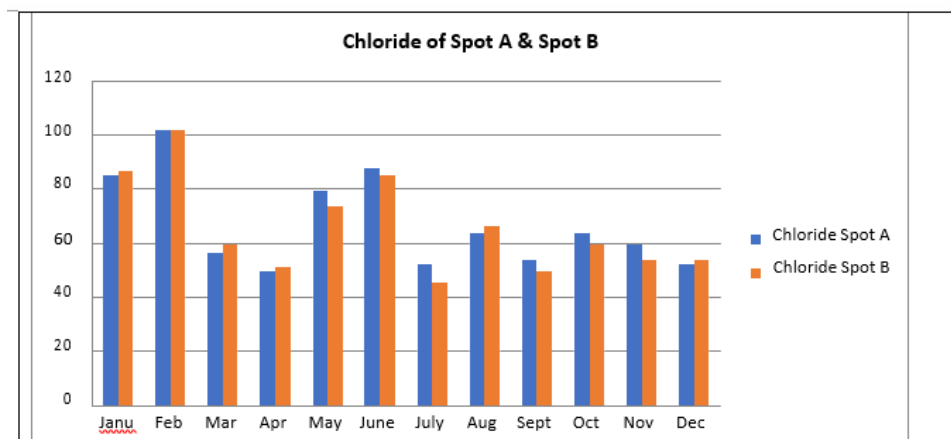
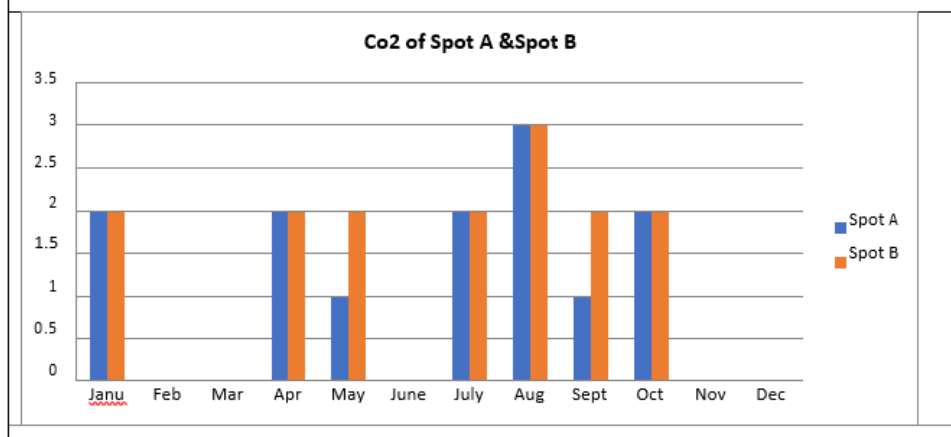
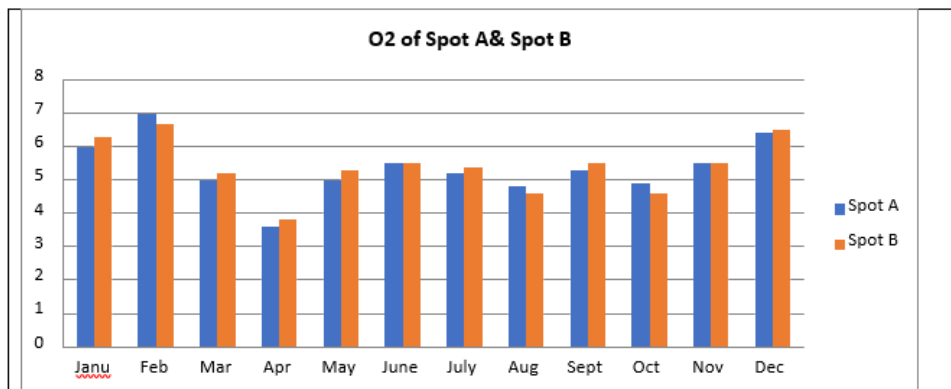
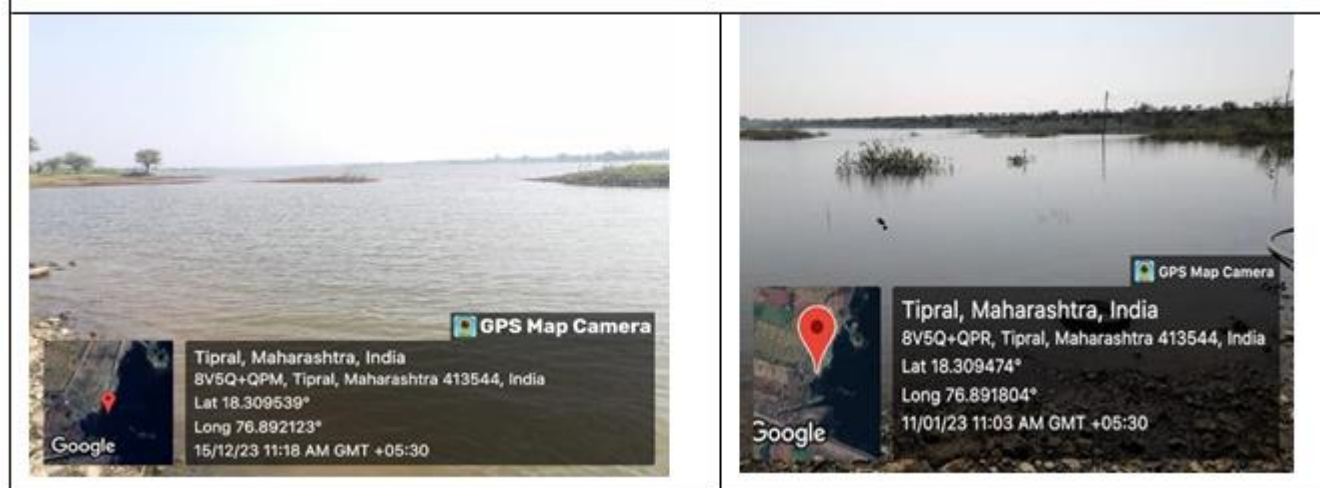
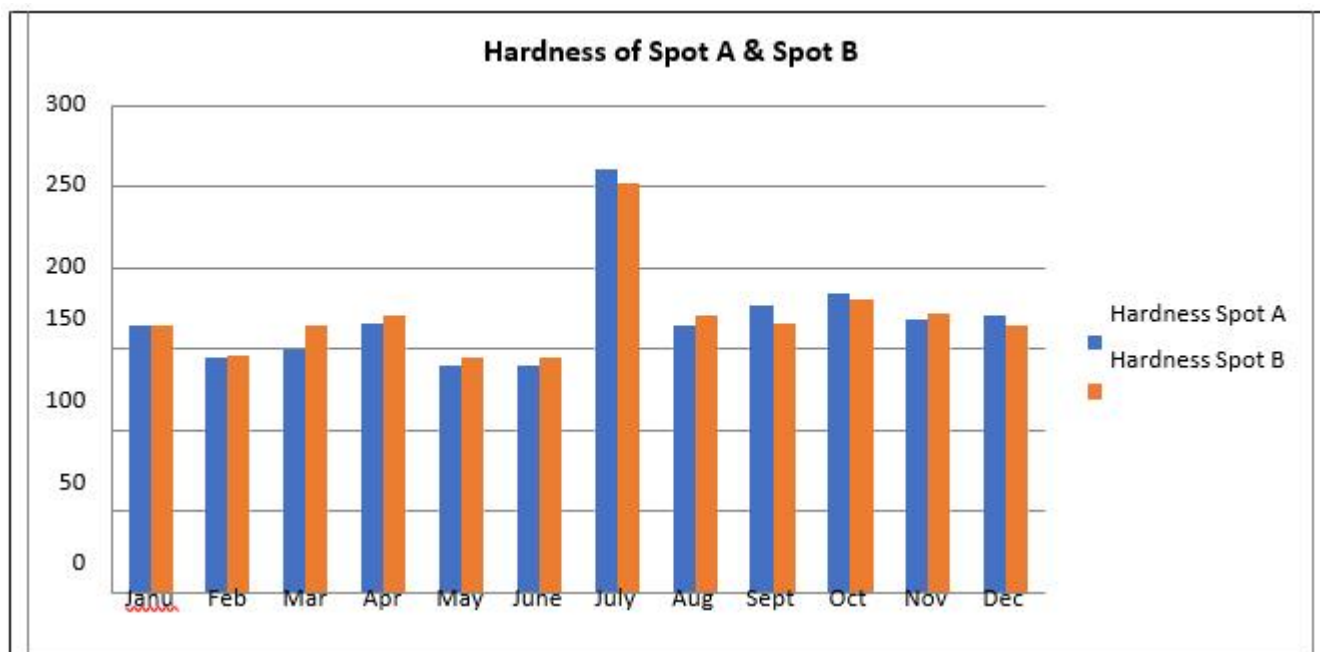


Table 1.2

Month	DO		Co2		Chloride		Salinity		Harness	
	Spot A	Spot B	Spot A	Spot B	Spot A	Spot B	Spot A	Spot B	Spot A	Spot B
Jan	6.0	6.3	2.0	2.0	85.08	86.49	153.59	156.14	164	164
Feb	7.0	6.7	-	-	102.06	102.06	184.24	184.24	144	146
Mar	5.0	5.2	-	-	56.72	59.55	101.59	107.51	150	164
Apr	3.6	3.8	2.0	2.0	49.63	51.04	89.61	92.15	166	170
May	5.0	5.3	1.0	2.0	79.40	73.73	143.34	133.11	140	144
June	5.5	5.5	-	-	87.96	85.08	158.31	153.59	140	144
July	5.2	5.4	2.0	2.0	52.46	45.37	94.72	81.92	260	252
Aug	4.8	4.6	3.0	3.0	63.81	66.64	115.20	120.31	164	170
Sept	5.3	5.5	1.0	2.0	53.88	49.63	97.28	89.61	176	166
Oct	4.9	4.6	2.0	2.0	63.81	59.55	115.20	107.51	184	180
Nov	5.5	5.5	-	-	59.55	53.88	107.51	97.28	168	172
Dec	6.4	6.5	-	-	52.46	53.88	94.72	97.88	170	164







### Sakol Dam Images

**Air Temperature;** In the present study of the air temperature spot A Range from 270c to 350c. The maximum temperature was recorded 350c in the month of June and minimum temperature recorded 270c in the month of July.

In the present study of the air temperature spot B Range from 260c to 340c. The maximum temperature was recorded 340c in the month of June and minimum temperature recorded 260c in the month of July. Similar study Dr. J.T Jagtap et.at (8) July 2023. Observed that high temperature in month of May and low Temperature in month of December Similar observation Recorded by Bady et.al (3) in sai Reservoir in latur.

**Water Temperature;** In the present study of water temperature Spot A Recorded range for 230c to 28 0c. The maximum water temperature recorded in sakol dam in the month of Feb and minimum temperature is recorded in the month of September. Spot B Recorded range for 240c to 28 0c. The maximum water temperature recorded in sakol dam in the month of Feb and minimum temperature is recorded in the month of September. Similar study by S.A Manjare, S.A. Vhanalakar& D.V Mulky et.al ISSN 0976-2612.

Water temperature plays an important factor which influences the biochemical, chemical and biological characteristics of water body.

**pH;** Spot A- The pH of water ranged between 8.8 to 9.8 and Spot B ranged 8.3 to 9.8 The maximum pH was recorded in month of June and minimum pH was recorded in month of January the factor like air temperature bring about Changes the pH of water most of biochemical reactions are influenced by the ph.

**TDS;** means Spot A-Total Dissolved Solids means the amount of particles that are dissolve in the water. The total dissolve solids fluctuated between 330 to 360 maximum TDS recorded in month of April and minimum TDS in month of June.Spot B TDS ranged Between 334 to 360 the maximum TDS recorded in month of April and minimum TDS in month of June.

**Dissolve Oxygen;** Spot A- The value of DO was recorded ranged between 3.6 to 7.0. the maximum value (7.0) was recorded in the month of February and minimum value (3.6) was recorded in the month of April. Spot B- The value of DO was recorded ranged between 3.8 to 6.7. The maximum value (6.7) was recorded in the month of February and minimum value (3.8) was recorded in the month of April. The all living organism use dissolve oxygen for their respiration and metabolic process alteration in the dissolve oxygen may be due to production of oxygen by photosynthesis. Similar study S.A Magore , S.A Vhanalalare and D.V Mulkey 2010. And Dr. J.T Jagtap 2023.

**Co<sub>2</sub>;** The value of Co<sub>2</sub> was recorded ranged between 0 to 3.0 the maximum value 3.0 was recorded in month of August spot A and B and minimum value 0 was recorded in month of Feb, March, June, November, Dec as same spot A and B.

**Hardness;** Spot A- The Value of Hardness Ranged between 140 to 260. The maximum value (260 mg/L) was recorded in the month of July and minimum value (140 mg/L) was recorded in the month of May& June. Spot B- The Value of Hardness Ranged between 144 to 252. The maximum value (252 mg/L) was recorded in the month of July and minimum value (144mg/L) was recorded in the month of May & June. Similar study Dr. J.T Jagtap 2023 his recorded hardness value range of 129 to 154.

**Chloride;** Chloride is a naturally occurring element that is often associated with elevated sodium level in the water. The value of chloride ranged between spot A is 49.63 to 102.06. The maximum value 102.06 was ranged in month of February and minimum value 49.63 mg/L in the month of April. Spot B 45.37 to 102.06. The maximum value 102.06 was recorded in month of February and minimum value 45.37 in month of July.

**Salinity;** Spot A the value of salinity was recorded range between 184.24 to 89.61. the maximum value 184.24 was recorded in the month of February and minimum value 89.61 in the month of April. Spot B the recorded range between 184.24 to 81.92. the maximum value 184.92 in the month of February and minimum 81.92 in the month of July. Salinity is the saltiness or amount of salt dissolve in a body of water called saline water.

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# Scope of Aquaculture in India

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## ABSTRACT

Aquaculture refers to the cultivation of aquatic organisms in a safe & controlled way. It uses several types of waste water as a source of nutrient and or warm temperature for the growth of plant and fish.

The Aquaculture sector has become a modern dynamic industry that produces safe, high valuable and high quality products, has developed the means to be environmentally sustainable.

In recent years it has led to substantial socioeconomics benefit - Increased nutritional level, income, employment and foreign exchange.

Vast un-utilized and under-utilized land and water resources under culture.

To fill the "Food gap" of the future the production from agriculture and aquaculture have to be improved in a sustainable way.

India is the second largest producer of farmed fish in the world after china and account for more than 8% of global aquaculture production.

## I. INTRODUCTION

Aquaculture is the cultivation of aquatic organism such as fish, shellfish and even plant. This term refers to the cultivation of marine and fresh water species and can range from land based to deep sea production aquaculture has been improving with time.

Today, the ponds are located in ponds, enclosures. Fish swim freely in a large net structure in the protected coastal areas. This means they have continuous access to clean water and exercise, so the fish are healthy lean and firm.

## II. IMPORTANCE OF AQUACULTURE

- Food production
- Restoring population that threatened and endangered
- Population enhancement of wild stock
- Aquarium construction
- Fish farming
- Home rehabilitation
- Aquaculture is the importance source of excellent quality protein and healthy oil

- Due to production of fish at low cost, it can be supplied at an affordable price even to poorest peoples
- Cultured fishes contrary to captured fish are free from pollutants
- Increases employment opportunity
- Importantly compensates dwindling capture fishery resources

### III.MATERIAL & METHODS

The paper examines the scope of aquaculture in india. The paper based on secondary data which is published by government research institute, journals, books etc.

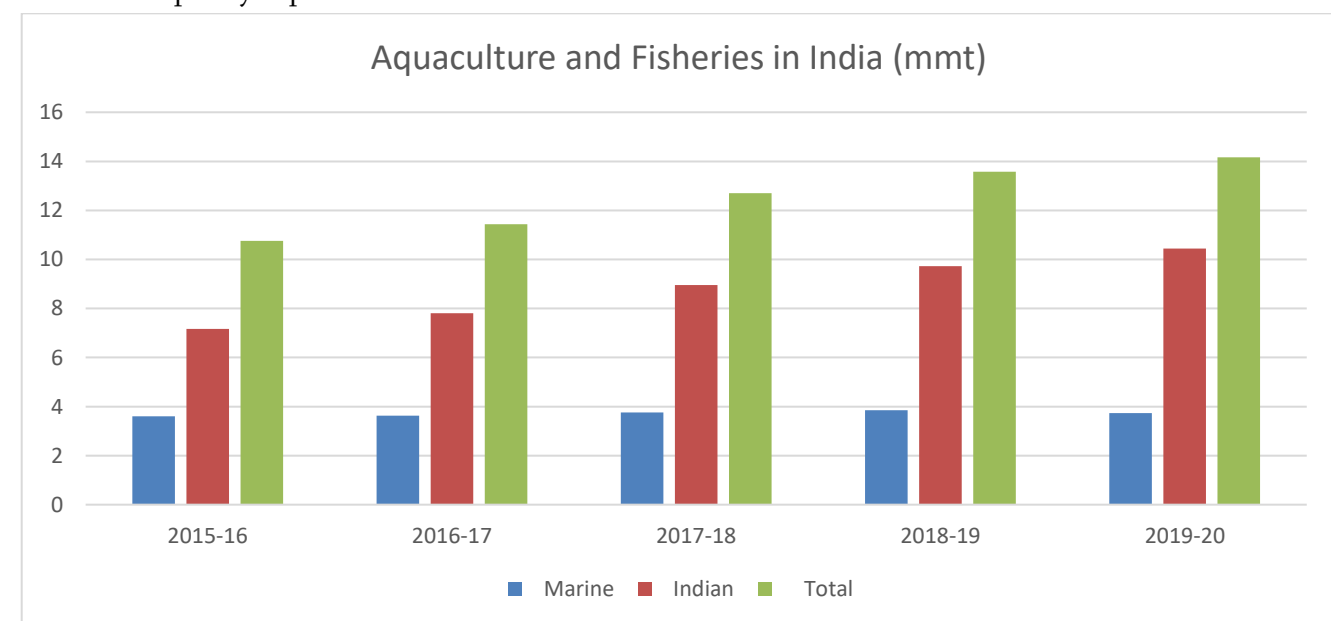
### IV.RESULT

Aquaculture is the farming of aquatic organisms including fish, Mollusca, crustaceans & aquatic plants. Farming implies some form of intervention in the rearing process to enhance production, such as regular stocking, feeding production from predators etc.

### V. SCOPE OF AQUACULUTURE

Freshwater aquaculture systems primarily confined to Rohu, Catla & Mrigala with exotic species such as silver carp, grass carp and common carp forming the second important group. Magur ( *Clarias batrachus*) receiving certain level of attention. *Pangasius Sp.* has higher growth potential and ready market. *Labeo calbasu*, *Labeo gonius*, *L. bata*, *L. dussumeri*, *L. fimbritus* , *barbodes cornaticus*, *Puntius pulchellus* , *P. kolus* , *P. sarana* and *Cirrhinus cirrhosa* potential and cultured and at a low level based on wild seed collection. The giant freshwater prawn, *macrobrachium rosenbergii* cultured at a low level in some parts of Andhra Pradesh.

In the Brakish water sector the shrimp, *Penaeus monodon* and *P. indicus* are dominant. In the last ten years *Litopennaeus vannamic* culture is a fast developing in india. The Finfish species like seabass ( *Lates calcarifer*), grey mullet ( *Mugil Cephalus* ) Pearl spot ( *Etroplus suratesis* ) Milk fish ( *Chanos chanos* ) are from promising and ideal but poorly exploited.



## VI. CONCLUSION

### Present status of aquaculture In India:-

- Aquaculture is one of the fastest growing sectors in India accounting global aquaculture production.
- On average, India is the third largest fish producing country in the world that accounts for a 7.56% share of global food production. Apart from this India is the second largest fish producer after China, through aquaculture
- Similar to marine capture production fishing operation in inland waters were severely impacted by the Covid-19 pandemic during 2020
- Largest fish farming states in India are Andhra Pradesh, West Bengal, Kerala, Tamil Nadu, Goa, Daman and Diu, Puducherry, Orissa, Karnataka and Maharashtra.

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# Green Synthesis of 3,4-dihydropyrimidin-2(1H)ones by Nano-ZnO

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## ABSTRACT

Green synthesis of 3,4-dihydropyrimidin-2(1H)ones in the presence of Nano-ZnO particles NP's (0.1%) the mixture of benzaldehyde, ethylacetoacetate, Urea and ammonium acetate was grind at RT temperature after 20 minutes reaction was completed. The reaction gives high yield.

**KEYWORDS:** Nano ZnO particles, benzaldehyde, ethyl acetoacetate, urea, ammonium acetate etc

## I. INTRODUCTION

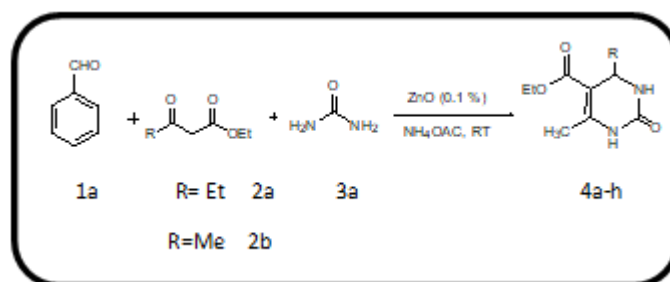
Development of Plant based nanoparticles has many advantages over conventional methods and has various applications in medicine and biology. In present study ZnO nanoparticles NPs were synthesized using leaf extracts of *Melia Azardarach*<sup>1</sup> 0.01M zinc acetate dihydrate used as precursor in leaf extract. The [3,4-d]-pyrimidines are analogs of most purine-based drugs, having huge scope in the past decade for a consequence of their wide usage in medicinal field<sup>2</sup>. On literature studies, dihydropyrimidine derivatives have considerable potential in the field of chemotherapy, as they were found to exhibit their antitumor activity by inhibiting different types of enzymes such as cyclin-dependent kinase<sup>3-5</sup>, Src and Abl tyrosine kinase<sup>6</sup>, glycogen synthase kinase-3<sup>7-9</sup>, adenosine deaminase<sup>10</sup>, and epidermal growth factor receptor protein tyrosine kinase. It also has very good coordinating ability similar to pyridyl ligands in supramolecular metallogrid-like architecture<sup>11</sup>. In addition, pyrimidines are pharmacologically active and display anticonvulsant<sup>12</sup> antiinflammatory<sup>13</sup> antibacterial<sup>14</sup> and antimycotic<sup>15</sup> activities. Recently, considerable attention has been focused on the development of new methodologies to synthesize many kinds of pyrazolopyrimidine ring systems.<sup>16</sup> Indeed, these compounds are widely recognized as important organic materials with interesting biological activities<sup>17</sup>. The most important biologically active compounds of this class are the formycin, allopuriol, and their corresponding nucleosides. Many synthetic methods for the preparation of pyridones and pyrimidines have been reported in the literature due to its broad spectrum biological activities and its skeleton. In this study we have reviewed some of the important synthetic methods for the preparation of 3,4-dihydro-2-pyridones and 3,4 dihydropyrimidones, 3,4-dihydropyrimidin-2(1H)ones which have appeared in the literature recently. Svetlik et al<sup>18</sup> reported the synthesis of 4-substituted aryl-3,4-dihydropyridones, from condensation of aromatic aldehyde, Meldrum's acid, methyl acetoacetate, ammonium acetate and acetic acid in refluxing methanol which afforded desired product in very poor yield even after long reaction period. Rodriguez's<sup>19-20</sup> 3,4-dihydro-2-pyridones was synthesized by solid-phase synthesis using Wang resin from the immobilized  $\beta$ -ketoester. using microwave irradiation as alternative to conventional heating. Mohan et al<sup>21</sup> have discovered a



simple, one-pot conversion of 4,5-diamino-6-chloropyrimidine in equimolar amount of sulfur in DMF to 90–100 °C for 17 h. Mohammad et al <sup>22</sup> in 2009 reported the use of 2-chloropyridine (2-ClPyr) with trifluoro methane sulfonic anhydride (Tf<sub>2</sub>O) as a versatile reagent combination for the synthesis of pyrimidine and pyridine derivatives.

## II. RESULT AND DISCUSSION

Since 3,4-dihydropyrimidin-2(1H)ones and 3,4-dihydro-2-pyridones serve as valuable building blocks in the construction of piperidines, perhydro quinolones, indolizidines, quinolizidines and other alkaloid ring systems and have a wide range of biological and pharmacological activities. Recently, zinc oxide NP's has received considerable attention as an inexpensive, nontoxic, readily available catalyst for various organic transformations, affording the corresponding products in excellent yields with high selectivity. According to literature studies on the synthesis of Pyrazolo-pyrimidines in presence of nano metal- oxide catalysts NP's by efficient methods<sup>23-26</sup>. The mild Lewis acidity associated with ZnO NP's enhanced its usage in organic synthesis to realize several organic transformations using stoichiometric levels to catalytic amount. In a model study, in the presence of zinc oxide NP's(0.1%) the mixture of benzaldehyde **1a**, ethylacetoacetate **2a-b**, Urea **3a** and ammonium acetate was grind at **RT** temperature after **20 min** reaction was completed ( progress of reaction monitored by TLC) a single spot corresponding to 3,4-dihydropyrimidin-2(1H)ones **4a-p**. The pure product was isolated by column chromatography and fully characterized.



**Scheme 1.** Mild and efficient synthesis of 3,4-dihydropyrimidin-2(1H) ones in high yield Catalyzed by ZnO

The IR spectrum of **4a-h** showed absorption at **1565**, **1638** and **3438 cm<sup>-1</sup>** corresponds to C=C, C=N, –NH respectively. The <sup>1</sup>H NMR spectrum of **4a-h** showed singlet of three protons at  $\delta$  **3.85** corresponds to ethoxy group, multiplet for ten protons in the region  $\delta$  **7.25-7.59** for aromatic proton and **12.52 (brs, 1H)** corresponds to –NH. The <sup>13</sup>C NMR spectrum showed peaks at  $\delta$  **54.6** and **145.7** corresponding to ethoxy carbon and C=N respectively, elemental data confirms with the structure of **4a-h** and corresponds to the known data (**Scheme 1**). Initially, a systematic study was carried out for catalytic evaluation of ZnO for The synthesis of 3,4-dihydropyrimidin-2(1H)ones. The reaction went to completion in 20min at RT with 0.11% ZnO. Accordingly, 0.1% was sufficient to catalyzed the reaction. A rate decreases with low yield was observed when higher molar ratios of ZnO were used. When we used 0.06 %, reaction completed in 260 min, whereas at 0.04 % and 0.02% of I ZnO it takes 212 and 120 min respectively but yield is not sufficient. We used 0.1 % ZnO it completed the reaction in 20 min with 90% yield.

By getting this result, we have extended this protocol to a variety of aldehydes and ethyl acetoacetate, urea summarized in **Table 2**. This protocol is rapid and efficient for the preparation of several 3,4-dihydropyrimidin-2(1H) ones **4a-h** from both electrons efficient as well as electron deficient aromatic aldehydes. The aryl groups

substituted with different groups did not show any effect on the formation of 3,4-dihydropyrimidin-2(1H) ones. A nearly stoichiometric amount of ammonium acetate was used in the course of the reaction, whereas previously a many-fold of ammonium acetate was required. This is an additional advantage of the novel methodology.

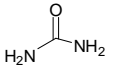

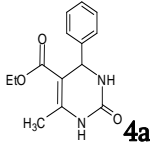
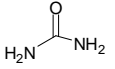
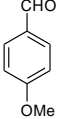
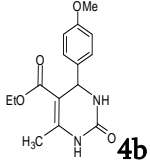
ENTRY	ZNO (%)	TIME (MIN.)	YIELD A (%)
1	No ZnO	260	00
2	0.06	212	traces
3	0.04	120	20
4	0.02	60	85
5	0.1	20	90

Table 1. Catalytic evolution for synthesis of 4a-h.

### III. EXPERIMENTAL PROCEDURE

The <sup>1</sup>H-NMR spectra were recorded on a Bruker AC-200 spectrometer with TMS as internal standard with 200 MHz frequency; chemical shifts ( $\delta$  scale) are reported in parts per million (ppm) relative to the central peak of the solvent. <sup>1</sup>H-NMR Spectra are reported in order: multiplicity, approximate coupling constant (J value) in hertz (Hz) and number of protons; signals were characterized as s (singlet), d (doublet), t (triplet), m (multiplet), br s (broad signal). The <sup>13</sup>C-NMR spectra were recorded at 50 MHz; chemical shifts ( $\delta$  scale) are reported in parts per million (ppm). IR spectra were recorded on ATI MATTSON RS-1 FTIR spectrometer. Melting points were recorded in an open capillary. The crude products were purified by column chromatography using silica gel (60–120 mesh size).

Table 2: Synthesis of 3,4-dihydropyrimidin-2(1H) ones:

Sr.No	1) Urea (3a) Ethylaceto Acetate (EAA) 2a	Aldehydes	Pyrimidines(4a-d)	Time (min)	Yield <sup>a</sup> (%)
1	 <b>3a</b>		 <b>4a</b>	22	94
2			 <b>4b</b>	18	93

3				20	91
4				23	94
	<b>Methyl Acetoacetate MAA(2b)</b>	<b>Aldehyde</b>	<b>Pyrimidines (4e-h)</b>	<b>Time (min)</b>	<b>Yield (%)</b>
5				20	90
6				24	92
7				19	93
8				22	90

### General procedure for synthesis of 3,4-dihydropyrimidin-2(1H)ones in high yield catalyzed by ZnO:

A mixture of Urea/thiourea 3a, 3b (4 mmol), substituted aldehydes 1a (4 mmol), ammonium acetate (10 equivalent), ethyl acetoacetate (4mmol) and zinc oxide (0.1 %) were stir for the appropriate time mentioned in Table 2. The completion of reaction was monitored by TLC using 25% ethyl acetate in petroleum ether. After completion of reaction, the reaction mixture was diluted with water (25 ml). The solid 3,4-dihydropyrimidin-2(1H) ones products, which separated out, were filtered, washed with sodium thiosulphate and dried. The crude products, thus isolated, were pure (single spot on TLC). They were subjected to further purification by chromatography through a column of silica-gel using 25% EtOAc in petroleum ether as eluent to yield the desired substituted 4,4-dimethylcyclohexane-1,3-dione (4a-h) in excellent yields of 84-95% and were fully characterized in the form of IR, <sup>1</sup>H, <sup>13</sup>C-NMR spectral and elemental analyses and mass spectroscopy.

#### IV. CONCLUSION

In conclusion, we have developed a mild, simple, straightforward, convenient and green protocol for the synthesis of a library of Synthesis of 3,4-dihydropyrimidin-2(1H)ones with shorter reaction time. The method is clean and simple, which can be used as an alternative to the existing methods.

#### V. ACKNOWLEDGMENT

Author wants to thanks Dept. of Chemistry and Principal B. Raghunath College Parbhani.

#### VI. SPECTRAL DATA

##### Methyl 1,4,5,6-tetrahydro-2-methyl-6-oxo-4-phenylpyridine-3-carboxylate (4e):

M. P. (OC) : 197-198

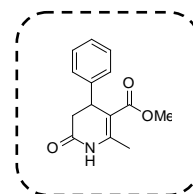
IR (CHCl<sub>3</sub>, cm<sup>-1</sup>) :  $\nu_{\max}$  1215, 1676, 1700, 2400, 3019, 3210.

<sup>1</sup>H NMR :  $\delta$  2.44 (s, 3H), 2.68-2.77 (dd, J= 16.8, 1.8 Hz, 1H), 2.90-3.02 (200 MHz, CDCl<sub>3</sub>) (dd, J= 16.4, 7.8 Hz, 1H), 3.68 (s, 3H), 4.24-4.30 (t, 1H), 7.22-7.31 (m, 5H), 8.11 (s, 1H).

<sup>13</sup>C NMR :  $\delta$  18.8, 37.6, 38.1, 51.3, 106.8, 126.5, 128.7, 141.8, 146.8, 167.3, 50 MHz, CDCl<sub>3</sub>) 171.4.

Elemental Analysis : C<sub>14</sub>H<sub>15</sub>NO<sub>3</sub> Calcd. C, 68.56; H, 6.16; N, 5.71.

Found C, 68.42; H, 5.98; N, 5.65.



##### Methyl-4-(4-methoxyphenyl)-1,4,5,6-tetrahydro-2-methyl-6-oxopyridine-3-carboxylate (4h):

M. P. (OC) : 188-189

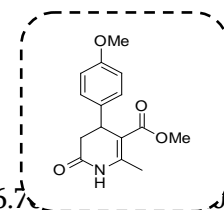
IR (CHCl<sub>3</sub>, cm<sup>-1</sup>) :  $\nu_{\max}$  1038, 1215, 1669, 1705, 3019, 3218.

<sup>1</sup>H NMR :  $\delta$  2.40 (s, 3H), 2.66-2.72 (dd, J= 16.5, 1.3 Hz, 1H), 2.91-3.03 (200 MHz, CDCl<sub>3</sub>) (dd, J= 16.8, 7.5 Hz, 1H), 3.66 (s, 3H), 3.75 (s, 3H), 4.21-4.26 (t, 1H), 6.7-7.0 Hz, 2H), 7.08-7.09 (d, J= 7.8 Hz, 1H), 7.90 (brs, 1H)

<sup>13</sup>C NMR :  $\delta$  18.8, 37.7, 38.4, 51.6, 55.7, 106.8, 114.3, 128.8, 133.5, 146.8, (50 MHz, CDCl<sub>3</sub>) 158.0, 167.3, 170.2.

Elemental Analysis : C<sub>15</sub>H<sub>17</sub>NO<sub>4</sub> Calcd. C, 65.44; H, 6.22; N, 5.09

Found C, 65.34; H, 6.09; N, 4.98.



##### Methyl-4-(4-nitrophenyl)-1,4,5,6-tetrahydro-2-methyl-6-oxopyridine-3-carboxylate (4f)

M. P. (OC) : 208-209

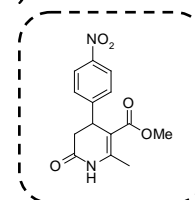
IR (CHCl<sub>3</sub>, cm<sup>-1</sup>) :  $\nu_{\max}$  1159, 1215, 1352, 1618, 1673, 1702, 2400, 2953, 3240.

<sup>1</sup>H NMR :  $\delta$  2.45 (s, 3H), 2.63-2.72 (dd, J= 16.6, 3.0 Hz, 1H), 2.94-3.06 (200 MHz, CDCl<sub>3</sub>) (dd, J= 15.1, 3.0 Hz, 1H) 3.65 (s, 3H), 4.34-4.37 (t, 1H),

7.37 (d, J= 8.2 Hz, 1H), 8.00 (brs, 1H), 8.14 (d, J= 8.0 Hz, 2H). <sup>13</sup>C NMR :  $\delta$  19.3, 37.6, 37.9, 65.1, 105.8, 124.1, 127.4, 147.3, 149.5, 166.8, (50 MHz, CDCl<sub>3</sub>) 170.2.

Elemental Analysis : C<sub>14</sub>H<sub>14</sub>N<sub>2</sub>O<sub>5</sub> Calcd. C, 57.93; H, 4.86; N, 9.65.

Found C, 57.82; H, 4.78; N, 9.55.



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# Understanding Ecosystem Dynamics : A Comprehensive Analysis

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## ABSTRACT

Abstract:

Ecosystems, intricate webs of life interwoven with abiotic elements, play a crucial role in sustaining life on Earth. This research paper endeavors to provide a comprehensive analysis of ecosystem dynamics, investigating their structure, function, and the myriad interactions that shape their existence. By delving into the intricacies of various ecosystem types, including terrestrial and aquatic realms, the study explores the hierarchical arrangement of communities, populations, and organisms. The paper scrutinizes the pivotal functions of ecosystems, including energy flow, nutrient cycling, and productivity, shedding light on the delicate balance that sustains life.

Ecosystem dynamics are not static; they are subject to influences from both natural forces and human activities. Disturbances, ranging from natural disasters to anthropogenic interventions, have profound impacts on the stability and resilience of ecosystems. This paper scrutinizes these influences, examining the concept of ecological succession and its role in ecosystem development. Furthermore, it critically assesses the extensive footprint of human activities on ecosystems, from deforestation to pollution, and contemplates the resulting consequences for biodiversity and ecosystem services. In addressing the challenges posed by anthropogenic impacts, the research paper explores conservation and restoration strategies. The significance of protected areas, sustainable resource management, and community engagement is underscored as essential components in safeguarding ecosystems.

Looking towards the future, the study outlines potential directions for further research in ecosystem science, recognizing the ever-evolving nature of ecological systems in the face of global environmental changes. As we strive to comprehend the complexities of ecosystems, this analysis contributes to a broader knowledge base, emphasizing the urgency of continued research and conservation efforts. In this journey towards understanding ecosystem dynamics, this paper serves as a roadmap for unraveling the mysteries of these intricate, interconnected systems.

**Keywords:** Ecosystems, Abiotic elements, Structure and function, Interactions, Terrestrial ecosystems, Aquatic ecosystems, Communities, Populations, Organisms, Energy flow, Nutrient cycling, Productivity, Ecosystem dynamics.

## I. INTRODUCTION

[1]Ecosystems, the intricate and interconnected systems comprising living organisms and their physical environments, form the ecological tapestry that sustains life on Earth. From the lush forests teeming with

biodiversity to the vast expanses of oceans teeming with marine life, ecosystems are fundamental to the balance and functioning of our planet's natural processes. Recognizing their significance in maintaining ecological equilibrium, this research paper aims to provide a comprehensive analysis of ecosystem dynamics.

The purpose of this research is to delve into the multifaceted aspects of ecosystems, investigating their structure, function, and the myriad interactions that shape their existence. Ecosystems are not merely collections of individual organisms but intricate networks where every element plays a vital role in maintaining the delicate balance necessary for the survival and prosperity of the system as a whole. This study seeks to unravel the complexities inherent in various ecosystem types, encompassing both terrestrial and aquatic environments.

### ***Research Questions and Hypotheses:***

1. What are the fundamental components of ecosystems, and how do they contribute to the unique characteristics of different ecosystem types?
2. How do ecosystems manage to sustain life through processes such as energy flow, nutrient cycling, and productivity?
3. In what ways do natural forces and human activities influence the dynamics, stability, and resilience of ecosystems?
4. What role does ecological succession play in shaping the development of ecosystems, particularly in response to disturbances?
5. How do human activities, ranging from deforestation to pollution, impact ecosystems, and what are the ensuing consequences for biodiversity and ecosystem services?

### **Literature Review:**

Before addressing these questions, it is imperative to build upon the existing body of knowledge. A brief literature review will outline key concepts, theories, and empirical findings in ecosystem science. By synthesizing the work of previous researchers, we aim to establish a foundation for our analysis while identifying gaps in understanding that warrant further exploration. Through this research endeavor, we aspire to contribute to the broader understanding of ecosystem dynamics and emphasize the urgent need for continued research and conservation efforts in light of evolving environmental challenges.

### **Ecosystem Definition and Components:**

An ecosystem is a dynamic and interconnected community of living organisms (biotic components) and their physical environment (abiotic components), functioning as a unit within a specific geographic area. The fundamental concept of an ecosystem encompasses the intricate relationships and interactions between organisms and their surroundings, resulting in the exchange of energy, nutrients, and information.

### **Biotic Components:**

- 1. Producers (Autotrophs):** [2]These are organisms capable of synthesizing their own food through processes like photosynthesis. Examples include plants, algae, and certain bacteria, which convert sunlight into energy.
- 2. Consumers (Heterotrophs):** Organisms that obtain energy by consuming other living organisms or organic matter. Consumers are categorized into primary consumers (herbivores), secondary consumers (carnivores), and tertiary consumers (top predators).
- 3. Decomposers:** Vital in nutrient cycling, decomposers break down dead organic matter into simpler substances. Fungi and bacteria are crucial decomposers that recycle nutrients, returning them to the soil for reuse.



**4. Biodiversity:** The variety of species within an ecosystem. High biodiversity contributes to the stability and resilience of ecosystems, as different species may play unique roles in maintaining balance.

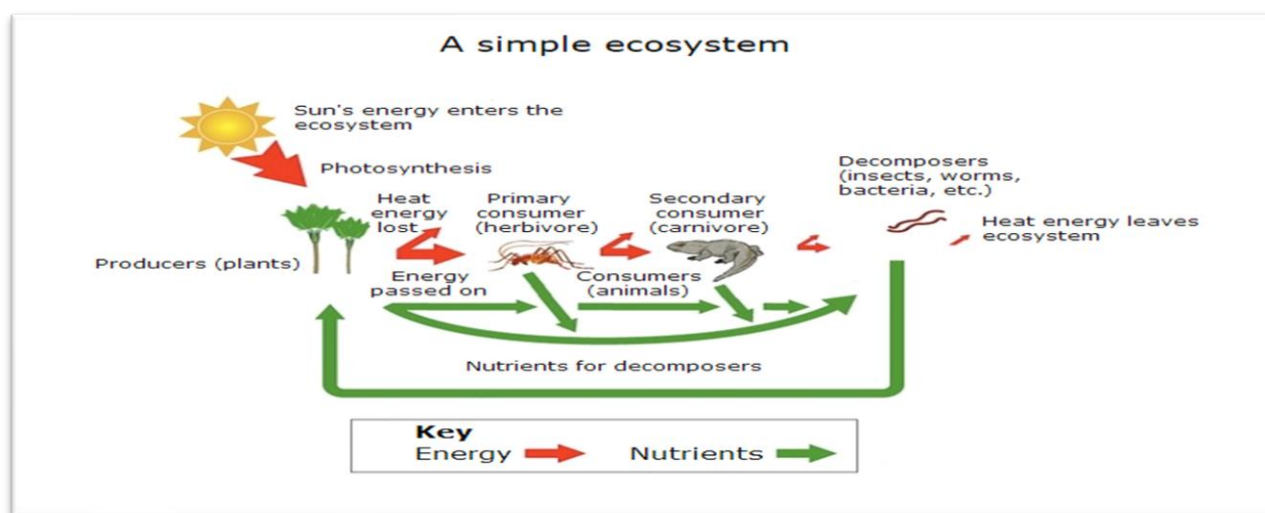
#### Abiotic Components:

**1. Physical Environment:** Includes non-living elements like soil, water, air, and climate, which influence the distribution and behavior of organisms within the ecosystem.

**2. Climate and Weather Patterns:** Temperature, precipitation, and seasonal variations impact the types of organisms that can thrive in a particular ecosystem.

**3. Geography and Topography:** The physical features of the landscape, such as mountains, valleys, and bodies of water, influence the structure and diversity of ecosystems.

**4. Nutrient Availability:** Essential elements like nitrogen, phosphorus, and carbon are critical for the growth of organisms. The cycling of these nutrients is a key aspect of ecosystem function.



#### Ecosystem Structure:

[3]Ecosystem structure refers to the organized arrangement of living organisms and their interactions with the physical environment. This hierarchical organization encompasses communities, populations, and individual organisms, each playing a crucial role in shaping the dynamics of the ecosystem.

##### **1. Organism Level:**

- At the base of the hierarchy are individual organisms, representing various species adapted to specific ecological niches.

- The interactions between organisms, including competition, predation, and symbiosis, contribute to the overall biodiversity and balance within the ecosystem.

##### **2. Population Level:**

- Populations consist of groups of individuals of the same species occupying a defined geographic area.

- Population dynamics, including birth rates, death rates, immigration, and emigration, influence the abundance and distribution of species within an ecosystem.

##### **3. Community Level:**

- A community comprises multiple populations of different species coexisting within the same area.

- Interactions between species, such as mutualism, competition, and predation, shape the community's composition and structure.

- Species diversity, including species richness and evenness, is a key determinant of community stability and resilience.

#### 4. Trophic Levels:

- Trophic levels represent the position of organisms in the food chain based on their feeding relationships.
- Producers (autotrophs) occupy the first trophic level, converting sunlight into energy through photosynthesis.
- Herbivores (primary consumers) constitute the second trophic level, consuming producers.
- Carnivores (secondary and tertiary consumers) occupy higher trophic levels, feeding on herbivores or other carnivores.
- Decomposers play a crucial role in breaking down organic matter, occupying a separate trophic level responsible for recycling nutrients.

#### 5. Ecosystem Level:

[4]- The combination of communities and the physical environment forms the ecosystem.

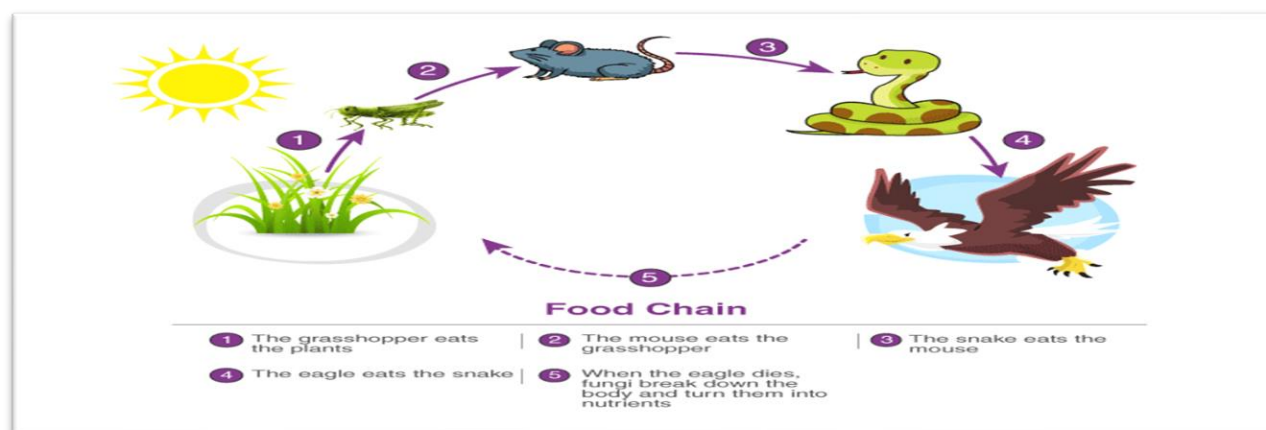
- Energy flow and nutrient cycling between biotic and abiotic components characterize ecosystem processes.
- Ecosystem boundaries are often defined by ecological factors, such as climate and vegetation.

#### *Role of Species Diversity and Interactions:*

**\*Species Diversity:** The variety of species within a community is vital for ecosystem health. High species diversity enhances ecosystem stability, resilience, and adaptability to environmental changes.

**\*Trophic Interactions:** Predation, herbivore, and competition among species regulate population sizes and maintain ecological balance. Trophic interactions influence the flow of energy through the ecosystem.

**\*Symbiotic Relationships:** Mutualistic, commensal, and parasitic interactions contribute to the structure and functioning of ecosystems by affecting the fitness and distribution of species.



#### Ecosystem Function:

[3]Ecosystem function refers to the processes and interactions that enable the flow of energy and cycling of nutrients within an ecological community. Understanding these functional aspects is essential for grasping the dynamics and sustainability of ecosystems.

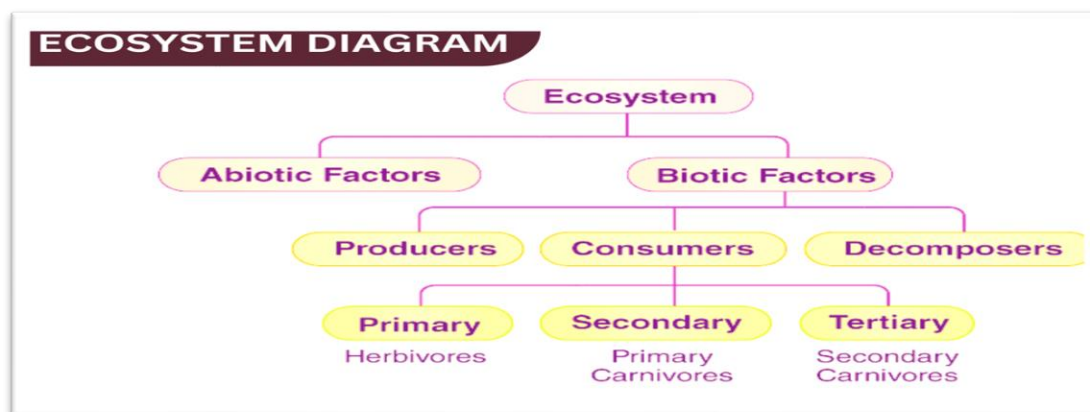
##### 1. Energy Flow:

**\*Primary Producers (Autotrophs):** Found at the base of the food chain, primary producers, mainly plants and algae, capture sunlight and convert it into chemical energy through photosynthesis.

**\*Consumers (Heterotrophs):** Herbivores (primary consumers), carnivores (secondary and tertiary consumers), and omnivores obtain energy by consuming other organisms.

**\*Decomposers:** Organisms like fungi and bacteria break down dead organic matter, releasing energy during the decomposition process.

The flow of energy through these trophic levels creates food chains and webs, illustrating the transfer of energy from one organism to another.



## 2. Nutrient Cycling:

**\*Decomposition:** Decomposers play a vital role in breaking down organic matter into simpler forms, releasing nutrients like carbon, nitrogen, and phosphorus back into the soil. This process is essential for nutrient recycling.

**\*Nutrient Uptake:** Plants and other primary producers absorb nutrients from the soil, incorporating them into their tissues. Herbivores obtain nutrients by consuming plants, and carnivores acquire them by feeding on herbivores or other carnivores.

Nutrient cycling ensures the availability of essential elements for the growth and development of organisms within the ecosystem.

## 3. Productivity:

**\*Primary Productivity:** The rate at which primary producers convert solar energy into organic matter through photosynthesis. It forms the foundation of the ecosystem's productivity.

**\*Secondary Productivity:** The rate at which consumers convert the organic matter from primary producers into their biomass. It represents the energy available to support higher trophic levels.

Productivity is a key indicator of an ecosystem's health and sustainability, reflecting its capacity to support life.

### *Roles of Primary Producers, Consumers, and Decomposers:*

**\*Primary Producers:** Generate organic compounds using sunlight, forming the basis of the food chain. They provide energy and nutrients for the entire ecosystem.

**\*Consumers:** Regulate population sizes and control the abundance of species within the ecosystem through predation and herbivory. They contribute to energy transfer between trophic levels.

**\*Decomposers:** Break down complex organic matter into simpler forms, facilitating nutrient cycling. Decomposers play a critical role in recycling nutrients, ensuring their availability for primary producers.

### Ecosystem Dynamics:

[5] Ecosystem dynamics refer to the constant changes and fluctuations in the structure and function of ecosystems over time. Understanding these dynamics is crucial for assessing stability, resilience, and responses to various influences, including disturbances and ecological succession.

### 1. Factors Influencing Ecosystem Stability and Resilience:

**\*Biodiversity:** High species diversity often enhances ecosystem stability, as different species may respond differently to environmental changes, contributing to a more resilient system.

**\*Trophic Interactions:** Balanced predator-prey relationships and competitive interactions help regulate population sizes, preventing the dominance of one species and promoting stability.

**\*Adaptability:** Ecosystems with diverse species are often more adaptable to changing conditions, demonstrating greater resilience against disturbances.

**\*Nutrient Cycling:** Efficient nutrient cycling contributes to ecosystem stability by ensuring the availability of essential elements for primary producers.

## **2. Disturbances and Their Impact:**

**\*Natural Disturbances:** Events such as wildfires, hurricanes, and earthquakes are part of natural ecological processes. While they may cause short-term disruptions, they can also lead to renewal and regeneration.

**\*Human-Induced Disturbances:** Anthropogenic activities like deforestation, pollution, and habitat destruction can have profound and often detrimental effects on ecosystem stability. These disturbances may disrupt trophic interactions, nutrient cycling, and biodiversity.

[6]**\*Climate Change:** Altered weather patterns, rising temperatures, and extreme events associated with climate change can pose significant challenges to ecosystem dynamics, affecting species distribution and behavior.

Analyzing the impact of disturbances provides insights into the adaptive capacity and resilience of ecosystems, influencing future management and conservation efforts.

## **3. Ecological Succession:**

**\*Definition:** Ecological succession is the gradual, sequential process of change in the species composition and structure of an ecosystem over time.

**\*Primary Succession:** Occurs in areas where no previous ecosystem existed, such as after a volcanic eruption or on newly formed land surfaces.

**\*Secondary Succession:** Takes place in areas where an existing ecosystem has been disturbed, often by human activities or natural events.

[7]Ecological succession plays a critical role in ecosystem development by facilitating the recovery and rebuilding of communities following disturbances. It involves pioneer species, which colonize disturbed areas, and climax communities, which represent a stable and mature ecosystem.

### **Human Impact on Ecosystems:**

Human activities have significantly altered ecosystems across the globe, with consequences that extend to biodiversity and essential ecosystem services. Deforestation, driven by agricultural expansion and logging, leads to habitat loss and disrupts ecosystems, impacting various species. Pollution, whether air, water, or soil, introduces harmful substances into the environment, affecting the health of organisms and altering ecosystem dynamics. Climate change, largely fueled by human-induced greenhouse gas emissions, causes shifts in temperature and precipitation patterns, affecting species distributions and migration behaviors.

The consequences of these human impacts on biodiversity are evident in the loss of species, reduced genetic diversity, and disruptions to ecological relationships. Ecosystem services, such as pollination, water purification, and climate regulation, are compromised, impacting human well-being. These alterations increase the vulnerability of ecosystems to diseases, invasive species, and extreme events, hindering their ability to adapt and function optimally. Recognizing the interconnected nature of these impacts is essential for implementing effective conservation and sustainability measures.

### **Conservation and Restoration:**

Conservation and restoration efforts are essential to mitigate the negative impacts of human activities on ecosystems and promote their health and resilience. Various strategies contribute to these goals, focusing on protection, sustainable management, and community engagement.

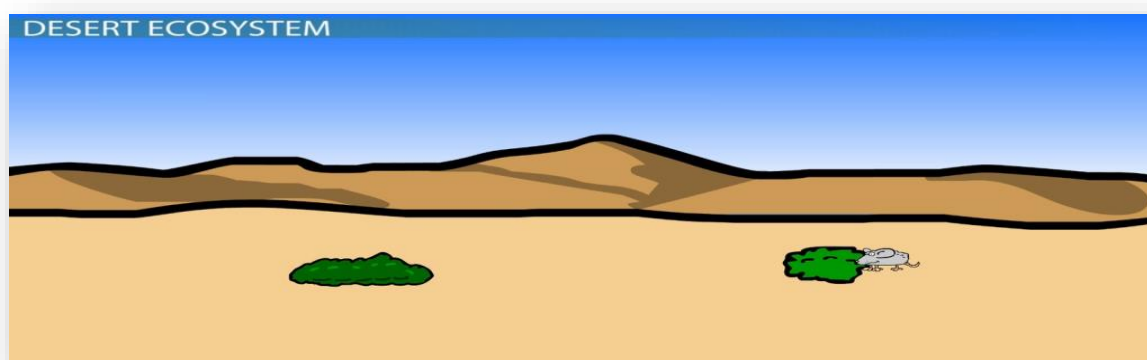
Conservation strategies include the establishment and maintenance of protected areas, where natural habitats and biodiversity are safeguarded. These areas serve as havens for wildlife, promoting the preservation of species and the maintenance of ecological processes. Beyond protected areas, sustainable resource management is crucial. This involves adopting practices that ensure the responsible use of natural resources, minimizing negative impacts on ecosystems. Sustainable forestry, fisheries management, and agriculture practices are examples of approaches that balance human needs with ecological conservation. Community involvement plays a pivotal role in successful conservation and restoration initiatives. Local communities often possess valuable traditional knowledge about ecosystems, and their engagement can enhance the effectiveness of conservation efforts. Collaborative approaches that empower communities to participate in decision-making, sustainable resource use, and habitat restoration contribute to long-term conservation success. Furthermore, community-based conservation projects promote a sense of stewardship, fostering a shared responsibility for the well-being of local ecosystems. Implementing these strategies requires a multi-faceted approach, involving partnerships between governments, non-governmental organizations, local communities, and the private sector. Conservation and restoration initiatives are most successful when they integrate ecological, social, and economic considerations, recognizing the interconnectedness of human societies and the natural environment. Through these efforts, we can work towards maintaining the diversity and functionality of ecosystems for the benefit of present and future generations.

### **Case Studies: (Desert Ecosystem)**

#### **1. Sonoran Desert (North America):**

**\*Ecosystem Structure:** The Sonoran Desert is characterized by a unique ecosystem structure, with a variety of plant and animal species adapted to arid conditions. Cacti, such as the saguaro and barrel cactus, serve as primary producers, while desert-adapted animals like the Gila monster and desert tortoise inhabit the region.

**\*Biodiversity and Adaptations:** Despite the harsh conditions, the Sonoran Desert showcases remarkable biodiversity, with species displaying specialized adaptations to conserve water and thrive in extreme temperatures. Examples include the kangaroo rat's ability to survive without drinking water and the creosote bush's chemical defenses against herbivores.



#### **2. Kalahari Desert (Africa):**

**\*Ecosystem Dynamics:** [8]The Kalahari Desert experiences seasonal fluctuations, with distinct wet and dry periods influencing ecosystem dynamics. During the rainy season, ephemeral rivers flow, creating temporary habitats for aquatic life. The vegetation responds to rainfall, leading to shifts in primary productivity and animal migrations.

**\*Human Impact:** Traditional communities, such as the San people, have lived in harmony with the Kalahari for centuries, showcasing sustainable resource management practices. However, modern activities, including agriculture and mining, pose threats to the delicate balance of the ecosystem, emphasizing the need for conservation measures.

### 3. Atacama Desert (South America):

**\*Extreme Conditions:** The Atacama Desert is one of the driest places on Earth, receiving minimal precipitation. The extreme conditions limit vegetation, but unique microorganisms, adapted to the harsh environment, thrive in salt flats and high-altitude regions. This highlights the resilience of life in extreme ecosystems.

**\*Climate Change Impact:** [9]Climate change exacerbates aridity in the Atacama, leading to changes in precipitation patterns and potentially affecting the distribution of endemic species. Studying this desert provides insights into the vulnerability of extreme ecosystems to global environmental changes.

### 4. Desertification in the Sahel (Africa):

**\*Disturbance and Ecological Succession:** [10]The Sahel region has experienced desertification due to a combination of factors, including overgrazing, deforestation, and climate variability. This case illustrates the concept of ecological succession as grasslands give way to shrubs and eventually bare desert. Efforts to combat desertification involve restoration projects and sustainable land management practices.

**\*Human-Environment Interaction:** [11]The Sahel case underscores the intricate relationship between human activities and ecosystem dynamics. Community involvement and restoration initiatives are crucial for combating desertification and restoring degraded landscapes.

These case studies exemplify the diverse challenges and adaptations within desert ecosystems, providing real-world examples that enrich our understanding of key ecological concepts such as biodiversity, adaptations, ecosystem dynamics, and human impacts on fragile environments.

### Future Directions in Ecosystem Science:

**1. Climate-Resilient Ecosystems:** [12]Investigate strategies to enhance ecosystem resilience to climate change, considering adaptive management approaches, assisted migration, and the identification of climate-resilient species.

**2. Ecological Engineering:** Explore innovative methods of ecological engineering to restore degraded ecosystems, such as the use of bioengineering techniques to enhance soil structure or the introduction of keystone species to promote ecosystem recovery.

**3. Microbial Ecology:** Deepen our understanding of the role of microbial communities in ecosystem processes, including nutrient cycling, disease suppression, and plant-microbe interactions, to unravel the microbial contributions to ecosystem resilience.

**4. Global Connectivity:** Study the impact of global connectivity on ecosystems, considering the movement of species, pathogens, and pollutants across regions, and its implications for biodiversity, disease spread, and ecosystem dynamics.

**5. Urban Ecosystems:** Investigate the ecology of urban environments, addressing the unique challenges and opportunities posed by urbanization, such as the role of green infrastructure, biodiversity in cities, and the effects of urban heat islands.

### *Challenges and Uncertainties in Ecosystem Management:*

**1. Nonlinear Responses to Climate Change:** [13]Understand the nonlinear and potentially unpredictable responses of ecosystems to climate change, considering tipping points, abrupt shifts, and synergistic effects that may amplify the impacts on biodiversity and ecosystem services.

**2. Anthropogenic Pressures:** Address the ongoing challenges posed by human activities, such as land-use change, pollution, and resource exploitation, and explore sustainable solutions to balance human needs with ecological integrity.

**3. Emerging Diseases:** Anticipate and manage the impacts of emerging diseases on ecosystems, considering the interactions between pathogens, hosts, and the environment, and developing strategies for disease prevention and control.

**4. Invasive Species:** Investigate the dynamics of invasive species and their impacts on native ecosystems, developing effective strategies for early detection, rapid response, and long-term management to prevent biodiversity loss.

**5. Interactions between Global Stressors:** Explore the complex interactions between multiple stressors, including climate change, pollution, and habitat loss, to better understand cumulative impacts on ecosystems and develop holistic management approaches.

### **Conclusion:**

The research paper delves into the intricate dynamics of ecosystems, revealing key insights into the delicate balance that sustains them. The findings underscore the complexity of interactions among species, the environment, and human activities, emphasizing the need for a comprehensive understanding to address the challenges they face.

Crucially, the research highlights the vulnerability of ecosystems to various threats, including climate change, habitat loss, and human-induced disturbances. By unpacking these dynamics, the study sheds light on the far-reaching consequences of ecosystem degradation and the potential cascading effects on biodiversity.

The paper stresses the critical role of continued research in unraveling the nuances of ecosystem dynamics. Ongoing scientific inquiry is essential for identifying emerging patterns, understanding resilience mechanisms, and predicting the potential impacts of external factors. This knowledge is paramount for informed decision-making and the development of effective conservation strategies.

Additionally, the research underscores the interconnectedness between healthy ecosystems and human well-being. Sustainable practices and conservation efforts are not only vital for preserving biodiversity but also for ensuring the provision of ecosystem services that directly benefit human societies.

In conclusion, the research paper advocates for sustained commitment to both research endeavors and conservation initiatives. The call to action is rooted in the recognition that ongoing efforts are necessary to navigate the evolving challenges faced by ecosystems, ultimately safeguarding the health and resilience of our planet's intricate web of life.

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# Community Engagement in Water Conservation: A Survey of Kalaburagi's Residents

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## ABSTRACT

This study, conducted between May to October 2023, explores the dynamics of community engagement in water conservation practices within the Kalaburagi district. Through a comprehensive survey of residents, the research examines demographic profiles, awareness levels, and water usage patterns. The findings offer a nuanced understanding of factors influencing water conservation behaviors, with a particular focus on the impact of educational programs. Community participation in local water conservation projects is assessed, shedding light on perceptions of effectiveness. The study identifies challenges and barriers hindering active involvement, providing valuable insights for targeted interventions. Resident recommendations for enhancing water conservation efforts serve as a roadmap for policymakers and community leaders. This research contributes essential knowledge to inform sustainable water management strategies, fostering a more water-conscious and engaged community in Kalaburagi.

**Keywords:** Water Conservation; Community Engagement; Kalaburagi; Sustainable Water Management

## I. INTRODUCTION

Water conservation is a critical imperative for regions facing escalating challenges in sustainable resource management, and the Kalaburagi district serves as a pertinent focal point for such investigations. This study, spanning the period from May to October 2023, delves into the intricate dynamics of community engagement in water conservation practices within Kalaburagi. As burgeoning population growth and changing environmental conditions strain water resources, understanding the factors influencing residents' behaviors becomes paramount for crafting effective and context-specific conservation strategies [1-3].

The research employs a comprehensive survey to unravel the demographic profiles, awareness levels, and water usage patterns prevalent among Kalaburagi's residents. By scrutinizing the impact of educational programs, the study seeks to unearth nuanced insights into the determinants of water conservation behaviors. Additionally, an assessment of community participation in local water conservation projects aims to elucidate the perceived effectiveness of these initiatives.

The investigation does not merely stop at profiling current practices; it extends to the identification of challenges and barriers hindering active community involvement. The study places emphasis on understanding

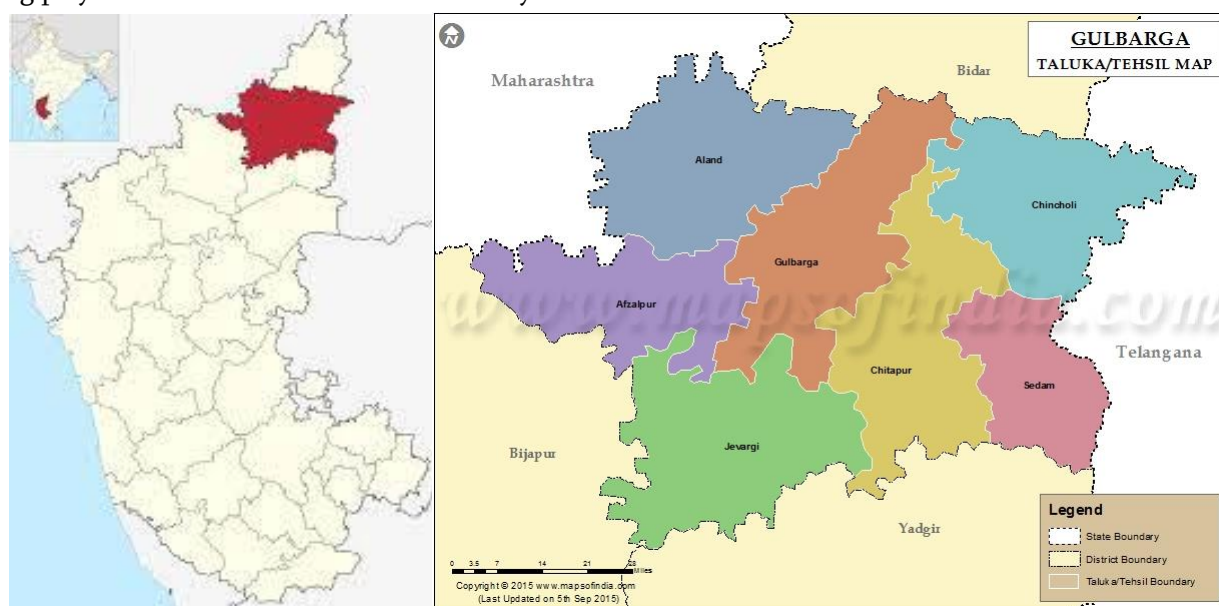
the residents [4] perspectives, thereby offering valuable insights for targeted interventions. Furthermore, by soliciting resident recommendations for enhancing water conservation efforts, the research aspires to provide a pragmatic roadmap for policymakers and community leaders.

In a time where water scarcity poses an imminent threat, the study aspires to contribute essential knowledge to inform sustainable water management strategies. By fostering a deeper understanding of community dynamics [5], the research endeavors to facilitate the development of strategies that resonate with the unique context of Kalaburagi, paving the way for a more water-conscious and engaged community.

## II. MATERIALS AND METHODS

### Study Area:

The study is centered in Kalaburagi, a district in the northern part of the Indian state of Karnataka. Kalaburagi, also known as Gulbarga, holds historical significance and is renowned for its cultural heritage. Geographically, it is situated on the Deccan Plateau, experiencing a semi-arid climate. The district is characterized by diverse landscapes, ranging from urban centers to rural villages. Kalaburagi City, the district headquarters, serves as a focal point for economic and administrative activities. Surrounding areas include agricultural regions, where farming plays a crucial role in the local economy.



**Figure 1: Study Area**

Water scarcity is a prominent issue in Kalaburagi, attributed to factors such as rapid urbanization, population growth, and climatic variations. The district relies on a mix of water sources, including surface water bodies, groundwater, and rainwater harvesting systems. Understanding the water conservation dynamics in Kalaburagi is essential due to the region's vulnerability to water stress. The study aims to capture the perspectives and practices of residents across the diverse landscapes of Kalaburagi, contributing valuable insights for the development of targeted water conservation strategies in this unique and critical geographical context.

**Survey Design and Sampling:** A structured survey instrument was designed to collect data on water conservation practices among residents of Kalaburagi. The study utilized a stratified random sampling technique [6-8] to ensure representation across diverse demographic groups, including age, gender, and occupation. The survey was administered during the period from May to October 2023.

**Demographic Data Collection:** The demographic data collection process involved systematically recording key details of the study participants. Information on age, gender, educational background, and occupation was gathered to establish a comprehensive understanding of the study population. This foundational data forms the basis for analyzing and contextualizing responses throughout the survey. The demographic insights will be instrumental in identifying patterns, trends, and variations in water conservation practices among different segments of the Kalaburagi community, contributing to a more nuanced interpretation of the study results.

**Awareness and Perception Assessment:** A series of questions gauged respondents' awareness of water scarcity and their perception of its severity in Kalaburagi. Likert scale responses were employed to capture varying degrees of awareness and perception [9].

**Water Usage Patterns and Behaviors:** Data on daily water consumption per household, water usage habits, and sources of water were collected. The survey also explored factors influencing water conservation behaviors and the relationship between awareness levels and conservation practices.

**Community Engagement and Initiatives:** Participants were asked about their involvement in local water conservation projects and their perception of the effectiveness of community-based initiatives. These insights provided a comprehensive view of community engagement in water conservation efforts [10].

**Challenges and Barriers Analysis:** Respondents were questioned about the challenges and barriers hindering their active participation in water conservation. Multiple-choice options were provided to identify key challenges in adopting water-saving practices.

**Recommendations Collection:** Residents were encouraged to provide recommendations for enhancing water conservation efforts. Open-ended questions allowed for the collection of qualitative data on community-suggested strategies [12, 13].

**Data Analysis:** Quantitative data were analyzed using statistical software, generating descriptive statistics to summarize survey responses. Qualitative data were subjected to thematic analysis to identify recurring patterns and emergent themes. The results provide a holistic view of water conservation dynamics within the Kalaburagi community [11].

**Ethical Statement:** This study adheres to the highest ethical standards in research, prioritizing the well-being and rights of the participants. The research process strictly complies with ethical guidelines and principles, ensuring transparency, confidentiality, and respect for the autonomy of all individuals involved.

### III.RESULTS AND DISCUSSION

A complex knowledge of the mechanics of water conservation in Kalaburagi is shown by the study. The findings show a remarkable degree of community involvement in nearby water projects and a favorable opinion of their efficacy. The need for focused interventions is highlighted by impediments that have been identified, such as low awareness and budgetary limitations. Awareness campaigns play a key role in influencing water conservation practices through educational initiatives. Locals are eager to implement water-saving practices, and stricter laws and greater public awareness are the main recommendations. These results offer a thorough basis on which politicians and community leaders may build community-driven, successful water conservation plans in Kalaburagi that encourage environmentally conscious behavior and sustainable practices.

Age Group	Male Respondents	Female Respondents	Total Respondents
18-25	120	110	230
26-35	90	80	170
36-50	80	70	150
51-65	45	40	85
65+	15	20	35
<b>Total</b>	<b>350</b>	<b>320</b>	<b>670</b>

**Table 1: Distribution of Respondents by Age Group and Gender**

Table 1 displays the demographic distribution of study participants across age groups and gender. The age categories, spanning from 18-25 to 65+, provide an overview of the diverse age representation within the study. Broken down by gender, the table allows for a nuanced understanding of the gender distribution across different age brackets. The total respondent's column sums up male and female participants in each age category, offering a comprehensive view of the overall demographic landscape. This table is foundational for demographic profiling, aiding in recognizing potential variations in age and gender that may influence the study's findings, particularly in the context of water conservation practices and awareness.

Educational Level	Number of Respondents
High School or below	150
Diploma/Certificate	100
Bachelor's Degree	250
Master's Degree	120
Doctorate or equivalent	50
<b>Total</b>	<b>670</b>

**Table 2: Educational Background of Survey Participants**

Table 2 outlines the educational background of the survey participants, categorizing them into High School or below, Diploma/Certificate, Bachelor's Degree, Master's Degree, and Doctorate or equivalent. The distribution is as follows: High School or below (150), Diploma/Certificate (100), Bachelor's Degree (250), Master's Degree (120), and Doctorate or equivalent (50), with a total of 670 respondents. This table is instrumental in providing a quick snapshot of the educational diversity within the study cohort. Understanding the educational levels of participants is essential for discerning potential correlations between educational background and attitudes or practices related to water conservation. It forms a foundational aspect for demographic profiling and aids in tailoring interventions based on participants' educational backgrounds.

Occupation	Number of Respondents
Student	180
Employed (Private)	280
Employed (Government)	120
Homemaker	90
Retired	40
<b>Total</b>	<b>710</b>

**Table 3: Distribution of Respondents by Occupation**

Table 3 provides an overview of the occupational distribution of survey participants, categorizing them into Student, Employed (Private), Employed (Government), Homemaker, and Retired. The distribution is as follows:

Student (180), Employed (Private) (280), Employed (Government) (120), Homemaker (90), and Retired (40), with a total of 710 respondents. Understanding the diversity of occupations within the study population is essential for exploring potential correlations between professional backgrounds and attitudes or practices related to water conservation. This table serves as a foundational element for demographic profiling, enabling tailored interventions based on the occupational backgrounds of the participants.

Awareness Level	Number of Respondents
High	320
Moderate	220
Low	130
<b>Total</b>	<b>670</b>

**Table 4: Level of Awareness Regarding Water Scarcity**

Table 4 outlines the awareness levels regarding water scarcity among respondents, classifying them into High, Moderate, and Low categories. The distribution includes High (320), Moderate (220), and Low (130), totaling 670 respondents. This table offers a quick snapshot of the prevailing awareness levels within the study population. Analyzing awareness levels is crucial for designing targeted awareness campaigns, tailoring educational programs, and assessing the effectiveness of water conservation initiatives in the community.

Perception Level	Number of Respondents
Very Severe	180
Severe	250
Moderate	200
Mild	40
Not Severe at All	20
<b>Total</b>	<b>690</b>

**Table 5: Perception of the Severity of Water Scarcity in Kalaburagi**

Table 5 presents the perceptions of respondents regarding the severity of water scarcity in Kalaburagi. Categorized into Very Severe, Severe, Moderate, Mild, and Not Severe at All, the distribution is as follows: Very Severe (180), Severe (250), Moderate (200), Mild (40), and Not Severe at All (20), totaling 690 respondents. This table offers a concise overview of the diverse perceptions within the study population regarding the seriousness of water scarcity. Understanding these perceptions is instrumental for tailoring communication strategies, educational initiatives, and intervention programs to address specific concerns and align with the community's perspectives on water scarcity severity.

Water Consumption (Liters)	Number of Respondents
Less than 100	80
100-200	150
201-300	200
301-400	120
401-500	80
More than 500	40
<b>Total</b>	<b>670</b>

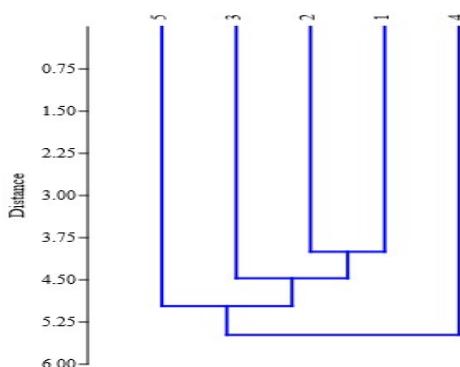
**Table 6: Average Daily Water Consumption per Household**

Table 6 outlines daily water consumption patterns in Kalaburagi households, categorizing respondents across consumption ranges. The breakdown includes Less than 100 (80), 100-200 (150), 201-300 (200), 301-400 (120), 401-500 (80), and More than 500 (40), totaling 670 respondents. This table provides a snapshot of water usage habits, crucial for understanding baseline consumption that influences overall water demand.

Water Usage Habit	Percentage of Respondents
Use of Water-Saving Devices	30.77%
Rainwater Harvesting	15.38%
Dependence on Municipal Water	25.64%
Reliance on Borewells	20.51%
Use of Recycled Water	7.69%
<b>Total</b>	<b>100%</b>

**Table 7: Water Usage Habits and Sources of Water**

Table 7 explores water habits and sources, indicating percentages of respondents involved in practices like water-saving devices (30.77%), rainwater harvesting (15.38%), dependence on municipal water (25.64%), reliance on borewells (20.51%), and using recycled water (7.69%). These insights are vital for tailoring water conservation strategies and fostering sustainable practices within the community.



**Figure 2: Hierarchical Dendrogram Illustrating Clustering Patterns in Residents' Water Conservation Perspectives**

In Fig. 7 each branch of the dendrogram represents a respondent, while the height of the connections reflects the dissimilarity in responses to environmental concerns, cost savings, community pressure, government regulations, education and awareness, and lack of awareness. This visual depiction unveils nuanced groupings, offering insights into the shared perceptions and priorities shaping water conservation attitudes among the surveyed population

Participation Level	Number of Respondents
Actively Involved	180
Participated Occasionally	250
Aware but Not Participated	120
Not Aware of Initiatives	120
<b>Total</b>	<b>670</b>

**Table 8: Participation in Community-Based Water Conservation Initiatives**

Table 8 highlights community participation in water conservation initiatives, categorizing respondents as Actively Involved (180), Participated Occasionally (250), Aware but Not Participated (120), and Not Aware of Initiatives (120), totaling 670 participants. This table offers valuable insights into the level of community engagement.

Willingness Level	Number of Respondents
Very Willing	300
Willing	220
Neutral	80
Unwilling	40
Very Unwilling	30
<b>Total</b>	<b>670</b>

**Table 9: Willingness to Adopt Water-Saving Measures**

Factors	Percentage of Respondents
Environmental Concerns	32%
Cost Savings	20%
Community Pressure	12%
Government Regulations	8%
Education and Awareness	16%
Lack of Awareness	12%
<b>Total</b>	<b>100%</b>

**Table 10: Factors Influencing Residents' Decision to Conserve Water**

Table 9 examines respondents' willingness to adopt water-saving measures, revealing levels of Very Willing (300), Willing (220), Neutral (80), Unwilling (40), and Very Unwilling (30), summing up to 670 participants. Additionally, Table 10 explores factors influencing residents' decisions to conserve water, indicating percentages for Environmental Concerns (32%), Cost Savings (20%), Community Pressure (12%), Government Regulations (8%), Education and Awareness (16%), and Lack of Awareness (12%). These findings are essential for tailoring community-focused water conservation strategies and understanding the motivating factors and barriers that shape residents' decisions.

Awareness Level	Water Conservation Practices
High	High
Moderate	Moderate
Low	Low
<b>Total</b>	<b>670</b>

**Table 11: Relationship between Awareness and Water Conservation Practices**

Table 11 illustrates the relationship between awareness levels and water conservation practices in Kalaburagi. Categorized into High, Moderate, and Low awareness levels, with corresponding water conservation practices, the table shows that out of the total 670 respondents, 450 with High Awareness predominantly exhibit High Practices.

	High Awareness	Moderate Awareness	Low Awareness	Total
High Practices	240	180	30	450
Moderate Practices	60	30	10	100
Low Practices	20	10	5	35
<b>Total</b>	<b>320</b>	<b>220</b>	<b>45</b>	<b>585</b>

**Table 12: Contingency Table for Chi-Square Test**

Table 12 provides a contingency table for a Chi-Square Test, breaking down the intersection of High Awareness with High Practices (240), Moderate Awareness with Moderate Practices (30), and Low Awareness with Low Practices (5), totaling 585 respondents. Analyzing this relationship is crucial for understanding how awareness levels influence actual water conservation behaviors within the community, providing valuable insights for targeted interventions and education programs.

#### IV. CONCLUSION

The chi-square test results indicate a significant association between awareness level and water conservation practices among residents in Kalaburagi. The observed distribution of respondents across different levels of water conservation practices (high, moderate, and low) varied significantly from what would be expected under the assumption of independence with awareness levels. Consequently, we reject the null hypothesis, suggesting that residents' awareness levels are indeed associated with their engagement in water conservation practices.

This finding underscores the importance of awareness campaigns and educational initiatives in influencing residents' behaviors toward water conservation. Tailored interventions that consider the varying levels of awareness can be more effective in promoting sustainable water practices within the community. Policymakers and community leaders may find these results instrumental in designing targeted programs to enhance water conservation efforts in Kalaburagi.

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# Study Some Integral Equations and Prefunctions via Shehu Transform

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## ABSTRACT

In this paper we study the special type of Volterra integral equations and Volterra Integro- differential equations with prefunctions. Also we obtained their solution via Shehu transform, which is a generalization of the Sumudu and Laplace transform.

**Keywords:** Prefunctions, Shehu transform, Integral equations, Laplace and Sumudu transform.

## I. INTRODUCTION

In order to solve differential equations and integral equations using several type of integral transforms. Recently researchers have been solved differential and integral equations using many integral transforms [1-11]. The Laplace transform, Sumudu transform and Fourier transforms are widely used in the literature. J. Fourier (1768-1830) is the initiator of the theory of integral equations. A term integral equation first suggested by Du Bois-Reymond in 1888. Researchers [12] have studied many integral equations with their solutions and discussed analytical and numerical methods for solving linear and nonlinear integral equations.

In 2010 Khandeparkar et al. [13-14], have defined new kind of Exponential, Hyperbolic and Trigonometric functions; they are termed as Prefunctions and extended Prefunctions. Some properties and Laplace Transforms of these functions are studied and solutions of initial value problems for non-homogeneous linear ordinary differential equations, system of Differential Equations via Laplace transform [15-16]. Dhaigude S.B. and Dhaigude C.D. [17] obtained solution of Volterra integral equations and Volterra integro- differential equations. In 2019 Shehu Maitama and Weidong Zhao [18] was introduced a new integral transform called Shehu transform which is generalization of the Sumudu and the Laplace transform in time domain. In newly research in Science and Engineering Shehu transform can be measured a stepping-stone to the natural transform, the Laplace transform, Sumudu transform and Elzaki transform.

## II. PRELIMINARIES

**Definition:-** The Shehu transform of the function  $v(t)$  of exponential order is defined on the set of functions,

$$A = \left\{ v(t) : \exists N, \mu_1, \mu_2 > 0, |v(t)| < N \exp\left(\frac{|t|}{\mu_i}\right), \text{ if } t \in (-1)^i \times [0, \infty) \right\},$$

by the following integral

$$\mathbb{S}[v(t)] = V(s, u) = \int_0^\infty \exp\left(\frac{-st}{u}\right) v(t) dt, \quad s > 0, u > 0$$

It converges if integral exist.

**Inverse Shehu transform** is defined as

$$v(t) = \mathbb{S}^{-1}[V(s, u)] = \int_{\alpha-i\infty}^{\alpha+i\infty} \frac{1}{u} \exp\left(\frac{st}{u}\right) V(s, u) ds, \quad t \geq 0$$

Where  $s$  and  $u$  are the S

hehu transform variables and  $\alpha$  is real constant and integral is taken along  $s = \alpha$  in the complex plane  $s = x + iy$ .

### Prefunctions and Extended Prefunctions:

The pre-exponential functions is denoted by  $pexp(t, \alpha)$  and is defined as,

$$pexp(t, \alpha) = 1 + \sum_{n=1}^{\infty} \frac{t^{n+\alpha}}{\Gamma(n+1+\alpha)}$$

For any real number  $t$  and  $\alpha$  being a parameter. Here  $pexp(t, \alpha)$  for each  $\alpha \geq 0$  stands for prefunction of  $(t)$ .

The Pre-trigonometric Functions (Pre-cosine function and Pre-Sine) is denoted by  $psin(t, \alpha)$ ,  $pcos(t, \alpha)$  respectively and is defined as

$$psin(t, \alpha) = \sum_{n=0}^{\infty} (-1)^n \frac{t^{2n+1+\alpha}}{\Gamma(2n+2+\alpha)}, \quad \alpha \geq 0, t \in \mathbb{R}$$

$$pcos(t, \alpha) = 1 + \sum_{n=1}^{\infty} (-1)^n \frac{t^{2n+\alpha}}{\Gamma(2n+1+\alpha)}, \quad \alpha \geq 0, t \in \mathbb{R}$$

The Extended Prefunction is defined as

$$pM_{3,2}(t, \alpha) = \sum_{n=0}^{\infty} (-1)^n \frac{t^{3n+2+\alpha}}{\Gamma(3n+3+\alpha)}, \quad \alpha \geq 0, t \in \mathbb{R}$$

### Shehu Transform of Pre-functions:

1. Shehu transform of  $pexp(t, \alpha)$  :

We know that  $pexp(t, \alpha) = 1 + \sum_{n=1}^{\infty} \frac{t^{n+\alpha}}{\Gamma(n+1+\alpha)}$ ,  $\alpha \geq 0$ ,  $t \in \mathbb{R}$

$$\mathbb{S}[pexp(at, \alpha)] = V(s, u, \alpha) = \int_0^\infty \exp\left(\frac{-st}{u}\right) pexp(at, \alpha) dt, \quad s > 0, u > 0$$

$$\begin{aligned} &= \int_0^\infty \exp\left(\frac{-st}{u}\right) \left[1 + \sum_{n=1}^{\infty} \frac{(at)^{n+\alpha}}{\Gamma(n+1+\alpha)}\right] dt \\ &= \int_0^\infty \exp\left(\frac{-st}{u}\right) dt + \sum_{n=1}^{\infty} \frac{1}{\Gamma(n+1+\alpha)} \int_0^\infty \exp\left(\frac{-st}{u}\right) (at)^{n+\alpha} dt \\ &= \frac{u}{s} + \sum_{n=1}^{\infty} \frac{1}{\Gamma(n+1+\alpha)} \frac{a^{n+\alpha} u^{n+1+\alpha} \Gamma(n+1+\alpha)}{s^{n+1+\alpha}} \\ &= \frac{u}{s} + \sum_{n=1}^{\infty} \frac{a^{n+\alpha} u^{n+1+\alpha}}{s^{n+1+\alpha}} \\ \mathbb{S}[pexp(at, \alpha)] &= \frac{u}{s} + \frac{a^{1+\alpha} u^{2+\alpha}}{(s-au)s^{1+\alpha}} \end{aligned}$$

In particular for  $a = 1$

$$\mathbb{S}[pexp(t, \alpha)] = \frac{u}{s} + \frac{u^{2+\alpha}}{(s-u)s^{1+\alpha}}$$

And also if  $\alpha = 0$

$$\mathbb{S}[pexp(t, \alpha)] = \mathbb{S}[exp(t)]$$

If  $u = 1$

$$\mathbb{S}[pexp(t, \alpha)] = L[pexp(t, \alpha)]$$

Similarly  $\mathbb{S}[pexp(-at, \alpha)] = \frac{u}{s} + \frac{(-1)^{1+\alpha} a^{1+\alpha} u^{2+\alpha}}{(s+au)s^{1+\alpha}}$

2. Shehu transform of pre-trigonometric and pre-hyperbolic functions:

- $\mathbb{S}[psin(at, \alpha)] = \frac{a^{1+\alpha} u^{2+\alpha}}{(s^2+a^2u^2)s^\alpha}$
- $\mathbb{S}[pcos(at, \alpha)] = \frac{u}{s} - \frac{a^{2+\alpha} u^{3+\alpha}}{(s^2+a^2u^2)s^{1+\alpha}}$
- $\mathbb{S}[psinh(at, \alpha)] = \frac{a^{1+\alpha} u^{2+\alpha}}{(s^2-a^2u^2)s^\alpha}$
- $\mathbb{S}[pcosh(at, \alpha)] = \frac{u}{s} + \frac{a^{2+\alpha} u^{3+\alpha}}{(s^2-a^2u^2)s^{1+\alpha}}$
- $\mathbb{S}[pM_{32}(at, \alpha)] = \frac{a^{2+\alpha} u^{3+\alpha}}{(s^3+a^3u^3)s^\alpha}$

Remark that we put  $\alpha = 0$  and  $u = 1$  in above formulas we get the Laplace transform of trigonometric and hyperbolic functions.

### Special type of Voltera integral Equations

In this section, Shehu transform method is applied and we get the closed form of numerical solutions of Voltera integral equations and Voltera integro differential equations

**Problem 1:** Consider the Voltera Integral Equation,

$$v(t, \alpha) - \int_0^t v(t, \alpha) dt = \frac{t^{1+\alpha}}{\Gamma(\alpha+1)} - t + 1 \quad (1.1)$$

Applying Shehu transform of on both sides of equation (1.1),

We get  $\mathbb{S}[v(t, \alpha)] - \mathbb{S}\left[\int_0^t v(t, \alpha) dt\right] = \mathbb{S}\left[\frac{t^{1+\alpha}}{\Gamma(\alpha+1)}\right] - \mathbb{S}[t] + \mathbb{S}[1]$

$$V(s, u, \alpha) - \frac{u}{s} V(s, u, \alpha) = \frac{1}{\Gamma(\alpha+2)} \frac{(\alpha+1)!}{s^{\alpha+2}} - \frac{u^2}{s^2} + \frac{u}{s}$$

$$V(s, u, \alpha) = \frac{u^{\alpha+2}}{s^{\alpha+1}(s-u)} + \frac{u}{s} \quad (1.2)$$

Taking inverse Shehu transform on both sides of equation (1.2), yields

$$v(t, \alpha) = \mathbb{S}^{-1}[V(s, u, \alpha)] = \mathbb{S}^{-1}\left[\frac{u^{\alpha+2}}{s^{\alpha+1}(s-u)} + \frac{u}{s}\right]$$

$$v(t, \alpha) = pexp(t, \alpha)$$

Therefore the prefunction  $v(t, \alpha) = pexp(t, \alpha)$  is the solution of Voltera integral Equation (1.1)

**Problem 2:** Consider the Voltera Integral Equations,

$$v(t, \alpha) + \int_0^t v(t, \alpha) dt = 1 + t - (-1)^\alpha \frac{t^{\alpha+1}}{\Gamma(\alpha+2)} \quad (2.1)$$

Applying Shehu transform method on both sides of Equation (2.1)

$$\mathbb{S}[v(t, \alpha)] + \mathbb{S}\left[\int_0^t v(t, \alpha) dt\right] = \mathbb{S}[1] + \mathbb{S}[t] - \mathbb{S}\left[(-1)^\alpha \frac{t^{\alpha+1}}{\Gamma(\alpha+2)}\right]$$

$$V(s, u, \alpha) + \frac{u}{s} V(s, u, \alpha) = \frac{u}{s} + \frac{u^2}{s^2} - (-1)^\alpha \frac{(\alpha+1)! u^{\alpha+2}}{\Gamma(\alpha+2)s^{\alpha+2}}$$

$$V(s, u, \alpha) = \frac{u}{s} - (-1)^\alpha \frac{u^{\alpha+2}}{(s+u)s^{\alpha+1}} \quad (2.2)$$

Taking the inverse Shehu transform on both sides of Equation (2.2), we get

$$v(t, \alpha) = pexp(-t, \alpha) \quad (2.3)$$

Hence the prefunction (2.3) is solution of Voltera integral equation (2.1)

**Problem 3:** Consider the Voltera Integro differential Equation,

$$v'(t, \alpha) + \int_0^t v(t, \alpha) dt = \frac{t^\alpha}{\Gamma(\alpha+1)} \quad (3.1)$$

$$\text{With initial condition, } v(0, \alpha) = 0 \quad (3.2)$$

Applying Shehu transform method on both sides of Equation (3.1)

$$\mathbb{S}[v'(t, \alpha)] + \mathbb{S}\left[\int_0^t v(t, \alpha) dt\right] = \mathbb{S}\left[\frac{t^\alpha}{\Gamma(\alpha+1)}\right]$$

$$\frac{s}{u}V(s, u, \alpha) - v(0, \alpha) - \frac{u}{s}V(s, u, \alpha) = \frac{(\alpha)! u^{\alpha+1}}{\Gamma(\alpha+1)s^{\alpha+1}}$$

By applying initial condition (3.2) and simplification gives that

$$V(s, u, \alpha) = \frac{u^{2+\alpha}}{(s^2-u^2)s^\alpha} \quad (3.3)$$

Now taking inverse Shehu transform on both sides of equation (3.3) it gives

$$v(t, \alpha) = p \sinh(t, \alpha)$$

Hence the prefunction  $v(t, \alpha) = p \sinh(t, \alpha)$  is the solution of equation (3.1)

### III. CONCLUSION

In this paper we have studied the special type of Voltera Integral Equations and Voltera Integrodifferential equations of prefunctions and obtain their solution in terms of prefunctions and also Shehu Transform Method is successfully applied.

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# Study of Physico-Chemical Parameters of Ausa Lake from Latur District (M.S.) India

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## ABSTRACT

An attempt has been made to study the Physico-chemical parameters of water of Ausa Lake at Latur District (M.S.) India. The time period of study was July 2023 to December 2023. Four water samples were selected from different sites in each month for study. The parameters studied were Water temperature, pH, Conductivity, Dissolved Oxygen, Alkalinity, Sulphate, Phosphate, Chlorides and Total hardness. Almost all the parameters were found below the tolerance limit. This study reveals the water quality of Ausa Lake from Latur District (M.S.) India.

**KEYWORDS:** Water quality, Ausa Lake.

## I. INTRODUCTION

The water quality from the reservoirs has a considerable importance for the reason that these water resources are generally used for multiple matters such as: drinking, domestic and residential water supplies, agriculture (irrigation), fish culture. 71% of earth surface is occupied by water (CIA, 2008), 96.5% of the world's water is marine water which is salty that is not to be directly useful for drinking, irrigation, domestic and industrial purposes. 1.7% in groundwater, 1.7% in glaciers. Less than 1% water is present in lakes, ponds, rivers, dams, etc., which is used by man for domestic, Industrial and agricultural purposes. According to an estimate about 70% of all the available water in our country is contaminated water bodies due to the discharge of effluents from industries and the domestic sewage waste. In developing countries, about 1.8 million people mostly children's die every year as a result of water related diseases (WHO, 2004).

Water pollution confronting serious problem in India as almost 70 per cent of its surface water resources and a growing percentage of its reservoirs are contaminated by biological, toxic, organic, and inorganic effluents. These resources have been rendered unhygienic for human consumption as well as for other activities, such as irrigation and industrial needs. This shows that degraded nature of water quality can contribute to water scarcity as it limits its availability for both human use and for the ecosystem. Due to growth of increasing population, agricultural usage, and industrialization, demand for domestic water has increased many times during the last few years. Improper waste disposal industrial effluents and over exploitation of resources has affected the quality, not only of tap water but also of ground water. Water pollution has many sources. The most polluting elements are the city sewage and industrial waste discharged into the rivers. The facilities to waste water treatment are not adequate in any city in India. Presently, only about 10% of the waste water is

treated; the rest is discharged as it is into our water bodies. Therefore, pollutants enter groundwater, rivers, and other water bodies. The Central Pollution Control Board monitoring results obtained during 2005 indicate that organic pollution continues to be predominant in aquatic resources.

### Physico-chemical Parameters:

The availability of good quality water is a contributing characteristic for preventing diseases and improving quality of life. It is necessary to know details about different physico-chemical parameters such as temperature, hardness, pH, sulphate, chloride, DO, alkalinity used for testing of water quality. Some physical test should be performed for testing of its physical appearance such as temperature, pH, while chemical tests should be performed for its dissolved oxygen, alkalinity, hardness, chlorides, sulphate and phosphate.

## II. MATERIAL AND METHOD

Water samples were collected in previously cleaned polythene bottles. Water samples were collected during July 2023 to December 2023 from 4 stations decided in the reservoir in the morning (9.00 to 10.00 a.m.). Temperature and pH of water samples were measured in the field immediately after collection with help of thermometer and pH meter. Other physico-chemical parameters were analyzed in the laboratory and all other parameters were analyzed by titration methods outlined in standard methods (APHA 1995, 2012).

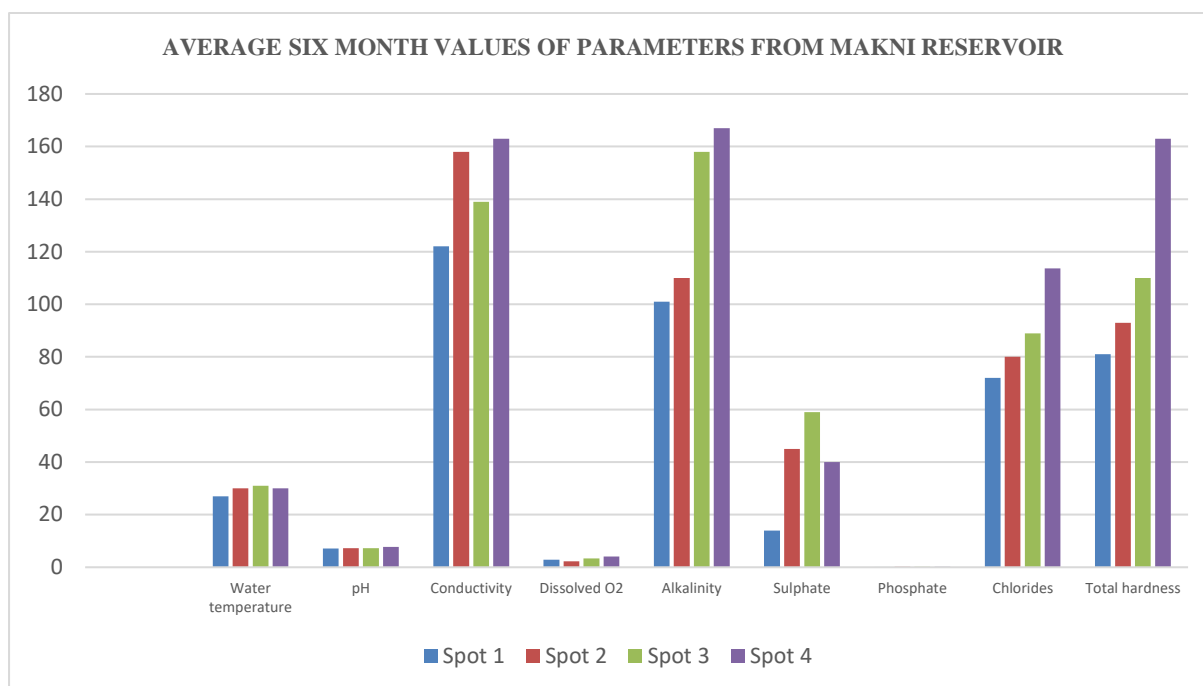
## III. RESULT AND DISCUSSION

The average six-month values from July 2023 to December 2023 values of every months physico-chemical characteristics are given in the table1.

Table 1. The average six-month values from July 2023 to December 2023					
Parameters	Units	Spot 1	Spot 2	Spot 3	Spot 4
Water temperature	°C	27°C	30°C	31°C	30°C
pH	-	7.3	7.1	7.2	7.6
Conductivity	µmhos/cm	122	158	139	163
Dissolved O <sub>2</sub>	Mg/ litre	2.7	2.1	3.1	4.6
Alkalinity	Mg/ litre	102	108	148	153
Sulphate	Mg/ litre	15	34	48	38
Phosphate	Mg/ litre	0.10	0.11	0.19	0.21
Chlorides	Mg/ litre	68	77	82	109.3
Total hardness	Mg/ litre	79	91	106	151

**Table 1:** showing the average six-month values from July 2023 to December 2023 in mg/litre values of physico-chemical parameters from AUSA Lake





**Graph 1. Showing the six-month values of physico-chemical parameters (July 2023 to December 2023) from Ausa Lake**



**Fig.1 Ausa Lake from Latur district (MS)**

The six-month survey (July 2023 to December 2023) has shown that physicochemical parameters of Ausa Lake from Latur district (MS) India shows wide range of results.

These are as follows

**Temperature:** It is mainly related with atmosphere and weather conditions. Temperature is basically important for its effects on certain chemical and biological activities in organisms. Temperature is in the range from 27°C to 31°C. Lowest temperature is at Spot 1 is 27°C and highest value is recorded at Spot 3 is 31°C. Temperature effects the seasonal and diurnal variation. It controls the rate of all biochemical and biological reactions including growth, multiplication, mineralization, decay, production etc. Temperature is recorded with the help of maximum minimum thermometer. Similarly, results have been reported by Jawale, A.K and S.A. Patil, (2009).

**pH:** It is determined with the help of pH meter. The pH values ranged from 7.1 to 7.6. This indicates the basic nature of water samples. pH is used to express the intensity of acidic or alkaline conditions. It is the appearance of hydrogen ion concentration, more precisely, the hydrogen ion activity. pH is a parameter important in assessing the water quality. Acidic conditions will increase as pH value decreases and alkaline conditions will increase as the pH value increases.

**Electrical conductivity:** water quality is measured by the method of electrical conductivity. As the salt is more conducive of electricity and if there is more amount of salt in a fixed volume of water the electrical conductivity of the water will be more in comparison to less saline water. It is a useful parameter to assess the purity of water. Electrical conductivity measures between 122 to 163  $\mu\text{mhos/cm}$ . Shrivastava and Kanungo (2013) were recorded the EC in between 115 to 212.13  $\mu\text{mhos/cm}$ .

**Dissolved Oxygen (DO):** It is one of the important parameters in water quality assessment. It shows the physical and biological processes prevailing in the water. Non polluted water is generally saturated with DO. The DO ranges from 2.1 to 4.6 mg/L. Dissolved oxygen is an important parameter that determines the quality of water in rivers and reservoirs. The higher concentration of dissolved oxygen, provide better water quality.

**Total Alkalinity:** Bicarbonate alkalinity together with carbonate alkalinity are called total alkalinity. Alkalinity, pH and hardness affect the toxicity of many substances in the water. It is determined by simple dilute HCl titration in presence of phenolphthalein and methyl orange indicators. Alkalinity of water is its acid neutralizing capacity. The alkalinity of groundwater is mainly due to carbonates and bicarbonates. The acceptable limit of alkalinity is 200 mg/l and in the absence of alternate water source, alkalinity up to 600 mg/l is acceptable for drinking which measures between 102 to 153.

**Sulphate and Phosphates:** The result of sulphate in the dam water was high (15- 48 mg/L). The source of sulphate may be from mineral rocks and fertilizers. The phosphate content of reservoir water was found in range of 0.10 to 0.21 mg/L. Phosphate led to eutrophication which could also lead to unpleasant taste and odor. The presence of heavy metals in drinking water higher than a certain concentration can cause detrimental impacts on human health.

**Chloride:** Chlorides are practically found in all-natural water. This is the most common inorganic anion present in water. Man, and animal excrete have high quantities of chloride. Also salts present in soil are the sources of chloride. Chloride content of water samples was 68 to 109.3 mg/L. According to WHO maximum permissible limit for Chloride is 500 mg/l. the value observed in present study are well below the permissible limit

**Total Hardness (TH):** In groundwater hardness is mainly contributed by bicarbonates, carbonates, sulphates and chlorides of calcium and magnesium. So, the principal hardness causing ions are calcium and magnesium. It is measured by titration method by standardized EDTA sol. using Erichrome black T as indicator. In most of the fresh water it is important mainly by calcium and magnesium ions found in combination carbonate and bicarbonates. In the present study TH were found to be 79 to 151 mg/L. Hardness is more than 20 mg / L is satisfactory for the aquatic productivity and helps to protect fishes against harmful effects. Similar findings were reported by Muley and Patil, (2006). Mishra *et al* (2014) reported the total hardness 146 to 268 mg/ liters in Varanasi pond.

#### IV. CONCLUSION

After the analysis of data, the present study can be concluded that the effects of water pollution are not only devastating to people but also to animals, fish, and birds also destroys aquatic life and reduces its reproductive

ability. Contaminated water is unsuitable for drinking, recreation, agriculture, and industry. It reduces the aesthetic quality of reservoirs and lakes. Eventually, it is a hazard to human health. To minimize the pollution in drinking water we can use modern technologies such as reverse osmosis and ozonation in large scale, which are effective in the Comparison of present study parameter values with the permissible limits prescribed by Indian Standards and WHO provides the conclusion that the water of AUSA Lake is useful for water domestic supply. But some parameters giving alarm for protection of water from pollution it may be used for drinking purpose for long time.

The present study was undertaken to account to bring an acute awareness among the people about the quality of water. Reservoir water also suitable to use for fish culture. The individual and the community can help minimize water pollution by simple housekeeping and management practices the amount of waste generated can be minimized.

## V. ACKNOWLEDGMENTS

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# Study on Solvent Effect by TOPSIS Method in Oxidation of Aliphatic Alcohol

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## ABSTRACT

In this article, the oxidation of aliphatic alcohol with benzimidazolium fluorochromate (BIFC), piridinium chlorochromate (PCC), bipyridinium chlorochromate (BPCC), imidazolium fluorochromate (IFC), quinolinium fluorochromate (QFC) carried out in different solvents like dicloroethane (DCE), acetone, dimethyl sulfoxide (DMSO), dimethyl formide (DMF), dichloromethane (DCM), chloroform (CF) at temperature 308 K. we analysed the solvent effect and found the decreasing order sequence of solvents for fast reaction by using the technique for order of preferences by similarity to ideal solution (TOPSIS) method.

**Keywords:** - Solvent effect, oxidation, TOPSIS, Aliphatic alcohols

## I. INTRODUCTION

In the oxidation of organic compounds with reagent there are Chromium Cr(VI) reagents most commonly used as a oxidant. Many Chromium Cr (VI) containing reagents have been used for the oxidation of various organic substrates [1-5]. Many researchers has been reported the oxidation of aliphatic aldehydes and aromatic aldehydes by, QBC [6], BPCC [7], MCC [8], IFC [9], TEACC [10], PFC [11], BPSP [12], BTEACC [13], PBC [14], PFC [15], PBC [16], QBC [17], BPCC [18], PCC [19], BTEACC [20], QFC[21], MCC [22], BIFC [23], IFC [24] QCC [25], TEACC [26] and TPSD [27, 28] in the solvent DMSO. The technique for order of preferences by similarity to ideal solution (TOPSIS) method is a broadly useful numerical technique in multi- criteria decision making problems. TOPSIS method was originally introduced by Hwang and Yoon [30], and further developed by Yoon [31]. Hwang *et.al.* [32], also published a modified new approach for decision making problems under multi objectives. In this article, we have studied kinetic aspect of the oxidation of aliphatic alcohol with imidazolium fluorochromate (IFC) [33], quinolinium fluorochromate (QFC) [34], benzimidazolium fluorochromate (BIFC) [35], piridinium chlorochromate (PCC) [36], bipyridinium chlorochromate (BPCC) [37] carried out in different solvents like dicloroethane (DCE), acetone, dimethyl sulfoxide (DMSO), dimethyl formide (DMF), dichloromethane (DCM), chloroform (CF) at temperature 308 K. and suitable solvent is selected for the different alternatives.

## II. MATERIALS AND METHODS

**Materials:** The aliphatic alcohol is commercial product and is used as supplied. BIFC [29], BPCC [7], PCC [19], IFC [24] and QFC [21] are prepared by the stated methods and purity is studied by iodometric method. Solvents are purified by the standard methods of purification [32].

### Measurements:

The reactions have been set up to occur under pseudo-first-order conditions by keeping an excess ( $\times 10$  or greater) of the substrate over the oxidant. The reactions are carried out at a constant temperature 308K. The required amount of substrate, solvent, etc. is combined to create the reaction mixture, which is then left in a thermostatic bath for the amount of time necessary for the solution to reach the bath's temperature. The reaction started by adding a solution of the oxidant, which had been previously equilibrated in the thermostat by means of a pipette. To mix the solution, the reaction flask was vigorously whirled. The reactions are tracked by spectro-photometrically measuring the decrease in [oxidant].

### Result and Discussion by using TOPSIS Method

The study of solvent effect on oxidation is an important concept in Physical Organic chemistry. The TOPSIS method is very useful in multiple criteria decision making problem. The rate constants ( $10^4 k_2 s^{-1}$ ) of oxidation of aliphatic alcohols by five reagents BIFC, BPCC, PCC, IFC and QFC in different solvents like dichloroethane (DCE), acetone, dimethyl sulfoxide (DMSO), dimethyl formide (DMF), dichloromethane (DCM), chloroform (CF) at temperature 308 K.

**Table-1. Decision Matrix of rate constants ( $10^4 k_2 s^{-1}$ ) for the Oxidation of Aliphatic alcohol by the oxidants BIFC, BPCC, PCC, IFC and QFC at 308 K.**

Reagent Solvent	IFC	QFC	BIFC	PCC	BPCC
DCE	5.1	70.9	36.1	13.8	35.8
DMSO	6.2	151.1	75.2	26.8	76.1
DMF	5.5	132.0	65.9	22.4	65.1
DCM	4.9	92.1	46.1	15.9	45.9
CF	5.7	79.8	40.9	12.5	41.0

**Step-1.** The normalized value  $y_{ij}$  is calculated as

$$y_{ij} = x_{ij} / \sqrt{\sum_{i=1}^m x_{ij}^2}, \quad i = 1, 2, \dots, m, \quad j = 1, 2, \dots, n$$

We obtained the normalized value matrix as follows:

**Table-2. Normalized value Matrix of rate constants ( $10^4 k_2 s^{-1}$ ) for the Oxidation of Aliphatic alcohol by the oxidants BIFC, BPCC, PCC, IFC and QFC at 308 K.**

Reagent Solvent	IFC	QFC	BIFC	PCC	BPCC
DCE	0.4148	0.2891	0.2938	0.3235	0.2914
DMSO	0.5042	0.6162	0.6120	0.6283	0.6193
DMF	0.4473	0.5383	0.5363	0.5251	0.5298
DCM	0.3985	0.3756	0.3752	0.3728	0.3736
CF	0.4636	0.3254	0.3328	0.2931	0.3337

**Step-2.** The weighted normalized value  $W_{ij}$  is calculated as

$$W_{ij} = y_{ij} * W_j, \quad i = 1, 2, \dots, m, \quad j = 1, 2, \dots, n$$

Where  $W_j$  is weight of the  $j^{\text{th}}$  attribute or criterion and  $\sum_{j=1}^n W_j = 1$

Now we obtained the weighted normalized value matrix for assigning equal weight for each criterion as follows:

**Table-3. Weighted Normalized value Matrix of rate constants ( $10^4 k_2 s^{-1}$ ) for the Oxidation of Aliphatic alcohol by the oxidants BIFC, BPCC, PCC, IFC and QFC at 308 K.**

Reagent Solvent	IFC	QFC	BIFC	PCC	BPCC
DCE	0.0830	0.0578	0.0588	0.0647	0.0583
DMSO	0.1008	0.1233	0.1224	0.1257	0.1239
DMF	0.0895	0.1077	0.1073	0.1050	0.1060
DCM	0.0797	0.0752	0.0751	0.0746	0.0747
CF	0.0927	0.0651	0.0666	0.0586	0.0667

**Step-3.** Now we calculate positive ideal solution (PIS) ( $A_+$ ) and Negative ideal solution (NIS) ( $A_-$ )

$$PIS = A_+ = \{W_1^+, W_2^+, W_3^+, \dots, W_j^+\}$$

$$\text{Where } W_j^+ = \left\{ \left( \max_i \frac{W_{ij}}{j \in J} \right), \left( \min_i \frac{W_{ij}}{j \in J'} \right) \right\}$$

$$NIS = A_- = \{W_1^-, W_2^-, W_3^-, \dots, W_j^-\}$$

$$\text{Where } W_j^- = \left\{ \left( \min_i \frac{W_{ij}}{j \in J} \right), \left( \max_i \frac{W_{ij}}{j \in J'} \right) \right\}$$

Where  $J = \text{Beneficial Attribute}$ ,  $J' = \text{Nonbeneficial Attribute}$

**Table 4. Positive ideal solution (PIS)  $A_+$**

Reagent Solvent	IFC	QFC	BIFC	PCC	BPCC
DCE	0.0830	0.0578	0.0588	0.0647	0.0583
DMSO	0.1008	0.1233	0.1224	0.1257	0.1239
DMF	0.0895	0.1077	0.1073	0.1050	0.1060
DCM	0.0797	0.0752	0.0751	0.0746	0.0747
CF	0.0927	0.0651	0.0666	0.0586	0.0667

Therefore, the Positive ideal solution

$$PIS = A_+ = \{0.1008, 0.1233, 0.1224, 0.1257, 0.1239\}$$

Table 5. Nigative ideal solution (NIS) $A_-$ 

Reagent Solvent	IFC	QFC	BIFC	PCC	BPCC
DCE	0.0830	0.0578= $W_2^-$	0.0588 $W_3^-$	0.0647	0.0583 $W_5^-$
DMSO	0.1008	0.1233	0.1224	0.1257	0.1239
DMF	0.0895	0.1077	0.1073	0.1050	0.1060
DCM	0.0797 $W_1^-$	0.0752	0.0751	0.0746	0.0747
CF	0.0927	0.0651	0.0666	0.0586 $W_4^-$	0.0667

Therefore, the Negative ideal solution

$$NIS = A_- = \{0.0797, 0.0578, 0.0588, 0.0586, 0.0583\}$$

**Step 4:-** Calculate the Separation measures from PIS and NIS of each alternatives by using Euclidean distance formula.

$$S_i^+ = \sqrt{\sum_{j=1}^n (W_j^+ - W_{ij})^2}, \quad i = 1, 2, 3, \dots, m$$

$$S_i^+ = [0.1112, 0.0, 0.03205, 0.85728, 0.10517]$$

$$S_i^- = \sqrt{\sum_{j=1}^n (W_j^- - W_{ij})^2}, \quad i = 1, 2, 3, \dots, m$$

$$S_i^- = [0.0069, 0.1152, 0.0842, 0.0286, 0.0168]$$

**Step 5:-** Computation of the Relative closeness to the ideal solution defined as:

$$C_i^+ = \frac{S_i^-}{S_i^+ + S_i^-}, \quad i = 1, 2, 3, 4, 5$$

Hence we get the relative closeness to the ideal solution as

$$C_1^+ = 0.0585$$

$$C_2^+ = 1.0000$$

$$C_3^+ = 0.7243$$

$$C_4^+ = 0.2468$$

$$C_5^+ = 0.1379$$

Table 6. Rank of preference order for selection of solvents

Solvent	$C_i^+$	Rank Preference
DCE	0.0585	5
DMSO	1.0000	1
DMF	0.7243	2
DCM	0.2468	3
CF	0.1379	4

Fig. 1 and 2. Graphical analysis of rate constants for the oxidation of aliphatic alcohol by different oxidants at 308 K.

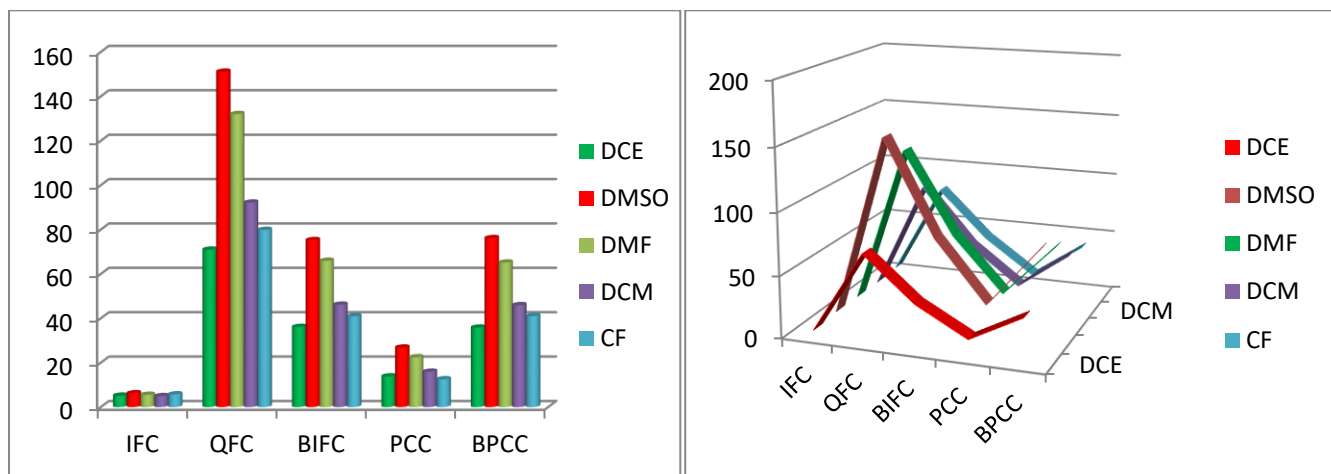


Fig. 3 and 4. Graphical analysis for normalization of rate constants ( $10^4 k_2 s^{-1}$ ) for the oxidation of aliphatic alcohol by different oxidants at 308 K.

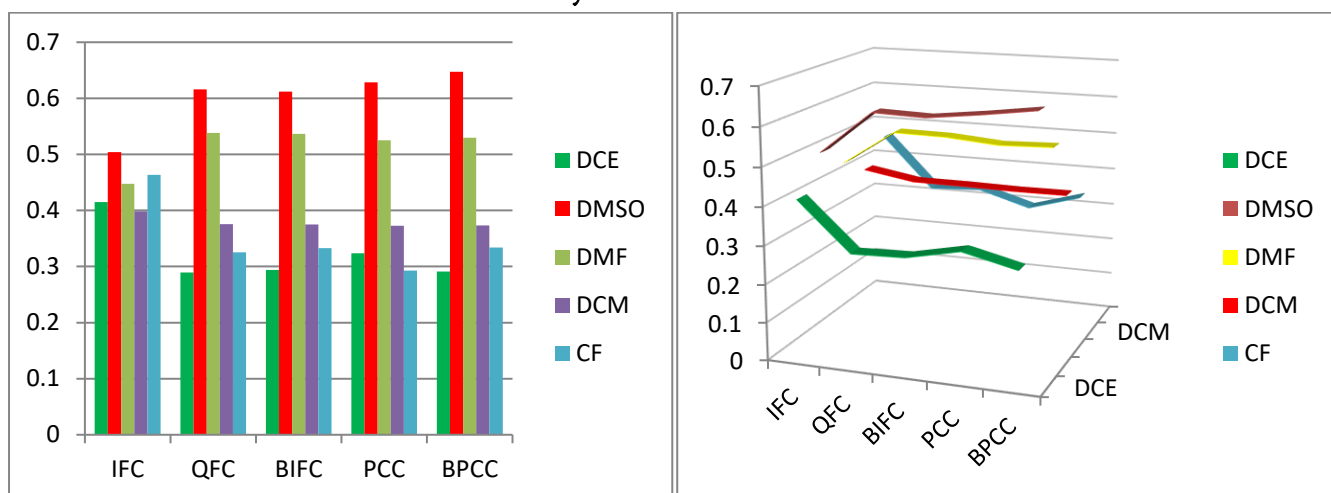
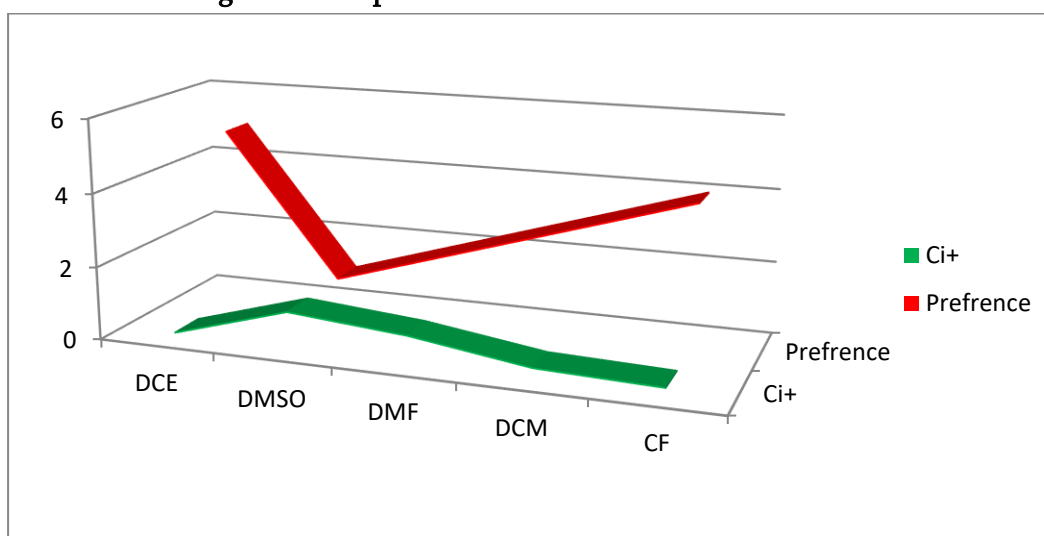


Fig.5. Rank of preference order for selection of solvents





### III.CONCLUSION

Solvent effect is one of the important concepts in kinetic study of oxidation reaction. In this paper we discuss the application of TOPSIS method for the selection of the most suitable solvent for the oxidation of oxidant by using hypothetical data. We have examined that the DMSO is the most suitable solvent for the oxidation of aliphatic alcohols with given oxidant according to the above mentioned parameters.

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# Synthesis of $\alpha$ -Aminophosphonates and their Antioxidant Properties

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## ABSTRACT

A range of  $\alpha$ -aminophosphonates was produced through the reaction of aldehydes, (1) aniline (2) and dimethylphosphite (3) facilitated by TMSCN, and their antioxidant capabilities were assessed in terms of H<sub>2</sub>O<sub>2</sub> activities. Most of these compounds demonstrated significant antioxidant potential. Among them, Dimethyl ((3-nitrophenyl)(phenyl amino) methyl) phosphonates(4f) emerged as the most effective and biologically active molecule in combating free radicals.

**Keywords-**  $\alpha$ -Antioxidant activity,  $\alpha$ -aminophosphonates, TMSCN

## I. INTRODUCTION

Free radicals play a crucial role in biochemical processes, essential for aerobic life and metabolic functions. In recent years, there has been increasing interest in free radicals and related oxygen species [1]. These radicals primarily originate from reactive oxygen and nitrogen species (ROS and RNS), generated in living organisms through a variety of enzymatic and non-enzymatic reactions, including those involved in the respiratory chain, phagocytosis, prostaglandin synthesis, the cytochrome P<sub>450</sub> system, and oxidative phosphorylation within mitochondria [2]. Oxygen free radicals pose a threat to the integrity of vital tissues, contributing to toxicity and damage. The damage mechanism includes lipid peroxidation, which compromises the structural integrity of cells, affecting lipids, proteins, and nucleic acids [3].

When lipids interact with free radicals, they can initiate the highly destructive chain reaction known as lipid peroxidation, resulting in both direct and indirect damage [4]. Understanding the fundamental biomedical science behind the role of free radicals in inducing cellular pathologies, along with the protective role of antioxidants, reveals that an imbalance between ROS and the antioxidant defense mechanisms can cause chemical alterations in critical biological macromolecules.

Antioxidants are compounds that neutralize reactive oxygen species (ROS)/free radicals or their harmful effects [5]. These include enzymatic antioxidants like superoxide dismutase (SOD) and catalase, as well as non-enzymatic ones such as glutathione, vitamin E, and vitamin C, alongside synthetic and dietary elements. Epidemiological studies have linked a higher consumption of antioxidant-rich foods with a reduced risk of various diseases and mortality [5]. With this background, our study focuses on assessing the impact of the synthesized compounds on NADPH-dependent lipid peroxidation and its underlying mechanism.

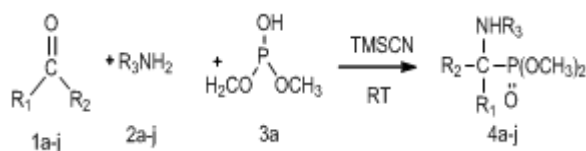
The  $\alpha$ -amino phosphonates and  $\alpha$ -amino acids have recently gained significant attention due to their potential as peptide mimics, enzyme inhibitors, [6] antibacterial agents, and pharmaceutical compounds[7]. Various synthetic techniques have been developed over the past two decades to efficiently produce  $\alpha$ -amino phosphonates [8]. One such method involves the nucleophilic addition of phosphites to imines catalyzed by bases or acids. Several Lewis acids, including  $\text{SnCl}_2$ ,  $\text{SnCl}_4$ ,  $\text{BF}_3\text{-Et}_2\text{O}$ ,  $\text{ZnCl}_2$ , and others, have been utilized in these processes [9-12]. However, traditional methods may not be suitable for one-pot reactions due to the degradation or inactivation of Lewis acids by the water produced during imine formation [13-16]. A technique combining magnesium sulphate and lanthanide triflate has been developed to address this limitation [17-20]. While effective for reactions involving aromatic aldehydes and amines, its performance with Ketones remains unexplored. Additionally, the yields of  $\alpha$ -amino phosphonates from aliphatic aldehydes and amines are typically moderate [21-24]. Therefore, an efficient method is needed for the synthesis of  $\alpha$ -amino phosphonates from both aldehydes and Ketones. TMSCN has emerged as a promising particularly in aqueous media. We hypothesized that TMSCN would be an ideal for a one-pot synthesis of  $\alpha$ -amino phosphonates using a carbonyl compound, amine, and dimethylphosphite[25-27]. Our experimental results, detailed in Table 1, demonstrate the effectiveness of this process for both aldehydes and Ketones, yielding the desired  $\alpha$ -amino phosphonates in high yields across a wide range of structurally diverse carbonyl compounds. Aldehydes showed greater reactivity compared to Ketones, and conjugated aldehydes presented no challenges in the reaction.

## II. EXPERIMENTAL PROCEDURE

A mixture of benzaldehyde (50 mg, 0.5 mmol), aniline (32 mg, 0.5 mmol), and diethyl phosphite (32 mg, 0.3 mmol) was added to a solution of TMSCN (15 ml, 0.3 mmol), and the mixture was stirred at room temperature. The reaction mixture was then diluted with water and extracted with diethyl ether. The ether extract, after being washed with brine and dried over sodium sulphate, was evaporated to leave the crude product, which was purified by column chromatography over silica gel to provide pure amino phosphonates (150 mg, 95%). The  $^1\text{H}$  and  $^{13}\text{C}$  NMR spectra of this compound are identical with those reported.

**Table 1. Synthesis of  $\alpha$ -Amino Phosphonates from Aldehydes/Ketones and Amines Catalysed**

Entry	R1	R2	R3	Time(min)RT	Yield %
4a	Ph	H	Ph	18	95
4b	Ph	H	PhCH <sub>2</sub>	25	95
4c	Ph	H	PhCHMe	30	92
4d	Ph	H	Cyclohexane	30	92
4e	Ph	H	MeCH <sub>2</sub> CH <sub>2</sub>	28	83
4f	-C <sub>6</sub> H <sub>4</sub> -NO <sub>2</sub>	H	Ph	28	89
4g	-C <sub>6</sub> H <sub>4</sub> -OH	H	Ph	40	92
4h	-C <sub>6</sub> H <sub>4</sub> -OCH <sub>3</sub>	H	Ph	32	88
4i	Me <sub>2</sub> CH	H	Ph	28	87
4j	Et	Et	PhCH <sub>2</sub>	38	90



Scheme1

### III. BIOLOGICAL ACTIVITY

#### *Hydrogen peroxide scavenging assay*

The hydrogen peroxide ( $\text{H}_2\text{O}_2$ ) radical scavenging activity of the synthesized compounds 4(a–j) was evaluated using the  $\text{H}_2\text{O}_2$  method [24]. A hydrogen peroxide solution (40 mM) was prepared in a phosphate buffer (pH 7.4 to 7.6), and to this, 100 mg/mL of each test compound in 3.8 ml of phosphate buffer was added, followed by 0.6 ml of the  $\text{H}_2\text{O}_2$  solution. The mixtures were incubated for half minutes in the dark, with occasional shaking. Absorbance readings for the test samples and a control (phosphate buffer without  $\text{H}_2\text{O}_2$ ) were taken at 240 nm using a UV spectrophotometer. Ascorbic acid served as the control standard. The formula for calculating the percentage of  $\text{H}_2\text{O}_2$  radical scavenging activity was provided [24].

$$\% \text{ of } \text{H}_2\text{O}_2 \text{ Inhibition} = \frac{\text{Abs}_{\text{control}} - \text{Abs}_{\text{sample}}}{\text{Abs}_{\text{control}}} \times 100$$

Where  $\text{Abs}_{\text{control}}$  was the absorbance of the standard  $\text{H}_2\text{O}_2$ ;  $\text{Abs}_{\text{sample}}$  was the absorbance in the presence of the sample and standard  $\text{H}_2\text{O}_2$ .

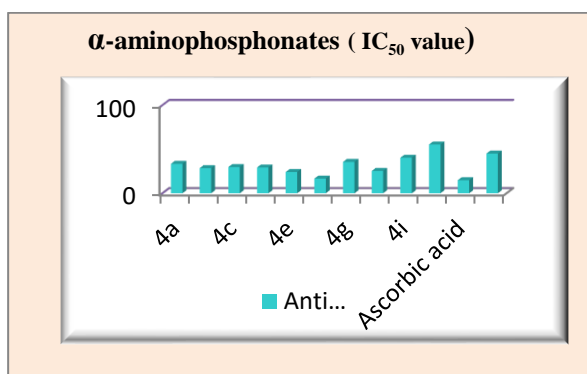


Chart 1-Antioxidant nature of structural analogs of  $\alpha$ -aminophosphonic acids ( $\text{IC}_{50}$  value) (4a–4j)  $\text{H}_2\text{O}_2$  assay

#### *Antioxidant activity analysis*

All the newly synthesized compounds 4(a–j) were evaluated for their antioxidant activity  $\text{H}_2\text{O}_2$  method at different concentrations 25, 50, 75 and 100 mg/mL. In  $\text{H}_2\text{O}_2$  methods, the compounds 4e, 4f, and 4h emerged to display promising antioxidant activities. In incorporation of different substituted aldehydes containing electron-withdrawing groups such as nitro (4f), hydroxyl (4g) substitutions on phosphonates group and aromatic ring moieties, exhibited significant potency. The experiments were evaluated in triplicate and mean values were summarized in chart1.

### IV. SPECTRAL ANALYSIS

**Dimethyl(phenyl)(phenylamino)methyl phosphonates (4a):**  $^1\text{H-NMR}$ (400 MHz, DMSO):  $\delta$  1.12(t, 3H), , 1.3(t, 3H), 2.34(s, 3H, Ar-CH<sub>3</sub>), 3.63–3.69 (m, 1H), 3.91–3.97 (m, 1H), 4.09–4.15 (m, 2H), 4.73 (d, J = 25.2 Hz, 1H, HC-P), 4.8 (br, 1H, NH), 6.61 (d, J = 7.2 Hz, 2H), 6.7 (t, J = 7.2 Hz, 1H, Ar-H), 7.07–7.14 (m, 3H, Ar-H), 7.22–

7.29 (m, 3H, Ar- H) ppm;  $^{13}\text{C}$ -NMR (100 MHz, DMSO):  $\delta$  16.21(d, 3), 16.46 (d, 3), 21.5, 56 (d), 63.2 (d, 2), 63.3 (d, 2), 113.5, 113.8, 118.3, 125, 128.5, 128.8, 129.2, 135.8, 138.2, 146.5(d,) ppm.

**dimethyl((3-nitrophenyl)(phenylamino) methyl) phosphonates** (4f):  $^1\text{H}$  NMR (500 MHz, DMSO):  $\delta$  1.33(t, 3H,) 3.93(m, 1H), 4.06(m, 1H), 4.17(m, 2H), 4.87(d, 1H), 6.59(d, 2H, J=7.6Hz), 6.76 (s, 1H), 7.13-7.15(m, 2H), 7.55 (d, 1H, J=7.6Hz), 7.85 (d, 1H, J=7.6Hz), 8.15-8.18(m, 1H), 8.37(d, 1H, J=2.0Hz);  $^{13}\text{C}$  NMR (100MHz, DMSO):  $\delta$  16.4(d, 1C, J=5.6Hz), 54.9(s, 1C), 56.4(s, 1C), 63.3(q, 1C, J=7.1Hz), 113.8(s, 2C), 119.1(s, 1C), 122.8(t, 1C, J=12.0Hz), 129.4(s, 2C), 129.6(s, 1C), 133.8(d, 1C, J=4.8Hz), 138.8(s, 1C), 145.5(s, 1C), 145.7(s, 1C), 148.5(s, 1C).

**dimethyl((3-methoxyphenyl)(phenyl amino)methyl) phosphonates** (4h):  $^1\text{H}$  NMR (500 MHz, DMSO): 1.31(t, 3H), 3.72-3.77(m, 1H), 3.81(s, 3H), 3.95-3.99(m, 1H), 4.11-4.17(m, 2H), 4.75(d, 1H), 6.62(dd, 2H, J=8.4Hz), 6.70-6.74(m, 1H), 6.82-6.85(m, 1H), 7.05-7.15(m, 4H), 7.25(d, 2H, J=7.6Hz);  $^{13}\text{C}$  NMR (100MHz, CDCl<sub>3</sub>): 16.4.(s) 55.2(s, 1C), 55.4(s, 1C), 56.9(s, 1C), 63.3(t, 1C, J=6.3Hz), 113.4(q, 2C, J=4.4Hz), 113.9(s, 1C), 118.4(s, 1C), 120.2(d, 1C, J=5.4Hz), 129.2(s, 1C), 129.6(s, 2C), 137.6(s, 1C), 146.3(s, 1C), 146.4(s, 1C), 159.8(s, 1C).

**dimethyl(3-(benzylamino)pentan-3-yl) phosphonates** (4i):  $^1\text{H}$  NMR (500 MHz, DMSO):  $\delta$  1.30(s, 6H,), 3.67-3.73(t, 6H), 3.88-3.92(m, 6H), 3.94-3.97(m, 1H), 4.10-4.16(m, 2H), 4.71(d, 1H), 6.55(d, 2H, J=8.8Hz), 7.37 (d, 2H, J=8.8Hz), 7.30(s, 1H), 7.33(t, 2H, J=7.2Hz), 7.39(t, 2H, J=7.2Hz);  $^{13}\text{C}$  NMR (100MHz, DMSO):  $\delta$  16.3(d, 1C, J=5.8Hz), 16.4(d, 1C, J=5.6Hz), 50.9(s, 1C), 52.2(s, 1C), 55.7(s, 1C), 63.3(q, 1C, J=6.8Hz), 108.8(d, 2C, J=7.1Hz), 110.8(s, 2C), 128.3.7(s, 2C), 128.6(s, 1C), 141.0(d, 1C, J=14.2Hz), 142.4(d, 1C, J=2.9Hz), 149.6(s, 1C), 153.1(s, 1C).

**dimethyl-(1-(benzylamino)-1-phenyl propyl) phosphonates** (4j):  $^1\text{H}$  NMR (500 MHz, DMSO):  $\delta$  1.15(T, 3H,), 1.27(t, 3H), 3.88-3.92(m, 6H), 1.90(m, 3H), 4.10-4.16(m, 6H), 4.71(d, 1H), 6.55(d, 4H, J=8.8Hz), 7.37 (d, 4H, J=8.8Hz), 7.30(s, 1H), 7.33(t, 1H, J=7.2Hz), 7.39(t, 2H, J=7.2Hz);  $^{13}\text{C}$  NMR (100MHz, DMSO):  $\delta$  16.3(d, 1C, J=5.8Hz), 16.9(d, 1C, J=5.6Hz), 4606(s, 1C), 52.2(s, 1C), 55.7(s, 1C), 63.3(q, 1C, J=6.8Hz), 108.8(d, 2C, J=7.1Hz), 110.8(s, 2C), 128.3.7(s, 2C), 128.6(s, 2C), 131.0(d, 2C, J=14.2Hz), 142.4(d, 2C, J=2.9Hz), 149.6(s, 1C), 153.1(s, 1C).

## V. CONCLUSION

Finally, the current method utilising TMSCN offers an effective one-pot synthesis of  $\alpha$  -amino phosphonates from the reaction of a carbonyl molecule, amine, and dimethylphosphite. reaction conditions tolerant of a variety of sensitive functional groups; and excellent yields. The existing methods for the synthesis of  $\alpha$  -amino phosphonates, in our opinion, will be replaced by this as a superior and more useful option. Consequently, the current study can be valuable to researchers for further exploration of new antioxidant agents which could be an important application in the field of phosphorus chemistry.

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# Hazardous Effect of Agricultural Chemical Waste (Pesticide) On Human Health

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## ABSTRACT

Indian farmers apply massive amounts of dangerous chemical pesticides, Insecticides, and herbicides to crops every year. Any components that are left over are regarded as hazardous wastes, and many of these compound's leak into the groundwater and soil. Throughout the world, pesticides are frequently employed in agriculture to eradicate pests and boost food production. In addition, they provide home, forestry, and public health functions. India is one of the biggest producers of pesticides, and the country's usage is rising yearly. The application of pesticides without a specific purpose kills the intended pests as well as non-target creatures, and the environment, including the water, soil, air, and plants, and it contaminates food, including fruits, vegetables, fish, prawns, and more. This demonstrates the extent to which pesticides affect both the environment and human health. Exposure to pesticides has been connected to neurotoxicity and neurological illnesses, as well as diseases like cancer.

**Key Words:** Pesticides, Insecticides, herbicides, Human Health, Pollution.

## I. INTRODUCTION

Chemicals called pesticides are applied to control pests. Among them are fungicides, nematocides, herbicides, insecticides, and many more. Herbicides are the most widely used type of these, making up almost half of all pesticide applications worldwide. The majority of pesticides are employed as plant protection treatments, which typically shield plants from insects, weeds, and fungi. Generally speaking, a pesticide is any chemical or biological agent that discourages, kills, incapacitates, or deters pests in some other way. Insects, plant diseases, weeds, mollusks, fish, birds, animals, roundworms, and microorganisms that cause property damage can all be considered target pests. Inorganic chemicals and plant extracts were the insecticides of choice from the time of Ancient India until the 1950s. The plant extracts included pyrethrum, nicotine, and rotenone, among other things, and the inorganic compounds included derivatives of copper, arsenic, mercury, Sulphur, and other elements. Organic farming still uses the less hazardous of these. Since their introduction in the 1940s, synthetic insecticides—a diverse class of biologically active substances—have grown to be essential, often utilized tools in the fight against infectious illnesses and pests. Growing worry has been expressed in recent years about pesticides' possible impacts on human health, wildlife, and delicate ecosystems, as well as their ability to pose a risk to the general public through residues in the food chain and supplies. The human body can absorb pesticides through four typical pathways: the dermal, oral, eye, and respiratory systems. Pesticide toxicity can

vary depending on the type of contact, such as oral, respiratory, or cutaneous. As might be predicted, the risks associated with pesticide pollution generally increase with dosage and time, without considering the potentially harmful properties of specific compounds. Pesticide exposure can occur naturally through domestic chores and work-related activities, but it can also be spread through diet.

Research suggests that pesticides may be linked to a variety of diseases, including asthma and leukemia malignancies. The potential for health hazards resulting from pesticide exposure is contingent upon the toxicity of the ingredients and the extent of exposure. Pesticide exposure can have immediate, severe negative health impacts on people, including stringy eyes, blisters, rashes, skin irritations, blindness, nausea, dizziness, diarrhea, and occasionally even death. Working with pesticides in agriculture can expose workers to a significant danger to their respiratory health, increasing their likelihood of developing asthma, bronchitis, dyspnea, wheezing, and expectoration.

## II. PESTICIDE EFFECT ON HUMAN HEALTH

Exposure to pesticides can cause cancer, birth defects, reproductive harm, toxicity to the nervous system and development, immunotoxicity, and endocrine system disturbance.

### **Cancer**

Research has shown a strong correlation between pesticide use and the emergence of cancerous growth in both adults and children. People who have a close relationship to pesticide exposure are more seriously at risk for a variety of cancers, including tumors of the lung, rectum, stomach, colon, and bladder, Wilm's tumor, non-Hodgkin lymphoma, soft tissue sarcoma, and ovarian disease.

### **Alzheimer's disease (chronic neurodegenerative disease)**

Alzheimer's disease (AD) is one of the most well-known causes of dementia in older individuals. The presence of extracellular amyloid beta (AB) plaques, neuronal death, and neurotransmitter loss are among the hallmarks of the illness. There is clear evidence linking environmental contaminants to the pathophysiology of AD. Several studies have found that individuals who are exposed to pesticides on a long-term basis are more likely to develop physiological, behavioral, and psychomotor impairment as well as dementia related to Alzheimer's disease. The drug used to treat AD is found to be replaced with organophosphate pesticides, which also appear to cause tau hyperphosphorylation and abnormalities in microtubule preparations.

### **Respiratory disorders**

Bernardino Ramazzini was among the first researchers to report in the 1700s that farmers had a higher incidence of respiratory ailments. The majority of pesticide applicators in impoverished nations like India do not wear Personal Protective Equipment (PPE) such as safety masks, gloves, etc., putting them in closer proximity to pesticides and increasing their exposure to higher dosages of the chemical. The majority of pesticides are sprayed in the fields, creating aerosols that can enter agricultural workers' respiratory systems directly. Pesticides are known to induce a variety of respiratory ailments, such as blood in sputum, dry cough, wheezing, and respiratory tract irritation. Their serum IgE levels were elevated. Dermato-respiratory symptoms include stuffy nose, dry cough, sinusitis, pharyngitis, bronchitis, asthma, respiratory insufficiency, pneumonia, dyspnea, pharyngeal irritation, nasal irritation (sneezing, secretions, and dryness), ocular irritation, cutaneous pruritus, and contact dermatitis.

### **Reproductive Disorder**

Exposure to pesticides during vulnerable life stages disrupts a living organism's ability to reproduce, grow sexually, and maintain fertility. A few undesirable outcomes, such as decreased fertility, infertility, early births, miscarriages that go undiagnosed, birth defects, teratogenicity, transformation, mutations, inherited malformations, and cancerous growths, may result from it. Adequate quantities of specific pesticides can increase the risk of sperm abnormalities, lower fertility, atypical abortions, birth malformations, and fetal development obstruction. A study using the carbamate insecticide carbofuran revealed an increase in sperm variety, bone marrow micronucleus production, and chromosomal abnormalities (CA).

### **Liver and Kidney Disorder**

The human body uses the liver and kidneys as its main organs for excretion and cleansing. This is where the body stores all toxic substances that are later converted and eliminated. As a result, they often accumulate large concentrations of toxins and chemicals, leading to anomalies in both structure and function. It is possible to explain the plausible mechanism of pesticide action in terms of tissues' vulnerability to free radicals. Lipophilic pesticides, such as chlorpyrifos, attack lipoidal films and produce reactive oxygen species (ROS) as well as oxidation and lipid layer corruption. Patients with chronic kidney disease (CKD) showed amplified oxidative stress with increasing pesticide accumulation, as evidenced by a critical positive association between the absolute level of pesticides and plasma levels of oxidative trace markers.

### **Endocrine disruption**

One of these pesticides' primary goals is endocrine disruption. "An exogenous substance that causes adverse health effects in an intact organism, or its progeny, secondary to changes in endocrine function" is the best definition of an endocrine disrupting chemical (EDC). Endocrine hormones are chemical compounds generated by a single gland that affect far-off cells, tissues, organs, and organ systems. These hormones are highly specialized, and when they are released at a certain moment throughout a particular growth stage is also very important. Pesticides interfere with these hormones' action, timing of release, or ability to imitate them. This can lead to a variety of cancers, abnormalities of the thyroid gland, abnormalities of the male and female genital tracts, decreased fertility, and impaired immune systems.

## **III.CONCLUSION**

Pesticides have increased agricultural productivity and indirectly benefited society in numerous ways, making them a blessing for both farmers and people worldwide. However, questions concerning the safety of pesticides have been raised due to the risks they represent to the environment and public health. The risks connected to the use of pesticides cannot entirely be eliminated, although they can be avoided in some manner. There are numerous ways to reduce pesticide exposure and its negative effects, including employing well-maintained spraying equipment or switching to alternative agricultural practices. The development of safer, more effective, and environmentally friendly pesticide formulations could lessen the negative consequences of using pesticides. Pesticide dangers can be reduced by using pesticides sparingly and only when absolutely essential or required.

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# Cestode Parasites: A Comprehensive Review of Their Ecology and Pathogenesis

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## ABSTRACT

Fish is one of the most important sources of nutrition. Parasites are a group of pathogens that cause severe infections in the host fish. Fish are infected with numerous cestode parasites, which are also called tapeworms. Cestodes belong to the phylum Platyhelminthes and class Cestoda, a group of worms with 5000 species that parasitize all groups of vertebrates, including humans. They exhibit a complex life cycle with three hosts. It is the most important topic of research that enables us to understand the entanglement of intrinsic and extrinsic factors that impact the population of fish. From this review, it is found that parasitic infection in fish increases rapidly per year. This increase is mainly due to climate change, pollution, and several anthropogenic activities. Many researchers have been studying new species of cestode parasites and their harmful effects on fish growth. Parasitism is the most prevalent way to exist on Earth, researchers may be able to better understand changes in a particular fish population or stream ecology by comprehending its position in the environment.

**Keywords:** Fish, cestode parasites, host

## I. INTRODUCTION

Fish is a rich source of minerals like magnesium zinc, iodine, iron and potassium. Parasites are omnipresent and they are mainly surviving in their host species. Numerous parasites with diverse life cycles that are categorized in various ways can be found growing on fish. Some of these parasites must pass through a number of intermediate hosts before they may reach a host, whereas many of them are transferred directly between ultimate hosts. Parasitic animals have evolved from free-living ancestors. Current evolutionary theory suggests that this is most likely to have occurred when individuals, pre-adapted for some other purpose, gained a selective advantage over other conspecifics by initial close association with and subsequent exploitation of a larger host organism (Poulin, 1998). Parasite life cycles can be maintained and developed in optimal conditions found in aquatic environments. The study of the occurrence of parasites in a particular fish species can give clues about the feeding ecology of the fish, and consequently about the food-web transmission of the parasites (Costa et al., 2018). Marine environment is complex and provides extremely diverse habitat for a host and their parasites. Every host population within a habitat therefore acquires a characteristics array of parasites and these

parasites communities in their turn can also characterize the habitat (Dogiel et al., 1962) and this concept forms the basis of modern ecological parasitology which deals with distribution and abundance of parasites in time and space (Kennedy, 1975).

The community structure of parasites is shaped by a number of ecological parameters, including temperature, depth range, host behavior, and food. They exhibit a complex life cycle with three hosts. Copepods are the primary host, followed by fish as the intermediate host and humans as the final host. Parasitic infections occur when parasites and hosts are present in the same place at the same time. The presence of infective parasite stages may also cause hosts to undergo changes in behavior. In fish infection mechanisms is depend on environmental factors and the tissue of the host. Parasites diminish the dietary level of the host. Parasites decrease the growth of fish, making the host more susceptible to pathogens and affecting productivity. Analysis of host-parasite associations accordingly shows that animals with comparable food habitats tend to have similar kinds of parasites and that related hosts tend to have related parasites (Cameron, 1964).

Cestode infection is foodborne or by ingestion by the host. All cestodes parasites shows three stages- eggs, larvae, and adults. Adult cestode parasites reside in the intestine of the final host species of fish. A cestode infection occurs when an adult tapeworm excretes feces into the environment, which is subsequently eaten by an intermediate host. Larvae develop from eggs, enter the circulation and accumulate in the muscle and other organs.

**Effects of parasites on fish health:** Fishes are vital constituent of ecosystem. The host and parasites relationship is temporary or may be lifelong. Cestodes are successful in surviving in the intestine of the fish till its reproduction. They attach to the intestine of the host with the help of hooks and ruptured, destruct the mucosal and sub-mucosal layer of intestine. The parasite finds nutritive material for growth and cause severe damage to the host. Parasite decreases fish growth and raised mortality rates.

**Infection accompanying changes in behavior of fish:** Fishes accomplish a capacious diversification of behaviors over different temporal scales. Every day they need to search out and *confrontation* for food and evade their predators. They need to find their mates, which may involve migration from one place to another or struggling over territory. Infection affects the ability of fish to perform these and other behaviors.

**Change foraging behaviour of fish:** Parasites exploit energy from their host. Fish infected with enervating parasites may reduce activity levels and affect fitness. Parasitic infection in fishes effects on frequently change energy expenditure and consequently, appetite and feeding behavior change.

**Effects on humans:** *Diphyllobothrium latum* is the largest species of tapeworm which infects humans. Diphyllobothriasis is occur worldwide. It is found in United States and northern Europe where people eat raw and undercooked fish. Larvae can cause severe disease and enter into the liver, eyes, muscles, subcutaneous tissues and brain. Infection of the cestode parasites is depending on the infecting species. Fish tapeworm if enters in the human intestine then, it take up dietary vitamin B12 and resulting vitamin B12 deficiency. Inadequate absorption of vitamin B12 leads to the gastritis, pernicious anemia, digestive diseases, headaches, dyspnea, transcobalamin II deficiency and heart failure or neurological manifestations may occur.

## II. CONCLUSION

From the above data collected from different research papers, it is found that there is an immense diversity of cestode parasites in fish; they affect fish behavior and cause severe damage to their tissues. As the climatic conditions are favorable for the parasite, its population is increasing rapidly. This increase is mainly due to climate change, pollution, and several anthropogenic activities. This has affected the lives of fish. Aquatic

habitats provide the epitome of conditions for the evolution of the parasite life cycle. The conclusion reached was that, within a given geographic area, a specific species group could be dominant in one host and dominating, influent, or accessory in another host. Various contributing elements, including habit, habitat, food, and other physiological parameters, could be responsible for this. It is estimated that there are numerous species of fish parasites which are still unknown and many species are new to science. So it is suggested that molecular level of study is necessary to description of unknown species, understanding the life cycle and interaction of these organisms with their hosts is often key to understanding the dynamics of ecosystems generally. To bring the knowledge of India's cestode fauna up to par with current understanding, contemporary molecular technologies should be used in systematic research.

### III.CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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# Recent Microwave Assisted Green Synthetic Approaches Toward the Synthesis of Spiro Heterocyclic Compounds: A Brief Review

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## ABSTRACT

Spiro heterocyclic compounds possess the heterocyclic framework, which is responsible for excellent pharmacological and biological potency. The unique structural feature of Spiro heterocyclic compounds is their backbone for their extensive use as pharmacological agents in the medicinal field, such as anticancer, antimalarial, antibacterial, antitubercular, anti-aids, and antibiotics. This unique feature of spiro heterocyclic compounds is a milestone for researchers to develop various efficient methods for the synthesis of pharmacologically and biologically more potent spiro heterocyclic compounds. In recent years, there have been several methods known for the synthesis of Spiro heterocyclic compounds. Now a days, microwave-assisted one-pot multicomponent synthetic methods are one of the most efficient and environmentally eco-friendly methods. In the present review, the authors try to enlist some microwave-assisted green synthetic methods of Spiro heterocyclic compounds.

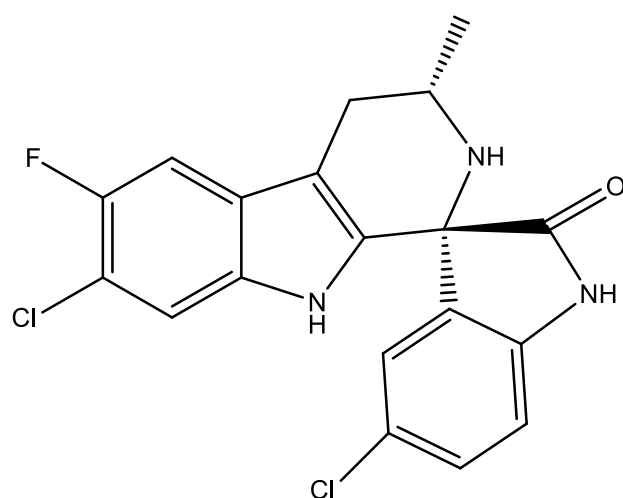
**Key Words:** Spiro heterocyclic compounds, microwave assisted, antibiotics, antimalarial, antitubercular, anticancer

## I. INTRODUCTION

Spiro heterocyclic compounds are the class of compounds which contains one carbon is common to the two ring which is fused at common carbon atom. This linkage is known as spiro linkage. Spiro heterocyclic compounds are found in nature in the variety of naturally occurring compounds containing N, O, S, as a member of heterocyclic ring. Due to the structural rigidity and spiro linkage Spiro heterocyclic compounds found their wide application in the medicinal and other fields. Many derivatives of Spiro heterocyclic compounds show diverse biological and pharmacological applications in day today life such as antiplatelet agents [1], anti-diabetic[2], anticancer agents [3,4], antihypertensive[5,6], antimalarial[7], CCR antagonist [08], antibacterial[9,10], anti-tubercular[11], anti-inflammatory[12], antipyretics [13], insecticidal and anti-helminthic[14], insect antifeedant[15], antibiotic and antifungal[16], cytotoxic [17], anti-food-deteriorating agent[18], anti-protozoal [19], CNS stimulant[20], cardiac glycol-side [21], HIV-1 reverse transcriptase inhibitor[22], cholesterol absorption inhibitory [23], stimulant and convulsant [24], antitumor [25], anti-coagulant[26], antineoplastic[27], diuretic [28], antipsychotic [29], antibroncho-constrictor[30], anxiolytic[31],

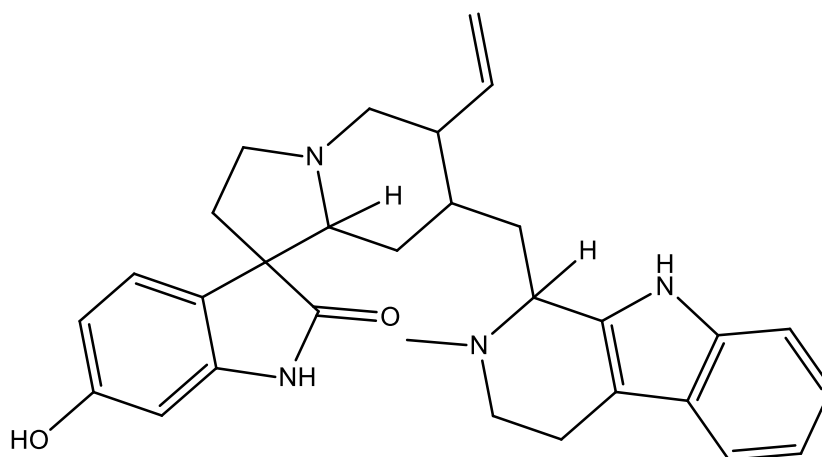
anti-ulcer agent[32]. Indole fused spiro heterocyclic compounds exhibit wide range of biological properties such as antibacterial [33-36], antifungal [37-39], antiviral [40-45], mycobacterial [46].

Spiro heterocyclic compounds are in high demand in the world of pharmaceuticals due to their potent pharmacological activity. Nowadays, there are several Spiro heterocyclic compounds known for their wide application in the medical and pharmaceutical fields, as well as allied fields. In recent years, there have been lots of methodologies known for the synthesis of Spiro heterocyclic compounds [47]. Some of the spiro heterocyclic compounds containing nitrogen, oxygen and sulphur as heteroatoms becomes a member of heterocyclic ring found to be more effective and efficient spiro heterocyclic compounds. Some of such compounds illustrated in bellow fig.1. Cipargramin (NTD609) is found to be potent antimalarial drug [48]. The oxindole derivative strychnofoli (S<sub>1</sub>) and Citrinadin (S<sub>2</sub>) exhibit SARS CoV-2 inhibitory activities [49].

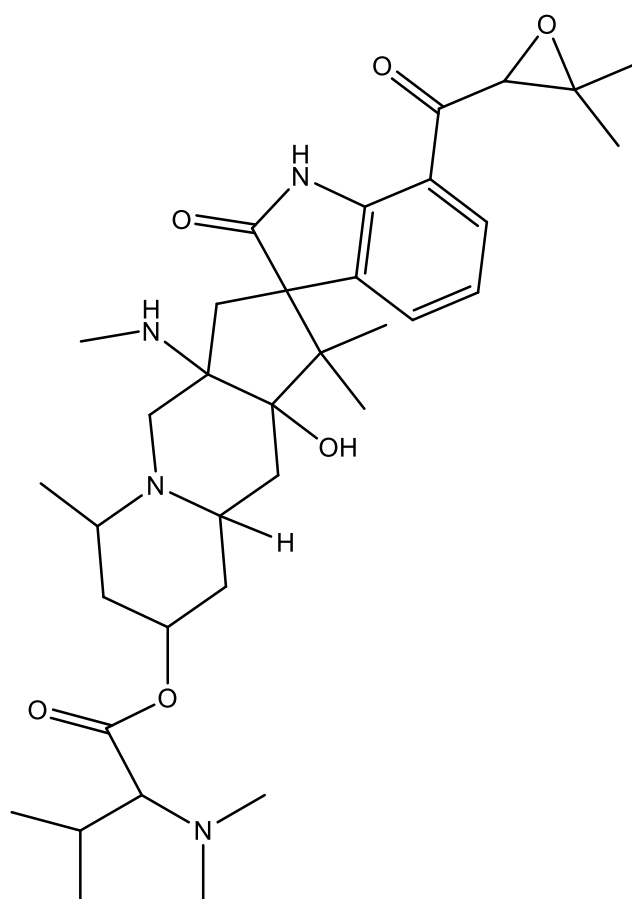


**Cipargramin (NITD609)      Antimalarial**

Fig.1 Medicinally important Nitrogen containing spiroheterocyclic compound



**A1 Strychnofoli SARS-CoV-2 inhibitor**

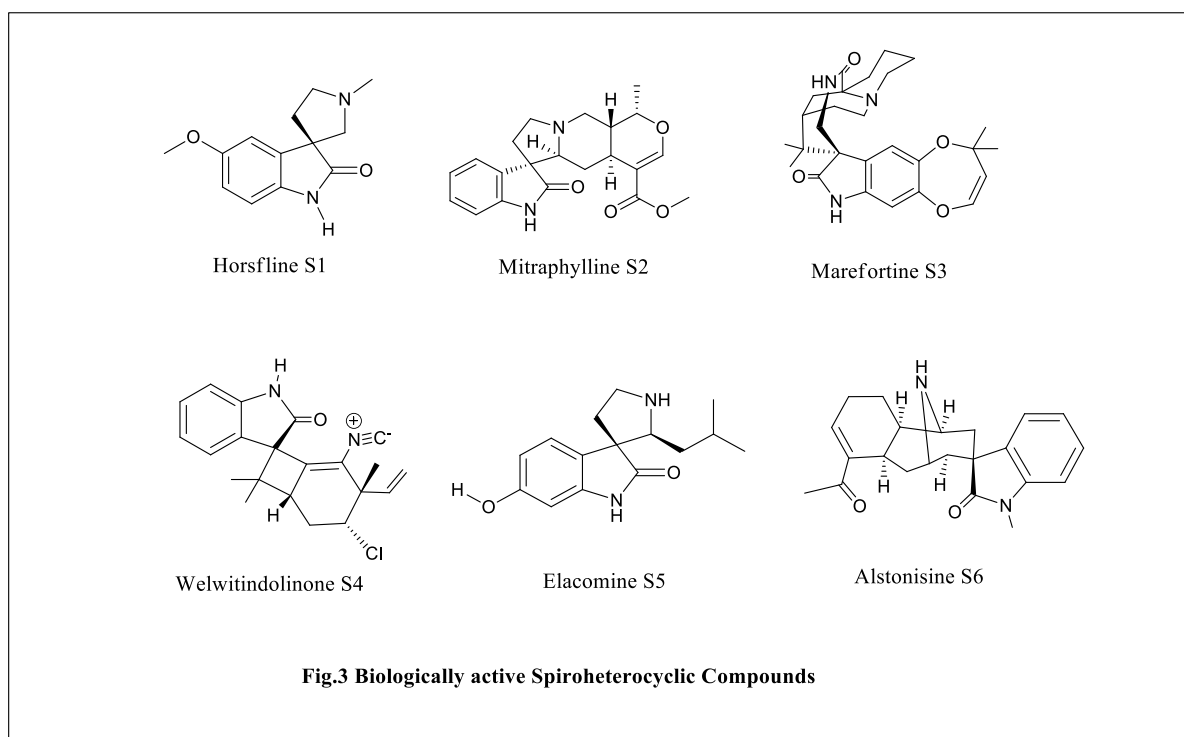


**A2 Citrinadin A SARS-CoV-2 inhibitor**

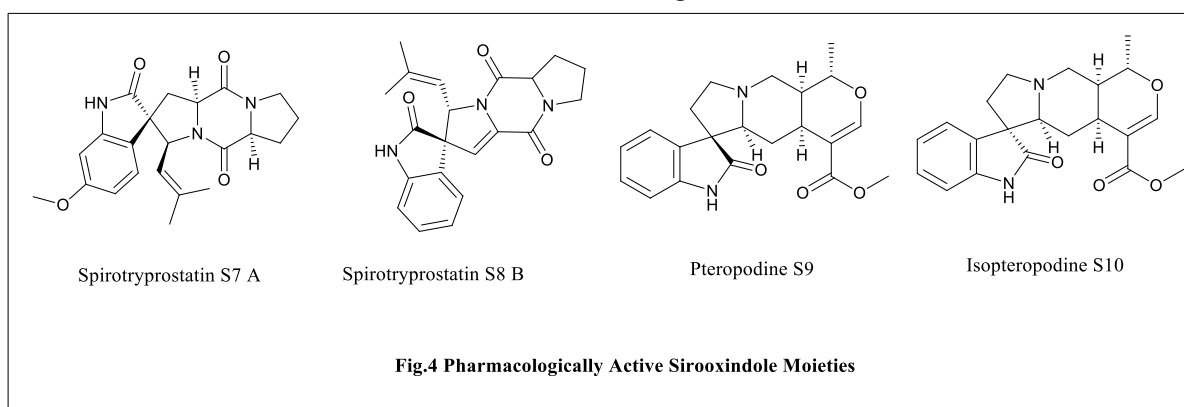
Fig .2 Nitrogen containing spiroheterocycle with biological potency

Some of the member from the Spiro heterocyclic family such as Spiroindole and Spirooxindole in which the spiro linkage at C<sub>2</sub> and C<sub>3</sub> position of indole acts as a building block of the various drugs. It is core of the many

drug moieties which acts as a pharmacophore and which exhibits potent pharmacological and biological activities. Many Spiroindole and spirooxindole core containing moieties well known for their pharmacological and biological activities such as Horsflinone (S1), Mitrephylline (S2), Marefortine (S3), Welwitindolinone (S4), Elacomine (S5), and Alstonisine (S6) (Fig.3) [50-53]. Spiroindole possess conatural three dimensional and rigid structure which has good affinity towards protein this fact makes Spiroindole became a synthetic target in organic chemistry and drug discovery. Due to this fact Spiroindole exhibits potent broad spectrum biological activities such as antimicrobial, antitumor, antidiabetic, anticonvulsant, potential antileukemic, local anesthetic, and antiviral activities. Rather spirocyclic systems acts as a synthetic precursor for the synthesis and exploration of medicines. Spirotryprostatin S7A and Spirotryprostatin S8B shows microtubule assembly inhibition. While Pteropodine S9 and Isopteropodine S10 steepen the operation of muscarinic serotonin receptors. Fig.4[54,55]



Spirocyclic oxindoles are valuable synthetic intermediates and constitute many pharmacological activities like antimicrobial, antitumor, antimicrobial, antibacterial, antifungal, anti-viral and local anesthetics.



Recently many methods were used for the synthesis of Spiro as well as heterocyclic compounds such as 1) Three component tandem cyclo-addition, 2) Microwave assisted synthesis, 3) 1,3, dipolar cycloaddition also known as Huisgen cycloaddition or Huisgen reaction, 4) Reductive lithilation,, 5) Alkylation and reductive

cyclization, 6) Ring closing metathesis, 7) [3+2] Annulation followed by reductive cleavage, 8) ring expansion, 9) Waters' ring closing metathesis, 10) Palladium-mediated cyclisation, 11) asymmetric Michael additions, 12) cycloaddition, and multicomponent reactions, 13) Prins/ene cascade process, 14) Fischer indole synthesis followed by Ugi reaction, 15) intramolecular cyclization using Eaton's Reagent, 16) Curtius rearrangement, 17) Regioselective Mizoroki–Heck cyclization for the synthesis of spirooxindoles [56,57], 17) Aldol cascade method by using (R)-pyroglutamic acid as catalyst[58]. In the literature there are numerous methods were mentioned for the synthesis of Spiroheterocyclic compounds containing hetero atoms like Nitrogen and Oxygen became a part of Spirocyclic ring. In last decade wide varieties of Spiroheterocyclic compounds and their derivatives were known such Spiroindoles, Spirooxindoles, Spirochromones, spiroperimidones, Spiroheterocyclic compounds prepared from isatin, five membered, six membered spirocompounds prepared from various precursors bearing heterocyclic Scaffold moieties.

Spiro heterocyclic system containing one carbon atom common two rings are structurally interesting. The presence of the sterically constrained Spiro compounds represents an important class of naturally occurring substances. Most of the methods used for the synthesis of spiro compounds are chemical methods which is not environment ecofriendly or they not follow the green approach.

In present study brief review about the green synthesis of Spiro heterocyclic compound is done. In this article we try to collect some methods used for the synthesis of Spiro heterocyclic compounds by using green approach. Green synthesis deals with the 12 Principles of Green Chemistry i.e. 1) Prevent Waste, 2) Atom Economy, 3) Less hazardous synthesis, 4) Design benign Chemicals, 5) Beginning Solvent and auxiliaries, 6) Design for energy efficiency, 7) Use of Renewable Feedstock's, 8) Reduce Derivatives, 9) Catalysis, 10) Design of degradation, 11) Real Time Analysis for Pollution Prevention, 12) Inherently Benning Chemistry for Accident Prevention. Some of the principles were utilized and synthesized some Spiro compounds and following methods were reported for the green synthesis.

In the recent there are so many methodologies have been used for the green synthesis of spiro heterocyclic compounds bellow figure depicts the methods used for the greener synthetic approach of spiro heterocyclic compounds fig.5 [59].



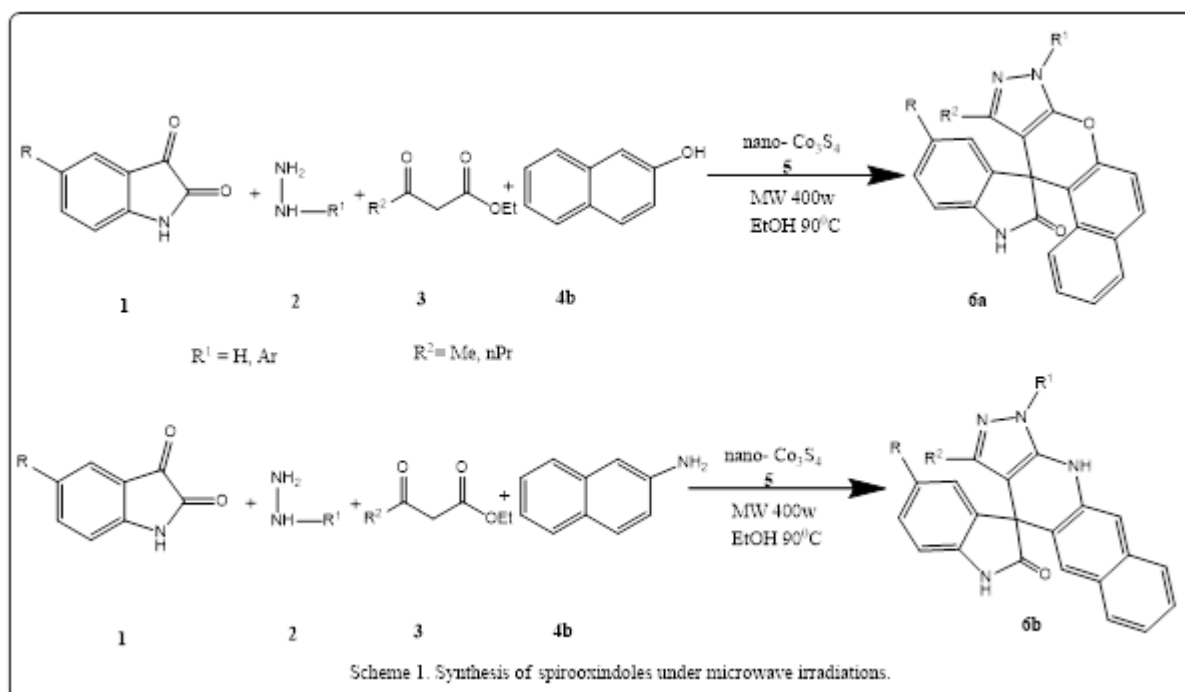
### Fig 5: Different methodologies used for green synthesis.

In the present review we are dealing with the microwave assisted synthesis of spiro heterocyclic compounds. In the present article author trying to enlist microwave assisted green synthetic methodologies for the synthesis of spiro heterocyclic compounds.

Various number of spiro heterocyclic compounds was synthesized under different conditions like solvent temperature and starting from various reactant and reagent under microwave irradiation. Microwave assisted synthesis are of two types one is solid supported as well as solvent free and another one is the microwave assisted synthesis in the presence of different solvents. By adopting Microwave assisted synthesis. Microwave assisted facile synthesis has tremendous importance in green synthesis. This method facilitates the easier, safe, and environmentally eco-friendly as well less time consuming and high yield synthesis of various types of drugs by one pot synthesis. This method bears good atom economy. Microwave (MW) irradiation is a solo tool in modern organic synthesis [60].

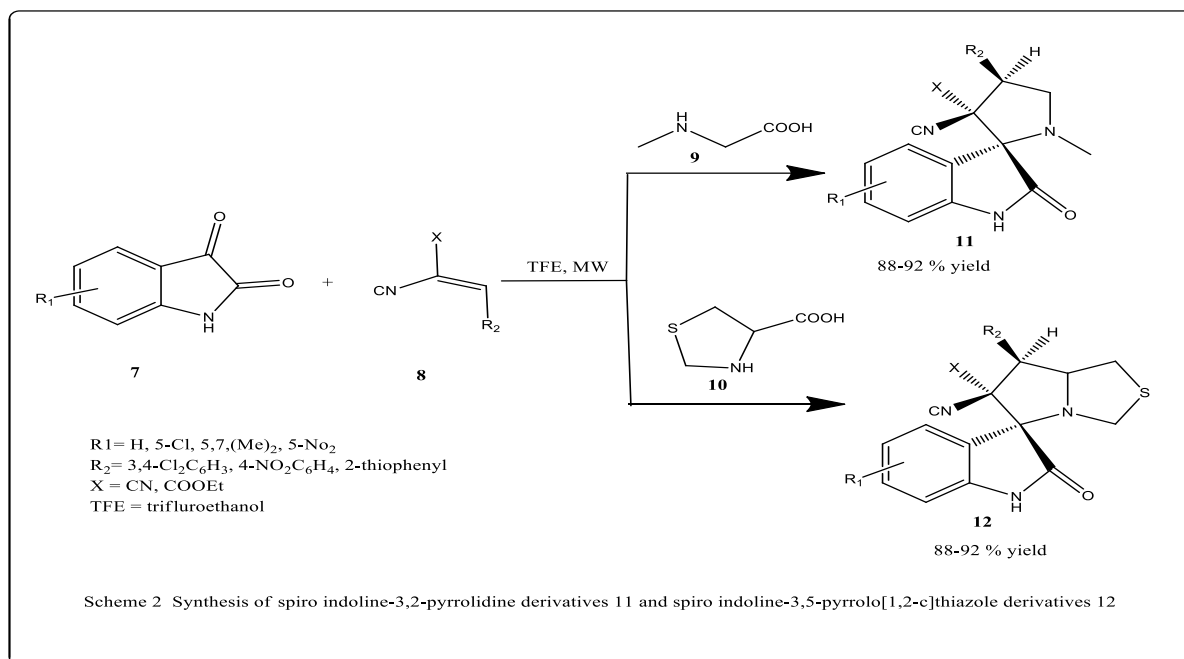
Since from last decade there are wide number of methods are known for the synthesis of spiro heterocyclic compounds but most of the methods associated with lacunas such as use of precious and poisons metal catalyst, high temperatures and harsh reaction conditions. As compared to this methodologies microwave assisted facile synthesis is better and overcome all the drawbacks. Microwave assisted synthesis is the cheap, less time consuming and easy method for the synthesis of spiro heterocyclic compounds.

Sheida Khojasteh and coworkers [61] reported easy and rapid method for the synthesis of spiro [pyrazolo quinoline-oxindoles] (**6a**) and spiro [chromeno pyrazolo-oxindoles] (**6b**) through a four-component reaction of phenyl hydrazine **1** or hydrazine hydrate, isatins **2**, ketoesters, (**3**) and 1-naphthylamine (**4b**) or 2-naphthol (**4a**) using nano- $\text{Co}_3\text{S}_4$  (**5**) under MWIs (Scheme 1). After the optimization of different catalyst and solvent they found the excellent 92% yield of the product is obtained by using  $\text{Co}_3\text{S}_4$  catalyst in the presence of ethanol at  $90^\circ\text{C}$  under the microwave irradiation Mw 400W.

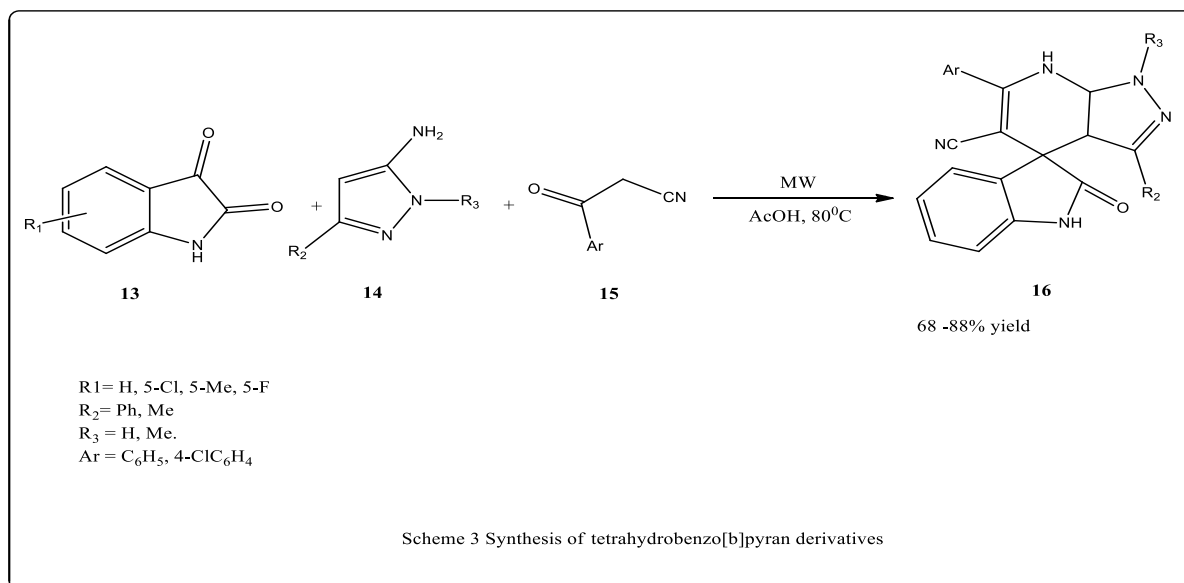


Dandia and co-workers[62] was discussed the environmental eco-friendly easy, convenient and efficient methods for the synthesis of antimicrobial spiro pyrrolidines (**11**) and thiapyrrolizi -dine oxindole derivatives (**12**), three component 1,3-dipolar cycloaddition of substituted isatin (**7**), sarcosine (**9**), 1,3-thiazole-4-carboxylic acid (**10**) and 2-cyano-3-phenyl-acrylic acid ethyl ester or 2-benzylidene-malonitrile (**8**) in

presence of reusable solvent 2,2,2 - trifluoroethanol (TFE) under microwave irradiation (Scheme 2). This method is applicable for the synthesis of highly chemo and regioselective synthesis of spiro heterocyclic compounds.

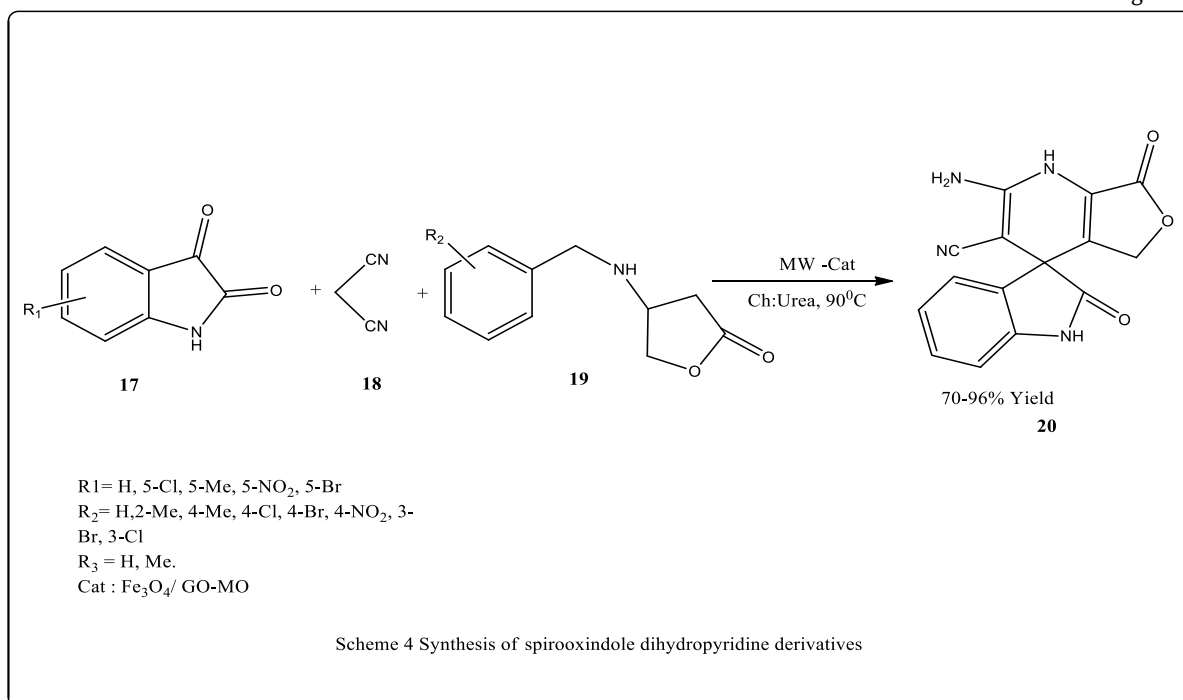


Tu and group [63] were invented the procedure for three component microwave assisted synthesis of spiro[indoline-3,4pyrazolo[3,4-b] pyridines] (**16**) by reacting isatins(**13**), pyrazole-5-amines(**14**), and ketonitriles (**15**) under microwave irradiation at 80°C in the presence of acetic acid results the spiro[indoline-3,4pyrazolo[3,4-b] pyridines] motif with excellent yield. AcOH plays dual role as reaction media and acid promoter.

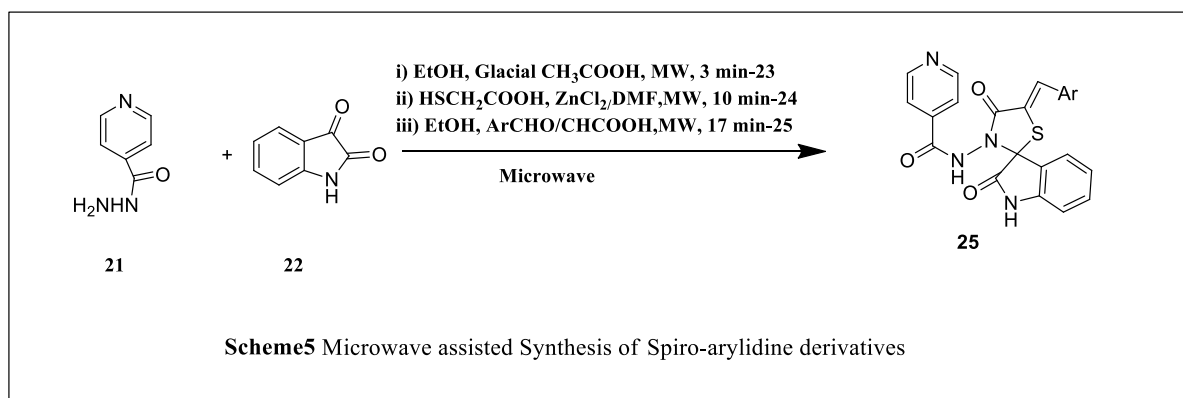


M. Zhang and coworkers [64] developed the microwave assisted synthesis of spirooxindole dihydropyridines (**20**) by using heterogeneous catalyst and choline chloride (ChCl)/urea as a green solvent reaction proceeds through one pot under microwave irradiation at 90 °C when isatins (**17**) combines with malononitrile (**18**) and anilinolactones (**19**) results excellent yield of the desired product (Scheme 4)

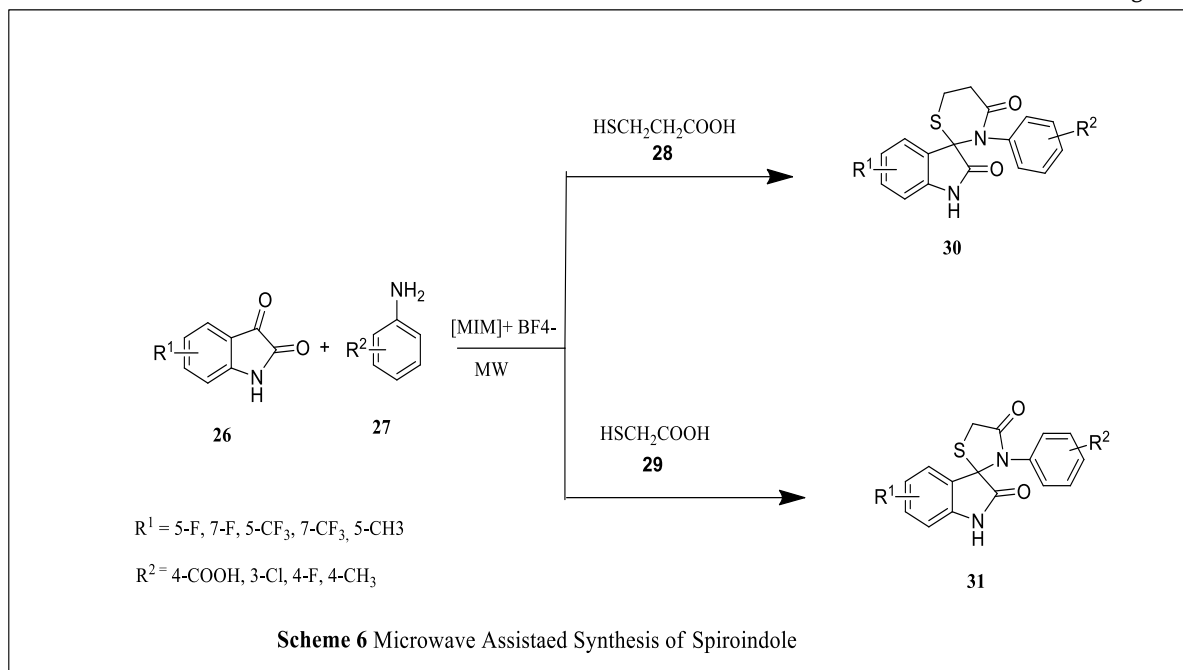




P. N. Shinde and others [65] reported the synthesis of spiro-[indole-thiazolidine] derivatives (**25**) by reaction of isoniazid (**21**) and isatin (**22**) in the presence of a catalytic amount of glacial acetic acid to give N-(2. )-oxo-1,2-dihydro-3'H-indol-3-ylidene) pyridine-4-carbon hydrazide (**23**), which then undergoes cyclo-condensation with mercaptoacetic acid and anhydrous ZnCl<sub>2</sub> to give spiro-[indole-thiazolidine] derivatives. (**24**). Compound (**24**) was then reduced with aromatic aldehydes to give arylidene derivatives (**25**) (Scheme 5). The synthetic methodology used to make these Motif facilitate: ease of operation, reduced reaction time, and easy handling. The author also investigated the antimicrobial activity of the obtained Spiro-[indole-thiazolidine] derivatives against Gram-positive and Gram-negative bacteria and found that some compounds have strong antimicrobial activity.



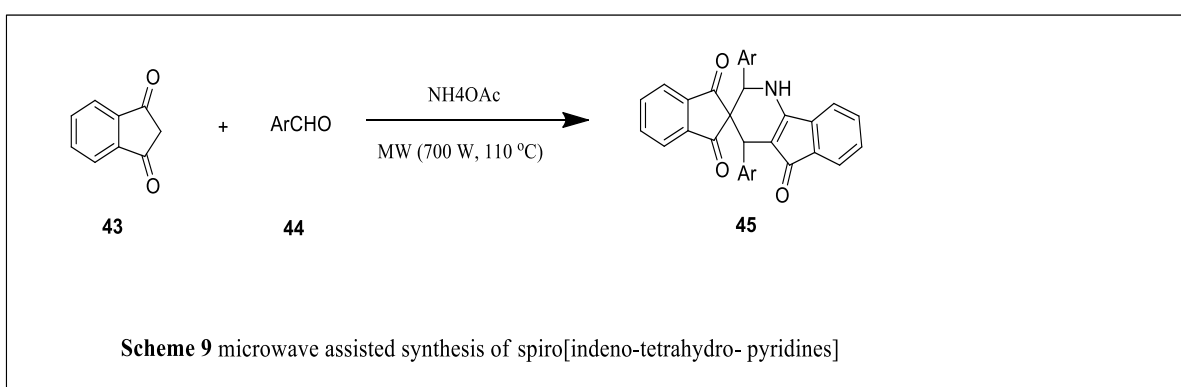
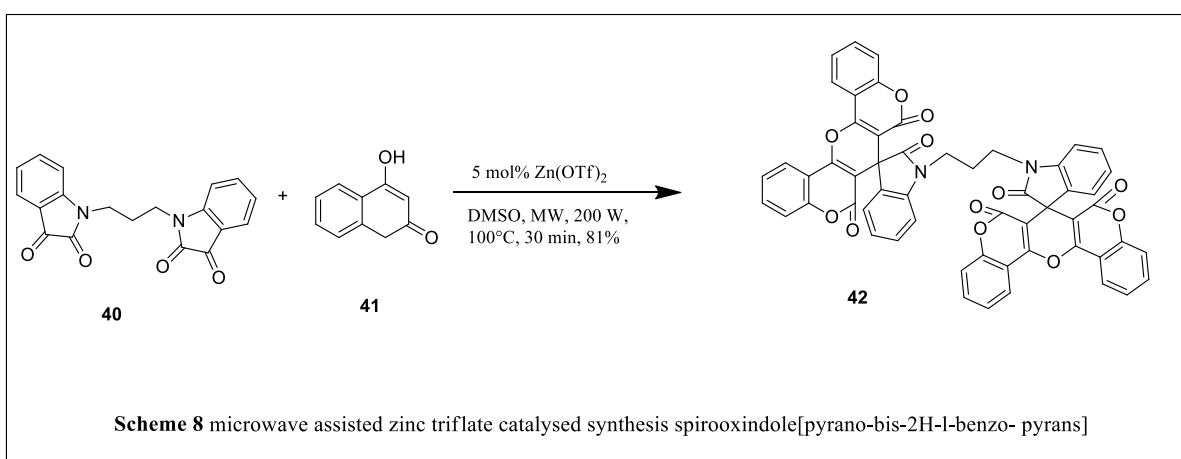
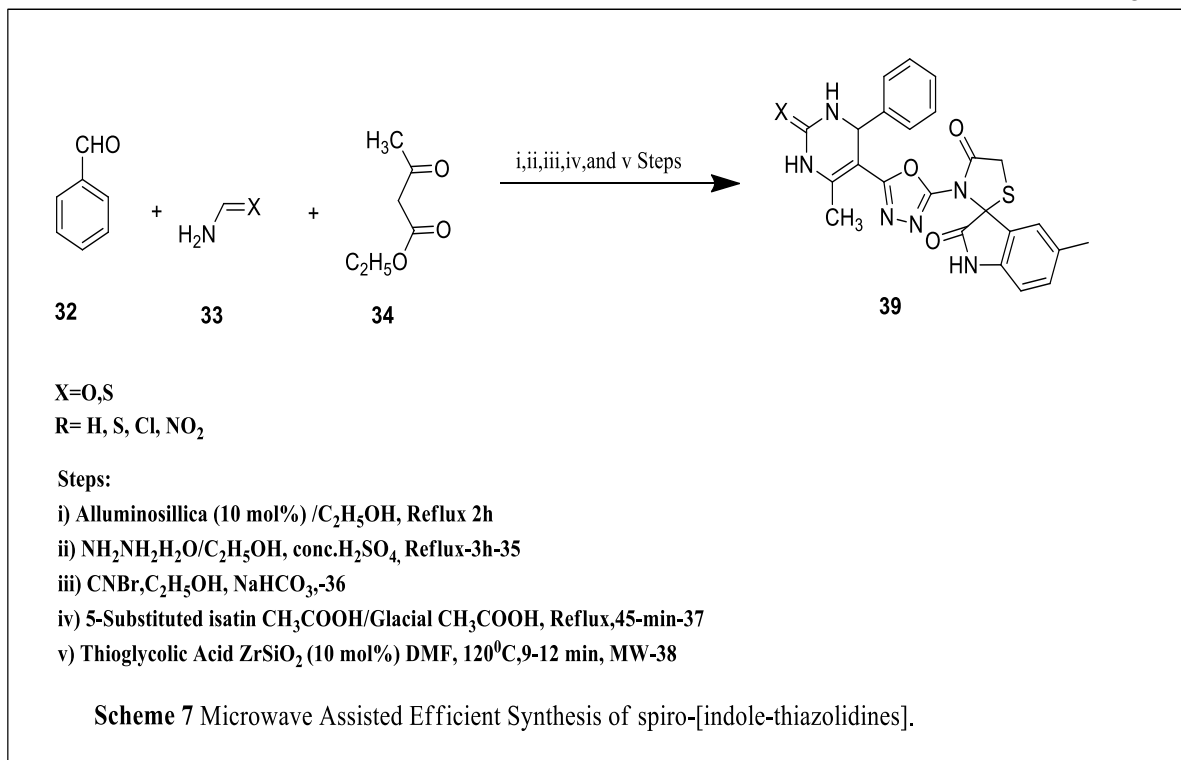
Arya et al. [66] also reported the synthesis of fluorinated spiro-indole (**31**), (**32**) by microwave cyclocondensation. Reaction of various isatin (**26**) with heterocyclic amines (**27**) using thioacids (**28**), (**29**) and 1-methylimidazolium tetrafluoroborate ([MIM]<sup>+</sup> BF<sub>4</sub><sup>-</sup>) (**30**) under microwave irradiation for about 2-4 min gives 90-97% yield of the desired product fluorinated Spiro compound. (Scheme 6).

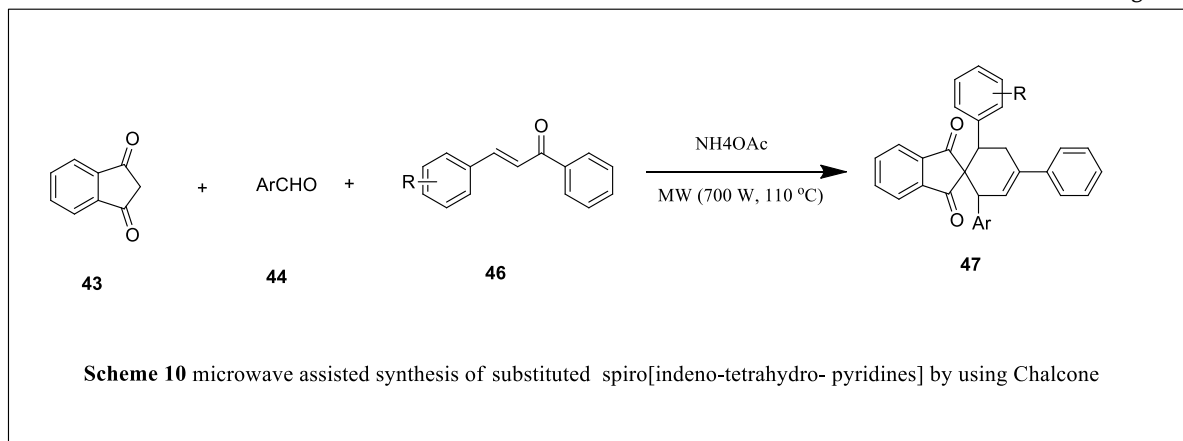


MA Borad and coauthors [67] reported the synthesis of several new derivatives of spiro-[indolethiazolidines] (**39**) from substituted isatins and thioglycolic acid (TGA) catalyzed by microwave irradiation of ZrSiO<sub>2</sub> (**38**). (Scheme 7) Precursors spiro compounds synthesized by previously described methods, namely 6-methyl-4-phenyl-2-oxo/thio-1,2,3,4-tetrahydro-pyrimidine-5-carbonic hydrazide (**35**), 5-(5-amino-1,3,4-oxadiazol-2-yl)-6-methyl-4-phenyl-3,4-dihydro-pyrimidin-2(1H)-one/thione (**36**) and 5-substituted-3-[[5-(6-methyl-2-oxo/thio-4-phenyl-1,2,3,4-tetrahydropyrimidin-5-yl)-1,3,4-oxadiazol-2-yl]imino]-1,3-dihydro-2H-indole-2-one (**37**). The author also explored the advantages of this method, i.e. ease of operation, rapid processing, significant product yield, recyclable and recyclable catalyst. The author also studied the synthesized derivative for their antimicrobial activity, such as anti-tuberculosis activity. They found that most scaffolds have potent anti-tuberculosis activity.

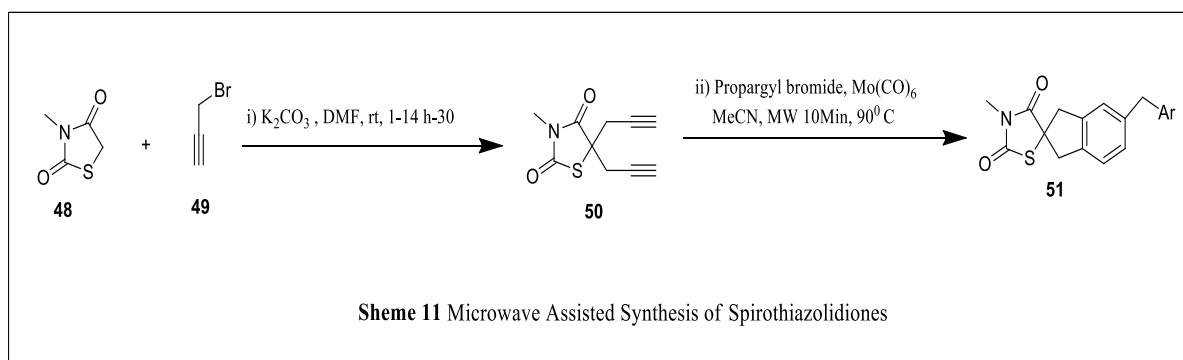
Parthasarathy et al [68] reported the microwave-catalyzed zinc triflate synthesis of spirooxindole [pyrano-bis-2H-1-benzopyrans] (**42**) by tandem double condensation between isatin (**40**) and 4-hydroxycoumarin (**41**). microwave irradiation (220 W) in DMSO solvent for 30 min at 1000 °C yields 86-95%. (Scheme 8).

Bhuyan et al [69] reported spiro[pyridines/piperidines] synthesis on irradiation with microwave yields 76-85% spiro [indeno-tetrahydro-pyridines] (**45**, **47**) when 1,3-indanedione (**43**), substituted benzaldehyde (**44**) and ammonium acetate in closed vessel is reacted in the microwave reactor about (700W) under 14 bar pressure at 110°C for 7 min (Scheme 9). By using Chalcone (**46**) instead of benzaldehyde get differently substituted product. (Scheme 10).



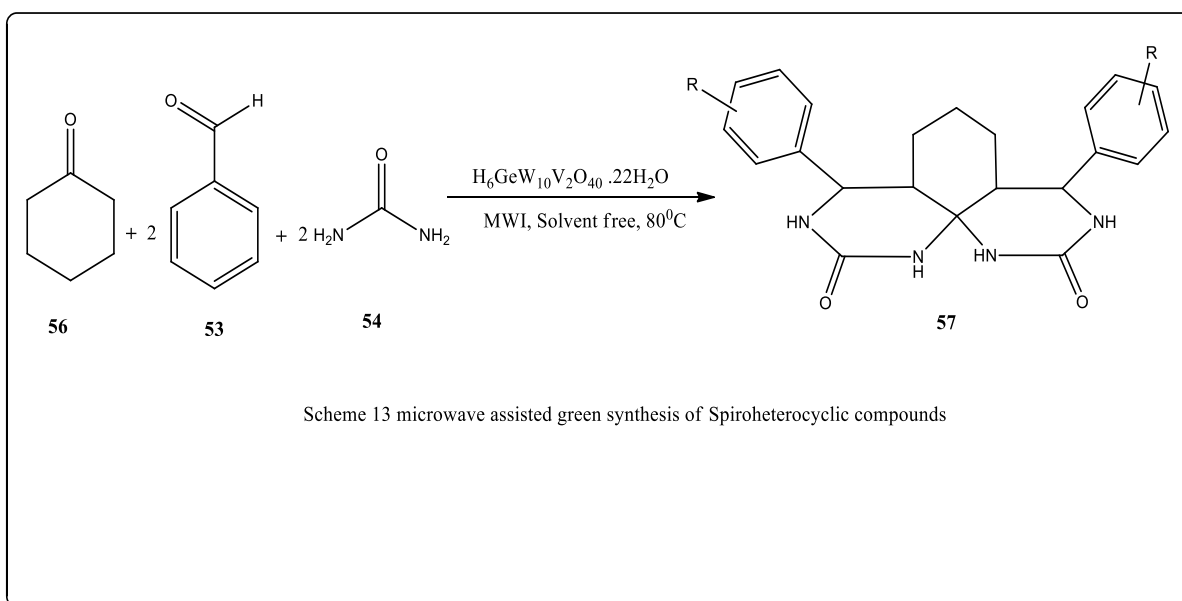
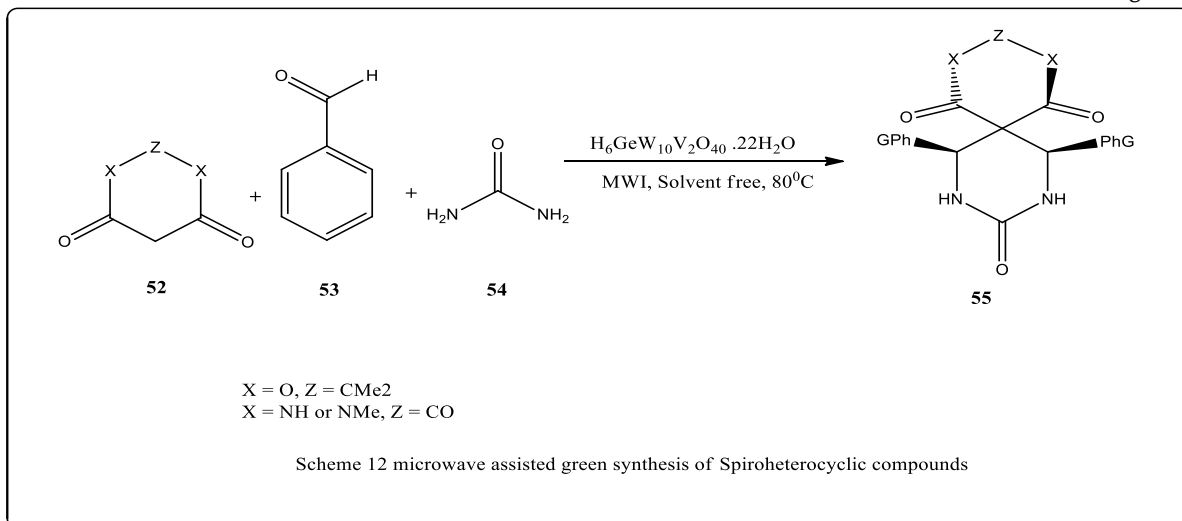


S. Kotha and colleagues [70] discussed a novel synthetic method for spiro thiazolidinedi-ones using [2 + 2 + 2] cyclotrimerization, followed by functionalization with DA chemistry and click reaction. (Scheme 11). In this method the Spiro thiazolidinedione is produced from the starting material i.e. precursor thiazolidinedione which is synthesized from N-methylthiazolidine-2,4-dione (**48**) and propargyl bromide (**49**) in DMF in the presence of  $K_2CO_3$  to obtain dipropargylated intermediate thiazolidinedione (**50**) in 85% yield. The final product i.e. Spiro thiazolidines (**51**) was further produced by cyclotrimerization when dyne (**50**) and propargyl bromide (**49**) reacted in presence of acetonitrile and catalyst  $Mo(CO)_6$  at  $90^\circ C$  by Microwave irradiation. Authors also investigated anticancer activity.

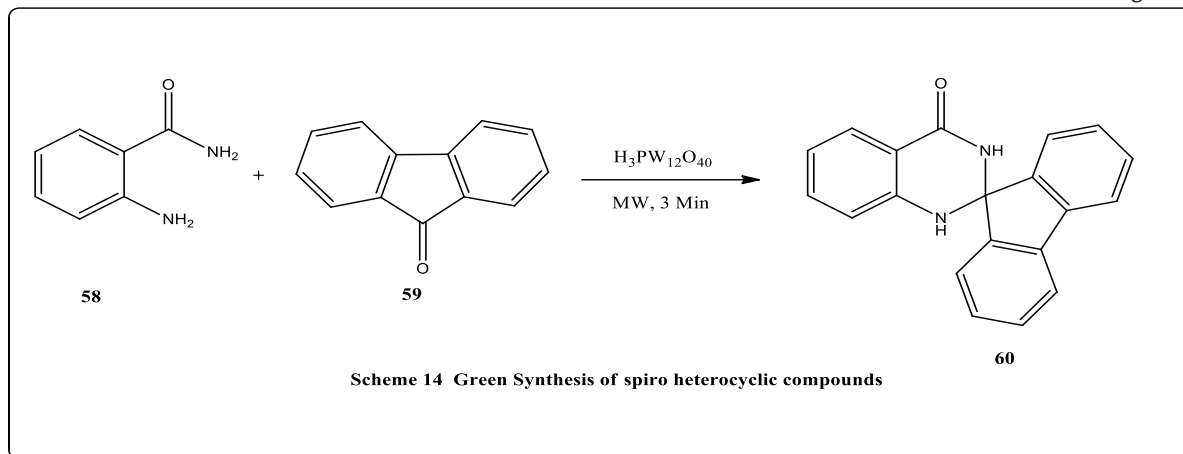


Jetti S.R. and coworkers [71] reported the microwave assisted efficient green synthesis of spirofused heterocyclic compounds Using Decatungstodivanadogermanic Heteropoly Acid as a Novel and Reusable Heterogeneous Catalyst under Solvent-Free Conditions. This transformation is carried out by microwave irradiation of cyclic  $\beta$ -ketoesters, and  $\beta$ -amides, meltdrum's acid, or barbituric acid derivatives (**52**), with one equivalent of aldehyde (**53**) and one equivalent of urea (**54**) in the presence of  $H_6GeW_{10}V_2O_{40} \cdot 22H_2O$  catalyst results in respected spiro heterocyclic compounds (**55**) in good yield (Scheme12).

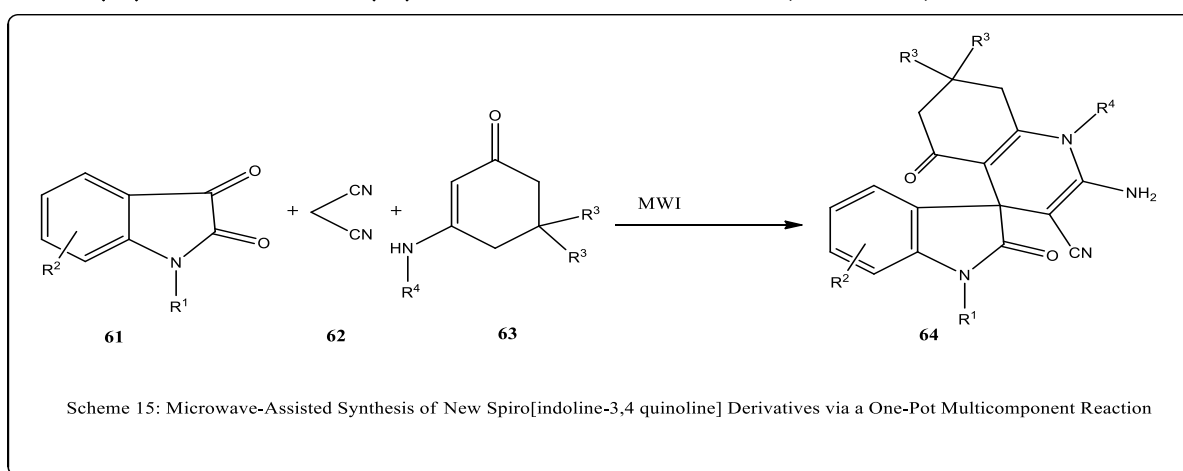
This result has been extended for the cyclic ketone like cyclohexanone (**56**) which gives good result and excellent yield of spiro compound (**57**) (Scheme 13).



Kannadasan S. and coworkers [72] reported Phosphotungstic acid mediated, microwave assisted solvent-free green synthesis of highly functionalized 2'-spiro and 2, 3-dihydro quinazolinone and 2-methylamino benzamide derivatives from aryl and heteroaryl 2-amino amides. This transformation is carried out by the spiro cyclization of anthranilamide (**58**) and aldehydes or ketone (**59**) by using a heteropoly acid catalyst ( $\text{H}_3\text{PW}_{12}\text{O}_{40}$ ). This reaction was proceeded through the imine-iminium ion isomerization mechanism from the imine intermediate and iminium ion under the influence of HPW-microwave irradiation condition. The formation of iminium ion under acidic condition is evident that subsequently undergoes isomerization leads to the observed product (**60**) Scheme 14.

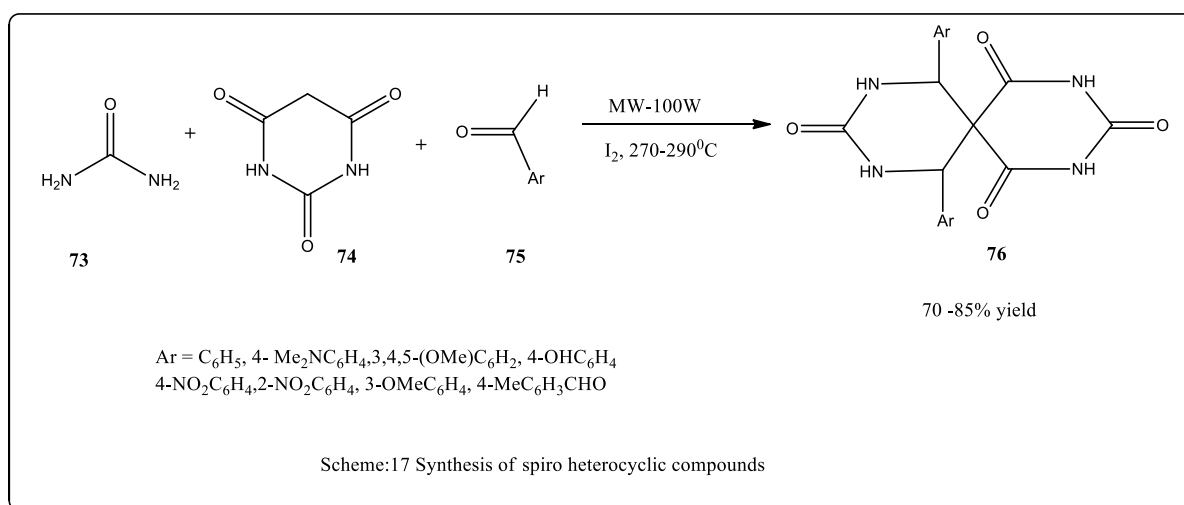
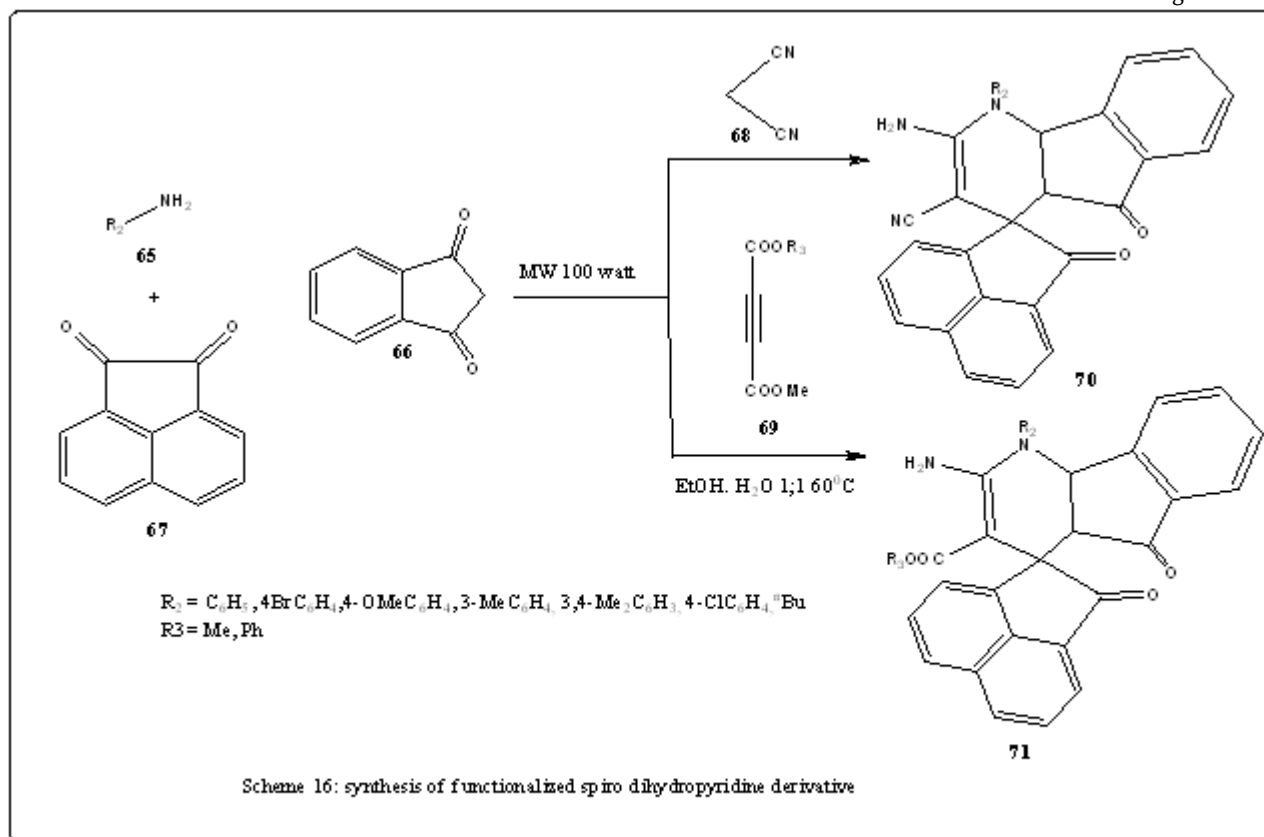


Zhao K. and group [73] reported the synthesis of 2-amino-1-aryl-2,5-dioxo-5,6,7,8-tetrahydro-1H-spiro[indoline-3,4-quinoline]-3-carbonitrile (**64**) were synthesized by one-pot reactions of isatins (**61**), malononitrile (**62**), and enamines (**63**) under microwave irradiation (Scheme 15).



Mukhopadhyay et al. [74] discussed the synthesis of dihydrospiro [indeno[1,2-b] pyridine]-4,3-indolines (**71**) or the analogous spiro acenaphthylene-1,4-indeno[1,2-b] pyridines (**72**) through microwave assisted MCR reaction in presence of aqueous ethanol. This transformation is carried out by irradiating series of substituted amines (**65**) and isatin, (66) acenaphthene quinone (**67**), malononitrile (**68**) or acyclic-1,3-diketone (**69**), and indane-1,3-dione. (**71**)

Mehta and his coworkers [75] reported an environment being synthesis of spiro heterocyclic compounds (**76**) by Biginelli type condensation of barbituric acid (**73**), substituted aldehyde (**74**), and urea (**75**) using Iodine as catalyst by solvent free microwave irradiated green synthesis at 270-290°C. (Scheme17)



Literature survey reveals that there numerous spiro heterocyclic compounds were synthesized by using microwave assisted one pot multicomponent reaction by using different solvents and catalyst. this methodology follows all the principles of green chemistry. Lots of researchers and scientist reported wide number of methodologies and synthetic procedure using microwave assisted synthesis of Spiro heterocyclic compounds. This article deals with some the representative methods of the synthesis of spiro heterocyclic compound by using microwave assisted synthesis.

Conclusion: From the above review microwave assisted synthesis of spiro heterocyclic compounds is the environmental being and efficient as well as green synthesis which is widely used in past present and future for the social welfare, rather using the most drastic and harsh condition methodologies such as heating at higher temperature, use of precious and poisonous metal catalyst.

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# Genotype by Environment Interaction and Grain Yield Stability in Sorghum [*Sorghum Bicolour* (L.) Moench] Hybrids

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## ABSTRACT

The experiment was undertaken to estimate genotype x environment interaction stability parameters in sorghum [*Sorghum bicolor* (L.) Moench]. Thirty six F<sub>1</sub>s along with their nine parents and three checks were evaluated in randomized block design with three replications at three different locations during kharif 2017. Observations were recorded in 19 different characters in each location. The analysis of variance revealed significant differences among all the treatments for all the characters in all the environments. The analysis of variance for stability revealed that the environments differed significantly for almost all the characters under study and also indicated the role of both linear and non-linear components in building up total genotype x environment interaction. On the basis of stability parameters, three parents viz; SU-1572, SU-1571 and SU-1557 and ten F<sub>1</sub>s viz; SU-1571 x SU-1557, SU-1571 x SU-1572, SU-1571 x SU-1519, SU-1557 x SU-1561, SU-1557 x SU-1519, SU-1572 x SU-1569, SU-1572 x SU-1579, SU-1572 x SU-1561, SU-1572 x SU-1519 and SU-1569 x SU-1519 found stable for different environments for increased grain yield per plant over three locations viz; Rajasthan College Agriculture, Udaipur; College of Technology and Agricultural Engineering, Udaipur and Agriculture Research Sub-Station, Vallabhnagar.

**Keywords:** Sorghum, hybrids, G X E interaction

## I. INTRODUCTION

Sorghum [*Sorghum bicolor* (L.) Moench] is the most important cereal crop grown for food, feed and fodder in India. Because of its adaptation to a wide range of ecological conditions, suitability for low input cultivation and diverse uses, it is one of the major cereal crops of the semiarid tropics (Doggett, 1988). It is fifth major crop of the world after wheat, rice, maize and barley, both in area and production. It is genetically suited to hot and dry agro-ecologies with frequent drought, where it is difficult to grow other crops (Jain et al., 2010). For getting better yields farmers rely mostly on in-built resistance and yield stability of the cultivar. The consequences of the phenotypic variation depend largely on the environment. This variation is further complicated by the fact that all genotypes do not react in similar way to change in environment and no two environments are exactly the same. Mean yield across environments are adequate indicator of genotypic performance only in the absence of Genotype x Environment (G x E) interaction. G x E is differential genotypic response across environments. It

is important for plant breeders to identify specific genotypes adapted or stable to environment(s), thereby achieving quick genetic gain through screening of genotypes for high adaptation and stability under varying environment conditions prior to their release (Mustapha et al., 2001). Stability model by Eberhart and Russel (1966) helps in identifying not only the stable genotypes but also ideal environment for sorghum cultivation. Considering the importance of the crop and the above facts, the present study was carried out to identify stable and highly adaptable genotypes for grain yield and its component traits for wider cultivation and to use in future breeding programmes.

## II. METHODS AND MATERIALS

Nine parental lines obtained from All India Co-ordinated Sorghum Improvement Project, Udaipur (Table 1) crossed in half diallel fashion during kharif, 2016 at Instructional farm, Rajasthan college of Agriculture Udaipur and during winter 2016 at Off Season Nursery, Warangal (Telangana) to obtain 36 F1s excluding reciprocals. These 36 F1s along with their nine parents and three checks were evaluated at three different environments viz., E1: Instructional farm, Rajasthan College of Agriculture, Udaipur, E2: Instructional Farm, College of Technology and Agricultural Engineering, Udaipur, and E3: Agriculture Research Sub-Station, Vallabhnagar during kharif 2017.

The standard agronomic practices were followed throughout the period of crop growth. The observations were based on the five randomly selected plants from each genotype and replication for 11 different agro-morphological traits viz; plant height (cm), flag leaf length (cm), flag leaf breadth (cm), ear head length (cm), number of primaries per panicle, number of spikelets per spikes, ear girth (cm), ear weight (g), 1000 grain weight (g), grain yield (g plant<sup>-1</sup>) and dry fodder yield (q plant<sup>-1</sup>). Phenotypic stability of a genotype for yield and different morphological characters was estimated by regression analysis according to Eberhart and Russell (1966).

**Table 1 List of parental lines along with pedigree**

SN	Parent	Pedigree
1	SU-1571	Selection from SPV-1753
2	SU-1557	EC-507856 x SPV-1685
3	SU-1572	CSV-17 x SUR-1255
4	SU-1569	Selection from PC-1080
5	SU-1579	SPV-1616 x IS-13236
6	SU-1581	SPV-1754 x IS-25071
7	SU-1561	SPV-1616 x SU-1071
8	SU-1519	CSV-15 x HC-308-6
9	SU-1565	SU-1205 x CSV-17

## III. RESULTS AND DISCUSSION

The mean sum of squares due to genotypes, environments and genotype x environment (G x E) were significant for all the characters studied indicating that the genotypes and environments are quite variable for all the traits under study. The mean of sum of squares for environment + (genotype x environment) [E+ (G x E)] were significant for all the characters except number of spikelets per spike. For environment (Linear), the values of mean sum of squares were found to be significant for all the characters. In case of G x E (Linear), all the

characters exhibited significant mean sum of squares. Mean sum of squares due to pooled deviation were significant for all the traits under study (Table 2). The significant G x E interaction for various traits were also reported by Kenga et al. (2004), Sharma (2004), Mona et al. (2012), Girish et al. (2016), Bhailume et al. (2016), Khan (2017) and Fantaye Belay et al. (2020).

The genotypes with high per se performance with non-significant S2di were classified on the basis of regression coefficient ( $b_i$ ). The genotypes with  $b_i < 1$  (significantly less than 1) were identified for adverse environmental conditions,  $b_i > 1$  (significantly higher than 1) for favorable environmental conditions and  $b_i = 1$  for unknown or unpredictable environmental conditions. Non-significant S2di was observed in five parents for grain yield (SU-1571, SU-1557, SU-1572, SU-1561 and SU-1565), among them SU-1572 and SU-1561 exhibited  $b_i$  value less than unity and mean values more than population mean indicating these two parents are stable under unfavorable environmental conditions for increased grain yield. Parent SU-1571 and SU-1557 recorded  $b_i$  value more than unity, means they are stable under favorable environments condition for more grain yield. The parent SU-1565 exhibited non-significant S2di,  $b_i < 1$ , but mean values less than parental mean indicating its stable performance under unfavorable environment for decreased grain yield.

Among 36 F1s, 22 F1s exhibited non-significant S2di for grain yield per plant revealing their predictable manner under different environmental conditions for this character. Out of those 22 hybrids, 10 hybrids viz; SU-1571 x SU-1557, SU-1571 x SU-1572, SU-1571 x SU-1579, SU-1557 x SU-1561, SU-1557 x SU-1519, SU-1572 x SU-1569, SU-1572 x SU-1579, SU-1572 x SU-1561, SU-1572 x SU-1519 and SU-1569 x SU-1519 exhibited non-significant deviation from regression (S2di), regression coefficient around unity ( $b_i \approx 1$ ) and mean values greater than the population mean. This indicated that above hybrids are predictable and stable in their performance irrespective of change in the environment. Among them six hybrids viz; SU-1571 x SU-1557, SU-1571 x SU-1519, SU-1557 x SU-1561, SU-1557 x SU-1519, SU-1572 x SU-1569 and SU-1569 x SU-1519 exhibited non-significant S2di,  $b_i > 1$  and mean values greater than the population mean indicating their below average stability under favorable environmental conditions for higher grain yield. Four hybrids viz; SU-1571 x SU-1572, SU-1572 x SU-1579, SU-1572 x SU-1561 and SU-1572 x SU-1519 manifested non-significant S2di,  $b_i < 1$  and mean values greater than the population mean indicating their above average stability under unfavorable environmental conditions for more grain yield. These hybrids also showed their stable performance in most of the yield contributing characters. The stable genotypes across the environment may be used in future breeding programme further development of stable varieties. While the genotypes which performed well under unfavorable and favorable environment may play a role in the development of variety for the respective environments. The hybrids having good per se performance and stability under different environmental conditions on pooled basis for eleven characters of sorghum are presented in Table 3.

**Table 2 Pooled analysis of variance for the estimation of stability parameters**

Character	Replication within environments	Genotypes	Environments	Genotypes x Environments (G x E)	Environments + (G x E)	Environments (Linear)	Genotypes x Environments (Linear)	Pooled deviation	Pooled Error
DF	6	47	2	94	96	1	47	48	282
Plant height	5.13	2467.81**	404.18**	2.95**	11.31**	808.35**	4.74**	2.14*	8.67

(cm)									
Flag leaf length (cm)	0.95	61.16**	165.15**	2.26*	5.66**	330.29**	3.26**	1.95*	1.41
Flag leaf breadth (cm)	0.02	0.37**	0.93**	1.01*	0.02**	1.87**	4.01	1.01*	0.02
Ear head length (cm)	0.21	26.50**	191.83**	4.45**	6.08**	383.67**	9.63*	2.56**	0.72
Number of primaries per panicle	5.87	265.96*	429.81**	9.66*	16.46**	859.62**	10.23**	6.94**	2.64
Number of spikelets per spike	0.27	1.95**	1.92**	6.02*	0.24	3.84**	7.17*	0.23**	0.12
Ear girth (cm)	0.02	1.85**	140.26**	7.88*	3.79**	280.52**	6.98*	1.77*	0.75
Ear weight (g)	10.37	470.18*	760.37**	39.52*	49.64	1520.74**	28.7**	39.49**	11.37
1000 grain weight (g)	0.03	30.82**	79.31**	5.62*	3.23*	158.59**	9.31*	1.89**	0.06
Grain yield (g plant <sup>-1</sup> )	10.15	491.78*	744.34**	44.37*	69.16*	1488.68**	49.05**	38.86**	11.26
Dry	33.45	567.52*	5191.36**	87.28**	174.03**	10382.72**	43.33*	89.33**	16.6

fodder yield (g plant <sup>-1</sup> )		*							1
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\*, \*\* significant at 5 and 1 % level, respectively

**Table 3 Stable hybrids (top three) identified for nineteen traits in sorghum**

SN	Character	Hybrids		
		Different environments (bi=1)	Unfavorable environments (bi<1)	Favorable environments (bi>1)
1	2	3	4	5
1	Days to 50 % flowering	SU-1571 x SU-1572	SU-1557 x SU-1569, SU-1557 x SU-1579, SU-1572 x SU-1579	SU-1572 x SU-1519, SU-1557 x SU-1572, SU-1572 x SU-1581
2	Days to maturity	SU-1557 x SU-1572, SU-1569 x SU-1579	SU-1571 x SU-1572, SU-1572 x SU-1579, SU-1572 x SU-1565	SU-1571 x SU-1579, SU-1571 x SU-1557, SU-1571 x SU-1581
3	Plant height (cm)	SU-1557 x SU-1581	SU-1569 x SU-1581	SU-1581 x SU-1561, SU-1569 x SU-1581, SU-1571 x SU-1572
4	Flag leaf length (cm)	-	SU-1571 x SU-1557, SU-1571 x SU-1572, SU-1519 x SU-1565	SU-1571 x SU-1561, SU-1557 x SU-1572, SU-1572 x SU-1565
5	Flag leaf breadth (cm)	-	SU-1571 x SU-1572, SU-1572 x SU-1561, SU-1581 x SU-1519	SU-1561 x SU-1519, SU-1519 x SU-1565, SU-1569 x SU-1519
6	Number of leaves per plant	-	SU-1557 x SU-1572, SU-1571 x SU-1581, SU-1572 x SU-1579	SU-1579 x SU-1561, SU-1572 x SU-1561, SU-1557 x SU-1561
7	Leaf length (cm)	SU-1571 x SU-1557	SU-1557 x SU-1561, SU-1571 x SU-1561 SU-1569 x SU-1561	SU-1579 x SU-1561, SU-1571 x SU-1572, SU-1581 x SU-1561
8	Leaf breadth (cm)	-	SU-1557 x SU-1565, SU-1561 x SU-1565, SU-1569 x SU-1565	SU-1571 x SU-1565, SU-1579 x SU-1565, SU-1581 x SU-1565
9	Ear head length (cm)	-	SU-1572 x SU-1519, SU-1572 x SU-1561, SU-1557 x SU-1569	SU-1557 x SU-1519, SU-1569 x SU-1519, SU-1572 x SU-1569
10	Number of primaries per panicle	-	SU-1571 x SU-1519, SU-1571 x SU-1557, SU-1571 x SU-1581	SU-1557 x SU-1519, SU-1571 x SU-1565, SU-1561 x SU-1519



11	<b>Number of spike-lets per spike</b>	SU-1569 x SU-1519, SU-1572 x SU-1569	SU-1569 x SU-1561	SU-1569 x SU-1579
12	<b>Ear girth (cm)</b>	-	SU-1572 x SU-1519, SU-1571 x SU-1519	SU-1571 x SU-1557, SU-1557X SU-1519, SU-1579 x SU-1519
13	<b>Ear weight (g)</b>	-	SU-1572 x SU-1519, SU-1557 x SU-1519, SU-1572 x SU-1561	SU-1571 x SU-1557, SU-1571 x SU-1519, SU-1569 x SU-1519
14	<b>1000 grain weight (g)</b>	-	SU-1572 x SU-1519	SU-1557 x SU-1581, SU-1571 x SU-1581, SU-1569 x SU-1519
15	<b>Grain yield (g plant<sup>-1</sup>)</b>	SU-1557 x SU-1519	SU-1572 x SU-1519, SU-1572 x SU-1561, SU-1572 x SU-1579	SU-1571 x SU-1557, SU-1581 x SU-1565, SU-1569 x SU-1519
16	<b>Dry fodder yield (g plant<sup>-1</sup>)</b>	-	SU-1557 x SU-1519, SU-1571 x SU1557, SU-1571 x SU-1569	SU-1569 x SU-1519, SU-1557 x SU-1572, SU-1572 x SU-1569
17	<b>Harvest Index (%)</b>	-	-	SU-1572 x SU-1519, SU-1557 x SU-1569, SU-1579 x SU-1565
18	<b>Protein content in grain (%)</b>	-	SU-1572 x SU-1561, SU-1579 x SU-1561	SU-1569 x SU-1579, SU-1557 x SU-1561, SU-1572 x SU-1579
19	<b>Protein content in fodder (%)</b>	SU-1579 x SU-1561	SU-1579 x SU-1581, SU-1581 x SU-1565	SU-1569 x SU-1579, SU1579 x SU1565, SU-1561 x SU-1565

#### IV. CONCLUSION

In all the environments studied, there were significant differences among all the treatments for all the characters. The environments under study differed significantly for almost all the characters when analyzed for stability. There was role of both linear and non-linear components in building up total genotype x environment interaction. According to of stability parameters, three parents viz; SU-1572, SU-1571 and SU-1557 and ten F1s viz; SU-1571 x SU-1557, SU-1571 x SU-1572, SU-1571 x SU-1519, SU-1557 x SU-1561, SU-1557 x SU-1519, SU-1572 x SU-1569, SU-1572 x SU-1579, SU-1572 x SU-1561, SU-1572 x SU-1519 and SU-1569 x SU-1519 found stable for different environments for increased grain yield per plant over all three locations under study.

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# Medicinal Plants as Immunity Booster against Corona Virus Infection

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## ABSTRACT

A number of medicinal plants are tested against various types of diseases especially COVID-19 in several types of research. Special emphasis of tests of medicinal plants is placed on Indian medicinal plants that are reported for antiviral, immuno-modulatory, and anti-allergic/anti-inflammatory activities, and they are categorized for prioritization in research based on earlier reports. In the Corona period, everyone understood the importance of good food, nutrition, and own immunity power. The burden of the COVID-19 pandemic in India has led to people seeking alternative treatments such as preventives and treatment options such as medicinal plants. This study aimed to assess factors associated with the utility of medicinal plants as an Immunity booster preventive or treatment of respiratory symptoms related to COVID-19 during the pandemic. Electronic Data Hub was used to systematically study fun studies. Only research papers published between 2020 and 2020 were included in the study. The studies reported that benefited greatly from the use of medicinal properties like Giloy, Ashwagandha, Sarpagandha, Amla, Lemongrass, etc. Most of the studies reported that medicinal plants were proving helpful in reducing the symptoms of covid, as well as helping to improve immunity.

**Keywords:** Covid-19; Corona; Medicinal plants; Indian plants; Immunity; SARS-CoV-2

## I. INTRODUCTION

The COVID-19 pandemic, also known as the coronavirus pandemic, is an ongoing global pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The virus was first identified in December 2019 in Wuhan, China (Liu et al., 2021). At present, not only India but the whole world has been disturbed by the havoc of the Corona epidemic, and lifestyle has completely changed. There has also been a change in eating habits and living habits (Villena-Tejada et al., 2021). Corona has forced people to think about the environment, so people have started planting trees around their Household (HH) houses, many people have started planting plants (herbs) with medicinal properties in their HH. Because these trees and plants are also the treatment for many diseases (Kumar and Gautam, 2021). Herbal medicines have also helped to alleviate the effects of infectious diseases such as COVID-19 (Agnihotri & Singh, 2021). Evidence supports that herbal medicine may be effective in reducing and managing the risk of COVID-19 (Kumar and Gautam, 2022). The use of herbal medicine as an alternative remedy for COVID-19 in combination with modern medicine, and has released several recommendations for herbal therapy (Agnihotri,

2022). Since many botanical drugs show antiviral efficacy, the use of herbal medicine for therapeutic purposes should not be underestimated. Currently, well-known herbal medicines with antiviral activities are being used as an additional treatment to suppress COVID-19, since conventional treatments are still not well succeeded (Cutcheon et al., 2020).

According to the literature survey, if both the methanolic extracts contain a methoxy group on the third group of the piconidal glycoside (polyphenolic compound) structure, such compounds show antiviral activity (Orhan et al., 2020). This has not been researched. If it happens, it will prove beneficial in preventing corona infection. Some special herbs, which can keep in the kitchen garden, can try to keep the whole family disease-free. In rural areas where medical facilities are very far away, the importance of such Arogya Vatika increases even more (Adhikari et al., 2020). These are the merits of some of these easy-to-plant medicinal plants. The objective of the study was to assess factors associated with the utility of medicinal plants as an immunity booster preventive or treatment of respiratory symptoms related to COVID-19 during the pandemic.

## II. METHODS

Assessment of Utility of plants as Immunity boosters against covid by using rapid review methods to search and critically appraise existing research. Electronic Data Hub was used to systematically study fun studies. Only research papers published between 2020 and 2020 were included in the study. A total of 31 research papers were studied thoroughly, while only abstracts of 102 research papers were studied.

## III. RESULTS AND DISCUSSION

The research was done by the University of Columbia, researcher has selected 100 plants for research work and tested their methanolic extracts against coronaviruses. Extracts from 12 plants displayed antivirus activity. In these, extracts of two plants *Rosa Nutkana* and *Amelanchier Alnifolia* were found to be active against coronavirus (Idrees et al., 2021). The common name of *Rosa Nootcana* is Nootka Rose, Wild Rose, (Hindi: Nootka Gulab), and the common name of *Amelanchier Alnifolia* is Saskatoon Vary. Both these plants belong to the species Rosacea. The chemical compound of methanolic extracts of both plants is active against the coronavirus (Li et al., 2020). The medicinal plants readily available in India are mentioned below:

1. **Giloy:** Giloy is also known as Amrita and its botanical name is *Tinospora Cardifolia*. The time of transplanting or sowing is May-June. It can be easily grown in almost all types of soil. Plant-to-plant distance should be kept at 60 by 60 cm. It is a vine with betel-like leaves. A new plant is formed from the pieces of the stem (Shree et al., 2022). Medicinal benefits: Grind about 6 inches piece of Giloy stem and boil it in 1 liter of water for 10 to 15 minutes and drink it, it is beneficial in fever, diabetes, liver, and kidney diseases. Apart from this, it is beneficial in arthritis, jaundice, leprosy, piles, and skin stress.
2. **Aloe Vera:** Aloe vera is also known as Ghrit Kumari or Gwarpatha. Its scientific name is *Aloe Barbadosis*. It is a plant of the Lamisi family. Its sowing or transplanting time is February-March and August-September. Plant to plant distance should be kept at 90 x 60 cm and 60 by 45 cm. It is a small plant, the main useful part of which is its fleshy leaves. A new plant is formed from the baby plant that came out from the mother plant (Mpiana et al., 2020). Medicinal benefits: Taking the pulp of aloe vera leaf and consuming it daily is beneficial for diabetes and stomach-related diseases. Apart from this, the pulp of its leaves is also used in cosmetics, joint pain, and burn cuts (Sánchez et al., 2020).

3. **Ashwagandha:** Ashwagandha is a bushy plant and a new plant is prepared from the seed. It is a plant of the Solanaceae family, its botanical name is *Withania Somnifera*. The time of sowing seeds is July-August. Plant to plant distance should be kept at 30 x 40 cm. The root of Ashwagandha is mainly used in medicine (Idrees et al., 2021). To get root, after October-November, when the leaves fall from the plant, the plant is uprooted from the ground and separated. Medicinal benefits: Taking the powder of Ashwagandha root with milk provides relief in fatigue, weakness, and joint pain. Taking Ashwagandha and Ashwagandha root powder in equal parts with milk is more beneficial and applying Ashwagandha leaves on boils is beneficial (Chopra, et al., 2021).
4. **Basil:** This is a bushy plant that is prepared from seeds. Its medicinal is *Ocimum Basilicum*. It is a plant of the Lamisi family. Its sowing or transplanting time is from February to May. Plant to plant distance should be 60 x 40 cm. Due to the innumerable medicinal properties of Tulsi, it is also called an environmental remedial plant (Pattanayak et al., 2021). Medicinal benefits: A decoction of basil leaves is beneficial for cold, and fever. So the juice of its leaves is beneficial in ear pain, stomach pain, skin diseases, graying of hair, burning in urine, menstrual disorders (periods), infertility, cough-cold, and blood pressure (blood pressure).
5. **Adusa:** It is also known as *Justicia Adhatoda*. Adusa is a bushy plant with large leaves, which can be planted by cutting. It produces white flowers. Medicinal benefits: boil 4 leaves of Adusa in half a liter of water for 10 to 15 minutes, after filtering, after cooling, mix two spoons of honey and drink it twice a day, it is beneficial in chronic cough, cough, and asthma (Ahmad et al., 2021).
6. **Neem:** Botanical name is *Azadirachta indica* and the plant is planted by seed and every part of the neem plant is medicinally very important. Medicinal benefits: Neem bark twig is useful for cleaning teeth and leaves are beneficial for diabetes, fever, and stomach diseases (Fatima et al., 2021). The smoke of dry leaves is also useful in repelling mosquitoes. Mixing powder of neem oil with neem cake or garden land also protects against termites and ants (Shree et al., 2022).
7. **Amla:** Botanical name is *Phyllanthus Emblica* and its propagation is also done by pen. Amla is also called nectar fruit. Medicinal benefits: Consuming the juice of amla fruit increases the immunity of the body. The regular consumption of amla fruit is a good source of vitamin C, which helps in the proper functioning of organs like the eyes, brain, heart, etc (Murugesan et al., 2021).
8. **Pomegranate:** Botanical name is *Punica Granatum* and also called denim or pomegranate. It can be prepared both from seed and cutting. The root bark, fruit, peel, and juice of the pomegranate plant are very useful medicinally. Medicinal benefits: Boil the bark of pomegranate root in water and drink it 4-6 times a day, it destroys stomach worms (Yousefi et al., 2021). Pomegranate fruit juice increases the amount of hemoglobin in the blood. It is also beneficial in heart disease. A decoction of the peel of the fruit provides relief in diarrhea and stomach diseases.
9. **Mint:** Botanical name is *Mentha piperita* and is also known as an aromatic plant. It can be easily planted in pots. Every branch of it can become a plant. Its leaves are used as medicine. Medicinal benefits: Grinding mint leaves and consuming them provides relief in diarrhea (Singh et al., 2021). Taking juice of leaves and ginger juice mixed in equal quantity provides relief for fever, colic, loss of appetite, etc.
10. **Evergreen:** The botanical name of the evergreen is *Catharanthus Roseus*. Its new plant is formed from both seed and cuttings. It is sown by the nursery in March-April and by transplanting in June-July. The distance between plant to plant should be kept at 30 by 30 cm. Medicinal benefits: The juice of the leaves of the evergreen plant is anti-cancer, anti-diabetic, anti-worm, and depressant (McMichael et al., 2020).

11. **Lemon Grass:** Lemongrass is also known as Jarakush, Malabar, or Lemongrass. Its leaves taste like lemon. The botanical name of lemongrass is *Cymbopogon Flax*. A hot or humid climate is suitable for this (Silveira et al., 2020). It is planted and sown in February–March. Plant to plant distance should be kept at 60 by 60 cm. Medicinal benefits: Lemongrass is used in the form of vitamin A, in making cosmetics, fragrances, soaps, etc.
12. **Safed Musli:** The botanical name of Safed Musli is *Chlorophytum Borivilianum*. It is a plant of the Liliaceae family. Its new plant comes from seed or tuber. Safed Musli should be planted in such a place where water does not stagnate, that is, there should be a good drainage system. In addition, the soil should be sandy and rich in organic matter (Hussain, et al., 2020). Moisture in the soil is essential during crop growth. The time for sowing seeds or transplanting tubers is May–June. Plant to plant distance should be kept between 30 to 15 cm. Medicinal benefits: It is beneficial in general weakness, joint pain, and diabetes.
13. **Liquorice:** Botanical name is *Laurus nobilis*. The bay leaf is an aromatic leaf commonly used in cooking. It can be used whole or in a dried or ground form. The leaves contain about 1.3% essential oils, consisting of 45% eucalyptol, 12% other terpenes, 8–12% terpinyl acetate, 3–4% sesquiterpenes, 3% methyl eugenol, and other  $\alpha$ - and  $\beta$ -pinenes, phellandrene, linalool, geraniol, terpineol, and also contain lauric acid. Its tea is very beneficial for health (Silveira et al., 2020). If you have sleep problems or have weak digestion, then definitely consume Bay leaves tea benefits. Bay leaves also provide relief from diabetes and stress.
14. **Sweet Basil:** Sweet basil is also called stevia. The botanical name of Stevia is *Stevia rebaudiana*. It is a plant of the Compositae family. This sandy loam soil and red soil should have a proper drainage system. Also, the pH of the soil should be between 6 and 8. Stevia can be grown in places with 150 x 180 cm rainfall and 15 x 30-degree temperature (Paidi et al., 2021). It is propagated by cuttings. Planting is done in February–March and September–November. Plant to plant distance should be 45 x 25 cm. Medicinal benefits: Sweet basil stevia is very beneficial in diabetes, high blood pressure, skin disorders, and dental diseases.
15. **Sarpagandha:** SarpagandhaGhanVati is an Ayurvedic medicine derived from sarpagandha, a valuable root obtained from the flowering plant, *Rauwolfia serpentina*. The botanical name of Sarpagandha is *Rauwolfia serpentina*, it is a plant of the Apocynaceae family. For this sandy loam soil is suitable. There should be a drainage system in the soil and there should be plenty of bacteria. It is propagated by seed, water, and stem (Singh et al., 2020). Plant to plant distance should be 60 x 60 cm. Medicinal benefits: The juice of Sarpagandha leaves is beneficial in diseases like hypertension, insomnia, and hysteria (Kumar et al., 2019).
16. **Ginger:** Botanical name is *Zingiber Officinale* also called Adrak. A flowering plant whose rhizome, ginger root, or ginger, is widely used as a spice and folk medicine. It is a herbaceous perennial which grows annual pseudostems about one meter tall bearing narrow leaf blades (Sand et al., 2020). Usually, we use ginger only for colds and coughs, but ginger is such a thing in which hundreds of properties are found. It not only cures many diseases but also prevents many diseases from occurring. It is said in Ayurveda to drink its water to consume it regularly (Paidi et al., 2021). Ginger water is very beneficial for our health. Ginger water is rich in anti-inflammatory, antifungal, antibacterial, and antiviral properties, which benefit health in many ways.

17. **Black pepper:** Botanical name is *Piper nigrum*. Due to the taste of black pepper, you can eat it by adding it to many things. The easiest way to include black pepper in your diet is through tea, soup, and vegetables, you can consume all these things by adding black pepper powder or whole black pepper (Silveira et al., 2020). Apart from this, black pepper is also used in many types of curries and vegetables. Sometimes it is also sprinkled with black pepper over salads and fruit chaat (Kumar et al., 2021).
18. **Cloves:** Botanical name is *Syzygium Aromaticum*. Ground cloves or clove buds are used. Cloves are used in all kinds of curries and vegetables. You can also use clove buds to make rice (Kumar et al., 2019). By doing this, there is a change in the effect of rice, cloves can also be used inside a tea or by adding them to detox drinks. Its consumption boosts immunity (Vicidomini et al., 2021). Interestingly, traditional medicines have used clove since ancient times to treat respiratory ailments, whilst clove ingredients show antiviral and anti-inflammatory properties. Other interesting features are the clove's antithrombotic, immunostimulatory, and antibacterial effects. Thus, in this review, we discuss the potential role of clove in the frame of anti-COVID-19 therapy, focusing on the antiviral, anti-inflammatory, and antithrombotic effects of clove and its molecular constituents described in the scientific literature.
19. **Chirata:** the plant is also known as Kanmegh or *Swertia Chirata*, Its trees are 2 to 4 feet high, one-Varshayu or Bi-Varshayu. Its leaves and bark are very bitter and are considered anti-fever and blood purifiers in medicine. It has many small and big castes; Like- Kalpnath, Geema, Shares, etc. According to the experts of the ancient Ayurveda medical system, Kalmeghi. e. absinthe plant is not less than time for corona. The use of medicine made from this plant increases the immunity of the body so much that the body itself becomes capable of eliminating viruses and other infections like corona (Dey et al., 2020). Considering the specialty of Kalmegh, a large number of medicines and decoctions have also been started in Bhopal. Due to the infection of Corona, its decoction is also being distributed throughout the state through the Department of AYUSH (TOI, 2021).
20. **Liquorice:** Liquorice or licorice is the common name of *Glycyrrhiza Glabra*, a flowering plant of the bean family Fabaceae, from the root of which a sweet, aromatic flavoring can be extracted. The licorice plant is an herbaceous perennial legume native to Western Asia, North Africa, and Southern Europe (Diomede et al., 2021). Gujarat Biotechnology Research Center (GBRC) shared the discovery made with the researchers. In a presentation titled 'Reposing and Validation of Phytochemicals and Ayurvedic Formulations' for the treatment of Covid-19, he told that alcoholic terbinic acid, alcoholic acid, and globalize found in licorice can prove to help fight the coronavirus (Khaw et al., 2021).

#### IV. CONCLUSION

The most effective during corona has been to increase immunity. Along with a good diet, herbs also contribute a lot to increasing immunity. Some of the antiviral medicinal plant species are Giloy, Aloe Vera, Ashwagandha, Basil, Adusa, Neem, Amla, Pomegranate, Mint, Evergreen, Lemon Grass, Safed Musli, Liquorice, Sweet Basil, Sarpagandha, Ginger, Black pepper, Cloves, Chirata, and Liquorice are the most desirable herbal drink or fruit that can introduce effective adjuvant components in COVID-19 management. Most of the studies were demonstrating that the vitamins and minerals found in this medicinal plant are helpful for a healthy life. And a healthy body is capable of fighting infections. Most of the studies reported that medicinal plants were proving helpful in reducing the symptoms of covid, as well as helping to improve immunity.

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# Pathological Quality of Khoa Marketed in Aurangabad City

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## ABSTRACT

The study was conducted to investigate the pathogenic quality of khoa marketed in Aurangabad city. In all 10 samples of khoa from Hotellers, 10 samples of khoa from Street vendors and 10 samples of khoa from Halwais shop were collected. The average yeast and mould count per gram were found to be highest in Street vendors sample and lowest in Halwais samples. In case of evidence of pathogens in samples of Hotellers and Street vendors were contaminated with Salmonella and Shigella and the few samples of Halwais were contaminated with Salmonella and Shigella.

**Key words:** Khoa, Pathogens, Hotellers, Street vendors, Halwais.

## I. INTRODUCTION

India is the highest milk producer and ranks first position in the world contributing 24.64% of global milk production in the year 2021- 22. Out of the total milk produced near about 6.5% milk is converted into khoa and khoa based sweets are provide a good means of conserving and preserving surplus milk solids. The manufacturer of these products is based on traditional method without any regard to the quality of raw material used and/or the hygienic quality of the product. Under such conditions many pathogenic microorganisms can find access to the milk products (Soomro *et.al.*, 2002). The unhygienic conditions at the production units lead to contamination of products with different types of pathogenic microorganisms leading to a low shelf life of the finished products, most of the products sold in the market without proper packaging and unduly exposing them to atmospheric contamination (Khan, 2006). Considering the above facts, the detection of pathogenic microorganism in khoa is an integral part of any good quality assurance program and reflect the effectiveness of sanitation practices, processing and distribution schemes. It is felt essential to find out the micro pathological quality of khoa marketed in Aurangabad City.

## II. METHODS AND MATERIALS

Present investigation was undertaken to study pathogenic quality of khoa marketed in Aurangabad city. All the samples of khoa analyzed in the present study were collected from various sources viz., Hotellers Halwais, Street vendors. The samples of khoa each of above source were collected randomly in sterilized butter paper and wrapped immediately and were brought in ice box till analyzed. Samples were subjected to yeast and mould count by the method cited in I.S.I (IS: 5403) 1969 using potato glucose agar medium. Salmonella -

Shigella were detected by the method cited in Standard methods for examination of products microbiological and chemical, published by A. P. H.A. 1960, using S.S agar medium.

### III.RESULTS AND DISCUSSION

**Table No. 1 Yeast and mould count of market khoa samples from various sources obtained**

Sr. No.	Source	Min. counts/g	Max. counts/g	Average counts/g
1.	Hotellers	$32 \times 10^2$	$37 \times 10^2$	$34.5 \times 10^2$
2.	Street vendors	$52 \times 10^2$	$60 \times 10^2$	$56 \times 10^2$
3.	Halwais	$2.0 \times 10^2$	$3.5 \times 10^2$	$2.75 \times 10^2$

Results obtained on yeast and mould counts of Market khoa sample are presented in Table No. 1. It is seen from table that the yeast and mould counts in khoa samples varied from source, in the range  $32 \times 10^2$  to  $37 \times 10^2$ /g in Hotellers,  $52 \times 10^2$  to  $60 \times 10^2$ /g in Street vendors and  $2.0 \times 10^2$  to  $3.5 \times 10^2$ /g.

The yeast and mould counts in Halwais samples were lower than other two sources.

The results are approximately the same as reported by Naidu and Ranganathan (1965). The yeast and mould count being 50 to 100/g and Ghodekar *et.al.* (1980) who reported the yeast and mould counts was 30 to 6500/g. Karthikeyan and Dhanakakshmi (2011) found 81.81% local vendors, 55.55 % private manufacturers and 54.54% organized dairies samples were positive for yeast and mould count. Rajarajan *et.al.* (2024) reported yeast and mould count varied from 40 to 130 cfu/g.

The presence of yeast and mould count indicated that the product might have been produced and handled under unhygienic conditions and product be contaminated after preparation of product.

Samples collected from Halwai shops has shown lower yeast and mould count. It might be due to the immediate supply of khoa to the Halwai shops, as well as Halwai themselves are preparing khoa as per their day to day requirement.

Thus low yeast and mould count is occurred.

**Table No. 2 Pathogenic organisms of market khoa samples obtained from various sources.**

Sr. No.	Source	Evidence of pathogens
1.	Hotellers	Present
2.	Street vendors	Present
3.	Halwais	Absent

#### **Salmonella and Shigella:**

The khoa samples from Hotellers and Street vendors were showed the presence of pathogens like salmonella and shigella. The growth of organisms on SS Agar plates which were incubated at 37°C for 2 days. Some colonies having pink colour with dark black center and some colonies having pink and some colourless colonies were observed.

The presence of salmonella and shigella is objectionable because they causes many diseases to the human beings and they able to survive for long periods during storage of khoa. Choudhury *et.al.* (2020) reported that the presence of Salmonella spp. and Shigella spp. Were detected in 15.38% and 42.30% in different sweet shops in and around Kolkata. Khan *et.al.* (2014) reported Salmonella typhi was present in 25% while Shigella spp. Bacteria present in 10% in all khoa samples in Akola city.

The presence of these pathogens showed that the post preparation contamination of khoa is always there in the khoa obtained from Hotellers and Street vendors but Halwais khoa samples had not shown evidence of these pathogens.

#### IV. SUMMARY AND CONCLUSION

The pathological quality of khoa the results obtained in the study are summarized as The average yeast and mould count per gram were found to be  $34.5 \times 10^2$ ,  $56 \times 10^2$  and  $2.75 \times 10^2$  of Hotellers Street vendors and Halwais khoa samples, respectively. The average yeast & mould count Per gram was found to be highest in Street vendors samples. It might be due to production and handling of khoa under unhygienic conditions. Whereas it was lowest in Halwais samples.

In case of evidence of pathogens in samples of Hotellers and Street vendors were contaminated with salmonella and shigella and the few samples of Halwais were contaminated with salmonella and shigella.

The presence of pathogens like salmonella and shigella was indicate that post preparation contamination if khoa samples with fecal matter It can be concluded that the pathogenic evidence in Halwai khoa sample is minimum. It is due to the freshens of khoa Halwais are preparing khoa with milk supplied to them. Khoa obtained is immediately used in the preparation of sweet meats. Thus no need of prolonged storage in shop.

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# Current Research Progress in Heat Conduction Problem

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## ABSTRACT

Heat transfer issues are one of the most important issues in many engineering domains. This analysis focuses on the analytical and numerical methods to solve. Heat conduction problems can be accurately described by Fourier law. However, for ultrafast and micro/ nanoscopic heat conduction problems. This paper reviews current progress on heat conduction in engineering. It covers the basic concept, physical model, thermal relaxation effect and related experiments. This paper also introduces the solution methods for heat conduction equations; including differential transform method, finite difference method, finite element method, variational method and other hybrid methods. At the end of the paper some challenging issues are discussed.

**Keywords:** Heat conduction, Analysis solution, Numerical solution

## I. INTRODUCTION

The movement of heat from one physical system to another is known as heat transfer. Heat transfer requires a difference in temperature. These things could be within a liquid or gas or they could be two solids, a solid and a liquid or gas. There are three different ways the heat can transfer: conduction, convection and radiation. The present review work is targeted solely on only the heat transfer by conduction. Conduction is that the method of transferring energy from high energy particles to low energy particles by collision of particles. Conduction process is the process of transferring heat from high temperature to low temperature region of a stationary object. Conduction occurs in many mediums such as solids, liquid and gas as long as no bulk motion is present. Heat transfer through conduction is used in many every day applications, for example to heat a pan on the stove or to cool a space on a cold winter day by conveying heat through the window pane.

The mathematical methods used in the study can be used to predict the temperature distribution Ansari Dezfoli [1]. Analytical solutions are only available for a very basic boundary condition and can not be used for more complex boundary conditions. However, 2D thermal problems with basic and complex boundary conditions can be solved using numerical methods such as boundary element method (BEM), finite difference method (FDM), finite element method (FEM), finite volume method (FVM), differential transform method (DEM), integral transform method (ITM). This method is generally used as a numerical method to solve linear, non-linear and various types of problems, Suresh et al. [2].

Heat conduction problem studies have a wide range of uses and are almost universally used in all scientific and engineering such as aeronautics engineering, biomechanics engineering, chemical engineering, nuclear physics,

equipment geometry and so on, in this paper review on the current progress on heat conduction by various method.

## II. REVIEW OF PREVIOUS WORKS

The earliest heat conduction experiment was carried on low temperature conditions. Han-Taw et al. [3] used to hybrid laplace transform/ finite element method for one dimensional transient heat conduction problems. Han-Taw et al. [4] Utilize the new approach combining the Laplace transform and Finite Difference method for transient heat conduction problem. Han-Taw et al.[5] analysis of the combined use of the Laplace transforms and finite element method for two- dimensional transient heat conduction. The presence method is a useful tool in solving lengthy problems or in other engineering applications. Chen and Lin [6] the non-linear transient heat conduction in a hollow cylinder with temperature dependent thermal conductivity is investigated numerically by using the hybrid application of the laplace transform technique and the finite element method or finite difference method. The differential transformation technique which is numerically method based on the Taylor series expansion.

Chu and Lo[7] employed the differential transformation and finite difference method to analyze nonlinear transient heat conduction problems. The differential transformation method converts the time- domain governing equations into spectrum – domain governing equations. Chu and Chen solve the non-linear heat conduction problem using differential transformation and finite difference method [8]. Peng and Chen[9] use a numerical method that has been combine the differential transformation and finite difference method for the prediction of laser heating problems. Peng and Chen[10] studied the hybrid differential transformation and finite difference method to annular fin with temperature dependent thermal conductivity. The exposed surface of the Fin with temperature- dependent thermal conductivity. The exposed surface of the fin dissipates heat to the environment through convection and radiations. Gaikwad and Ghadle[11] have determined the temperature and thermal deflection in a thin hollow circular disk under an unsteady – state temperature field due to internal heat generation within it.

## III. THEORETICAL DEVELOPMENT OF HEAT CONDUCTION AND SOLUTION METHODS

Fourier law of heat conduction: according to French Mathematician **Jean Baptise Joseph Fourier (1768-1830)** the heat is proportional to the normal temperature gradient.

$$\bar{q} = -k\nabla T \quad (1)$$

Where  $\bar{q}$  is the heat flux vector,

$\nabla T$  is the normal temperature gradient vector,

$k$  is called the thermal conductivity and the minus sign is inserted so that the second principal of thermodynamics will be satisfied.

The General three- dimensional heat conduction equation is [12]

$$\frac{\partial}{\partial x} \left( k \frac{\partial T}{\partial x} \right) + \frac{\partial}{\partial y} \left( k \frac{\partial T}{\partial y} \right) + \frac{\partial}{\partial z} \left( k \frac{\partial T}{\partial z} \right) + \dot{q} = \rho c \frac{\partial T}{\partial \tau} \quad (2)$$

For constant thermal conductivity equation (2) is written :

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} + \frac{\dot{q}}{k} = \frac{1}{\alpha} \frac{\partial T}{\partial \tau} \quad (3)$$

Where the quantity  $\alpha = \frac{k}{\rho c}$  is called the thermal diffusivity of the material.

## **Numerical Solution:**

An approximation of a mathematical equation's solution is called a numerical solution. For engineering purposes, numerical methods can be used to estimate the solution of heat conduction equation. Although numerical methods, such as finite difference method (FDM), finite element method (FEM), finite volume method (FVM), differential transform method (DTM), Integral transform method (ITM) are elaborate enough to explain all the physical mechanism.

### **A. Finite Difference Method**

One of the earliest techniques for the numerical solution of differential equations was the finite difference method. It was first utilized by Euler, probably in 1768. While, Chen et al. [13] pointed out the analysis of a one-dimensional fin using the analytic method and the finite difference method. The FDM is an numerical solution of an effective method of obtaining temperature profile for the steady heat transfer process. The FDM is derived from the differential equation of heat conduction. The heat conduction differential equation which is converted into difference equation through discretization and the resulting series of recursively or algebraic equations can be easily solved by matrix method. Sobamowo [14] The finite difference method was used to analyze heat transfer in a longitudinal rectangular fin with temperature-dependent thermal conductivity and internal heat generation. Wadkaret al. [15] The determination transient temperature distribution in a thick straight rectangular fin. The governing non-linear differential equation is solved by using finite difference method. Yang [16] proposed a sequential method to estimate boundary condition of two-dimensional hyperbolic conduction problems.

### **B. Finite Element Method**

The Finite Element Method (FEM) is a famous method for numerically solving differential equations in engineering and mathematical modeling. The finite element method has proven, within the past few years, to be one of the most general and useful procedures for the analysis and prediction of irregular geometry problems. Visser [17] A finite element method for the determination of non-stationary temperature distribution and thermal deformations, Cha'o -Kuang Chen et al. [18] obtained by the implementation of a new hybrid **Laplace transform/ Finite element** method developed by the authors. Test examples are used to show that the basic accuracy is comparable to that obtained by analytical, finite difference and finite element methods. previously reported hybrid laplace transform/ finite element methods have been confirmed to one nodal solution at a time.

### **C. Differential Transform Method**

The differential transformation method (DTM) is a numerical which depends upon a Taylor series and has application in many areas including heat transfer. Chen and Liu [19] using this method to solve two boundary value problem. The differential transformation is also very suitable to combine with other numerical techniques, as Yu and Chen [20] applied the application of the hybrid method to the transient thermal stresses response on isotropic annular fins. The nonlinear transient conduction- convection – radiation heat transfer annular fin equation is solved by the hybrid method of the Taylor transformation and the finite difference approximation. Wadkar et al. [21] employed the hybrid differential transformation – finite difference method used to solve the non linear transient heat conduction problem. The differential transformation method used to solve the governing equations from the time domain to spectrum domain.

### **D. Integral transform method**

In mathematics, an integral transformation is a transformation that describes a function by integrating it from its original function space into another function space via integration. Gaikwad [22] has determined the quasi



static thermal stresses in a thick circular plate subjected to arbitrary temperature on the outer circular edge, with lower and upper face are at zero temperature the governing heat conduction equation has been solved by using finite fourier sine transform technique. Gaikwad and Nanir [23] analyzed the transient thermoelastic temperature distribution of a thin circular plate and its thermal deflection during uniform internal heat generation development. The integral transform method is used to obtain the analytical solution for the temperature field and thermal deflection.

#### IV. CONCLUSION

This paper provides an overview of current research progress in heat conduction problem. In engineering applications there existing broad phenomenon. For example, a difficult task in finding solutions to governing equations that reflect physical system. Nothing could be more appealing than discovering exact closed form solutions to these equations. However, because non linearity occurs in the majority of real- world engineering issues numerical techniques must be used to acquire the solution.

In modern society, more and more researchers and experts are interested in the research of heat conduction phenomenon.

So far, the problems of heat conduction of the following challenging issues.

1. This question is posed by some researcher who claim that heat conduction equation does not confirm to the second thermodynamic law.
2. It is very difficult to obtain the analysis solution of heat conduction problems with complex boundary conditions.
3. The numerical results are mainly based on computational methods, and in most cases the results are numerical oscillations therefore the correct method of calculation is very important.
4. Experiment research on heat conduction is still very rare.

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# Impact of Microplastic in Marine Environment and Human Health

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## ABSTRACT

Small plastic particles called microplastics, which have a diameter of five millimeters or smaller, have become a major environmental issue with profound impacts on both marine environments and the well-being of people. The origins, distribution, and ecological impacts of microplastics in aquatic habitats are covered in detail in this paper, along with any possible concerns about human health from the ingestion of polluted seafood and water. Microplastics are produced by several processes, such as the degradation and breakup of larger plastic objects, deterioration of synthetic materials, and removal of tiny particles from cosmetics and other personal care items. These particles enter lakes, rivers, seas, and other bodies of water, posing a serious hazard to aquatic life. Marine and freshwater creatures are both affected, with effects ranging from physical ingestion and tangling to modifications in habits, development, and reproductive success. Additionally, hazardous viruses and substances can be transported by microplastics, thereby increasing environmental hazards.

Keywords- Microplastic, Marine environment, Seafood, Human health, Aquatic life

## I. INTRODUCTION

Microplastics are a major problem in the oceans and marine life. Most plastics produce small-particle plastic trash; microplastics are defined as materials made from plastic with a diameter of less than 5 mm (You *Li et. al.*, 2021). Plastic pollution in the environment is generally seen as a danger to the health of aquatic ecosystems and is extremely unpleasant for ethical and aesthetic reasons (Thompson *et. al.*, 2006). They originate from several different sources, such as bigger plastic waste that breaks down into smaller bits or microbeads, which are microscopic fragments of synthetic polyethylene plastic used in both health and cosmetic products (NOAA). Over the past several decades, there has been an exponential rise in the production of anthropogenic trash, 70 percent of which consists of plastics (Derraik, 2002). In actuality, less than a year after manufacturing, over 50 percent of all plastic is wasted, and the majority of that garbage cannot be recycled or utilized again. Microplastics are present throughout the planet from the polar regions to the equator and coastal areas to aquatic habitats (Tursi *et. al.*, 2022).

More than 10 billion tons of plastic materials have been manufactured since the third industrial revolution in 1950, with the annual production rate rising exponentially. More specifically, from 2 million tons in 1950 to 367

million tons in 2020, the output of plastics has increased dramatically. Additionally, it is predicted that the output will rise even more, reaching around 600 million tons by 2025 (Fig.1) (R. Geyer et al.,2017).

Ocean currents and circulation patterns move microplastics, making it challenging to monitor and identify them. Microplastics are abundant in seas worldwide. Microplastics have major negative effects on water and marine life. When marine species consume microplastics, they can have a variety of harmful consequences on their well-being, including genotoxicity, growth retardation, stress caused by oxidation, and reduced feeding activity (You Li *et. al.*, 2021). Different marine biota, such as corals, plankton, and aquatic invertebrates such as fish and whales, can swallow these microscopic plastics, which are ultimately transported down the food chain (Sharma and Chatterjee, 2017). Additionally, larger plastic trash can entangle marine creatures, leading to asphyxia and harm. Microplastics can disrupt the ocean's natural food webs and carbon cycles, changing the biological pump that helps control climate by boosting the creation of oceanic snow and carbon from organic matter. The entire ecology may be impacted in a cascading manner.

## II. MECHANISM OF THE FORMATION OF MICROPLASTIC

The primary form of microplastics is when plastics break down owing to environmental weathering. The two primary modes of plastic breakdown in which plastics occur are abiotic and biodegradation. Environmental elements, including sunshine, heat, and mechanical stress, lead to abiotic degradation, which causes plastics to disintegrate into smaller fragments. In contrast, biodegradation refers to the breakdown of plastics by microorganisms, such as bacteria and fungi (Osman *et. al.*, 2023). The fragmentation of macroplastics results in the formation of microplastics. The primary methods through which microplastics are produced in nature are the aging and disintegration of plastics. Small plastic particles typically absorb organic contaminants and heavy metal ions and have a high level of toxicity, which may result from their structure. Because of their small size and slow decomposition in natural environments, microplastics readily bioaccumulate. A method for calculating the propensity of polymers to produce microplastics depending on their physical and mechanical characteristics, has been developed to predict the production of microplastics. Weathering can occur when plastic is exposed to external elements, including wind, rain, and temperature fluctuations. This may result in the plastic becoming brittle and shattering into smaller pieces (Bacha *et. al.*, 2021). Microplastics can also arise as a result of their aging, which is a significant process. Traditional petroleum-derived plastics have a tough time of deteriorating and aging in the natural environment, where they are influenced by several environmental elements (Lu *et. al.*, 2023). Microplastics may form as a result of the aging process, which can cause plastics to become fragile and shatter into tiny pieces. Small plastic particles typically absorb organic contaminants and heavy metal ions, and have a high level of toxicity, which may result from their structure. The abrasive action of waves on sand and rocks along the coast also degrades plastic.

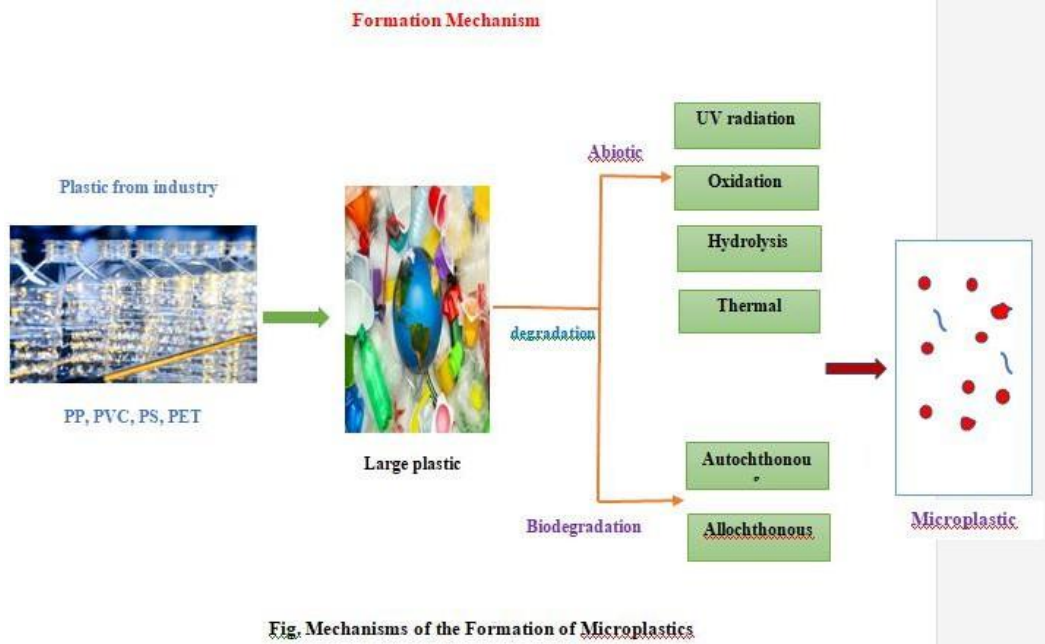


Fig. Mechanisms of the Formation of Microplastics

Abiotic degradation is the process by which plastics are broken down into microplastics under the influence of physical and chemical factors. UV radiation, oxidation, thermal impacts, hydrolysis, and abrasion from wave action in the seas and oceans are the main causes of the abiotic deterioration of plastics (Costa *et. al.*, 2017).

### III. CLASSIFICATION OF THE MICROPLASTIC

There are two main categories of microplastics: primary and secondary (Verma *et. al.*, 2023).

**Primary microplastics:** Primary microplastics are discharged as plastic particles into the environment. The most common types of microplastics are minute fragments made for industrial purposes, such as cosmetics and microfibers shed from fabrics, fishing nets, and garments.

**Secondary microplastics:** Secondary microplastics are left over by the decomposition of larger plastics, such as water bottles. Secondary microplastics are produced when polymers break down because of environmental weathering.

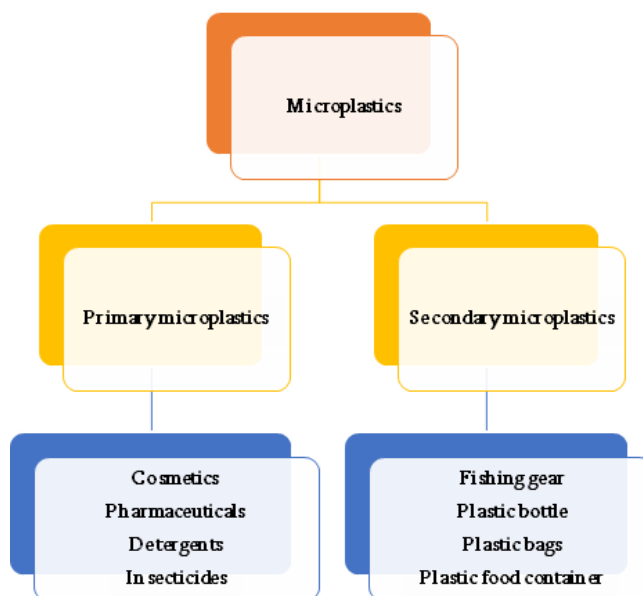


Fig Types of Microplastics

### IV. SOURCES OF MICROPLASTICS IN THE OCEAN

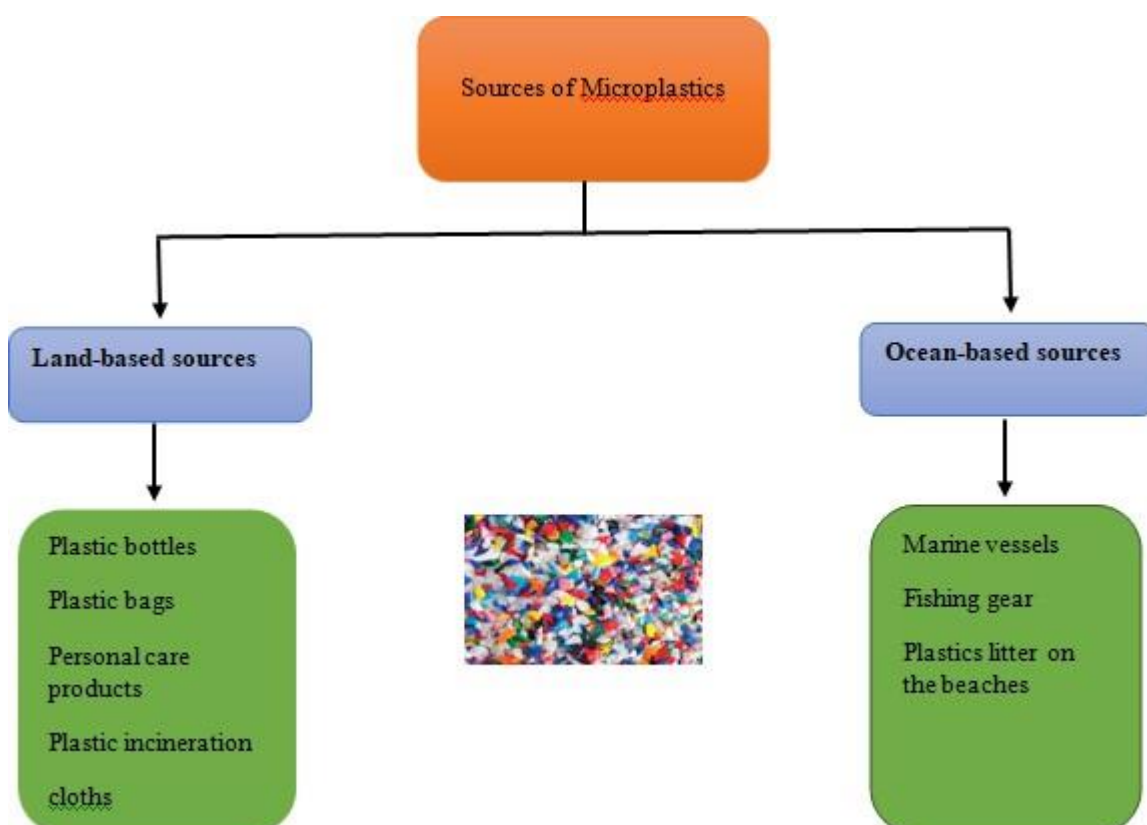
Microplastics in water are produced from a variety of sources, both primary and secondary. According to estimates, between 15 and 31% of microplastics in the seas are primary microplastics, which are microscopic particles that are directly discharged into the environment (Yang *et. al.*, 2021). Primary microplastics mostly originate from

- Cleaning synthetic clothing
- driving-related tire abrasion
- Microbeads in face scrubs

After entering the environment, larger plastic items degrade due to natural weathering processes, producing secondary microplastics (Coyle *et. al.*, 2020). These are sources of secondary microplastics.

- Water bottle
- Fishing net
- Plastic bags
- Microwave container

There are several different causes of marine microplastic contamination, which can typically be categorized into inland, maritime, and aerial sources. The most significant route for microplastics to enter the ocean is thought to be rivers. Owing to hydrodynamic processes, wind and ocean currents, and larger ocean gyres, including the Pacific Ocean, Atlantic Ocean, Indian Ocean, polar regions, and equator, as well as from coastlines to open seas, microplastics are common in the marine environment (Yang *et. al.*, 2021).



## V. IMPACTS OF MICROPLASTIC ON MARINE ENVIRONMENTS

Plastic pollution is one of the most pervasive issues affecting marine ecosystems. Additionally, it endangers human health, tourism on the coast, and the quality and safety of food, and the health of the ocean has an impact on climate change (Kumar *et. al.*, 2020). Owing to their extensive dispersion and potential harm, microplastics have become a serious environmental problem, especially in marine ecosystems. Some of the main ways in which microplastics affect marine ecosystems are as follows.

#### Decomposition and Fragmentation

Microplastics eventually break down in the environment because of their chemical, physical, and biological effects (You Li *et. al.* 2021). Smaller plastic fragments are released as a result of this process and marine species can easily consume these particles.

#### Marine life ingestion

Marine creatures, ranging from microscopic zooplankton to larger fish, as well as filter-feeding species such as mussels and oysters, frequently mistake microplastics for food. Microplastics can cause physical harm, obstruct the digestive tract, and decrease nutritional absorption when swallowed. These effects can eventually affect development or reproduction. Owing to their small size, various marine species can readily consume these plastic particles, which hurts the health of these animals (Chatterjee and Sharma, 2019).

#### Toxic Chemicals

Pesticides and polychlorinated biphenyls (PCBs) are concentrated and absorbed from the surrounding water by plastics. Microplastics containing these compounds can expose marine life to increased toxin concentrations, which may result in bioaccumulation and possible toxicity throughout the food chain. These compounds might be found in microplastics, which expose marine life to increased toxin concentrations and could result in bioaccumulation and possible harmful effects on the food chain. These compounds might be found in microplastics, which expose marine life to increased toxin concentrations and could result in bioaccumulation and possible harmful effects on the food chain.

#### Disruption of Marine Ecosystems

Ecosystems may be disturbed if microplastics accumulate in the marine environment. The capacity of some animals to obtain food, reproduce, and evade predators may change because of the presence of microplastics. Large marine animals, fish, zooplankton, phytoplankton, and other species may all be negatively impacted by microplastics (Corinaldesi *et. al.*, 2021). They can affect these organisms at the molecular, cellular, and organismal levels. They may alter gene expression, produce reactive oxygen species, and eventually result in damage to tissues and stress caused by oxidative stress (Bhuyan 2022).

#### Physical Habitat Alteration

Microplastics can accumulate on the seafloor and in other aquatic ecosystems by changing the structure of such habitats. This may affect benthic creatures, which depend on these areas for protection and food.

#### Economic Impact

These economic implications may result from microplastics in marine environments. For instance, the fishing sector can be impacted if fish populations decrease as a result of ingesting microplastics or if hazardous compounds from plastics contaminate the seafood.

#### Bioaccumulation

Animals living in the ocean may eventually accumulate microplastics. Plastic materials are not biodegradable; therefore, they remain in the ecosystem for a long time. This increases the possibility of bioaccumulation when species at higher trophic levels eat polluted prey, which can cause health problems. As a result, large predators, such as fish that people eventually eat, may have higher concentrations of microplastics. Microplastics can be

consumed by marine species in either a direct or indirect manner throughout the food chain, causing their accumulation in tissues (Chatterjee and Sharma 2019).

A multifaceted strategy is required to address the effects of microplastics on marine ecosystems. This includes lowering the amount of plastic produced and wasted, enhancing trash disposal and recycling procedures, creating substitute materials, and spreading awareness of the problem. To properly comprehend the scope of the issue and create efficient remediation solutions, further studies are required.

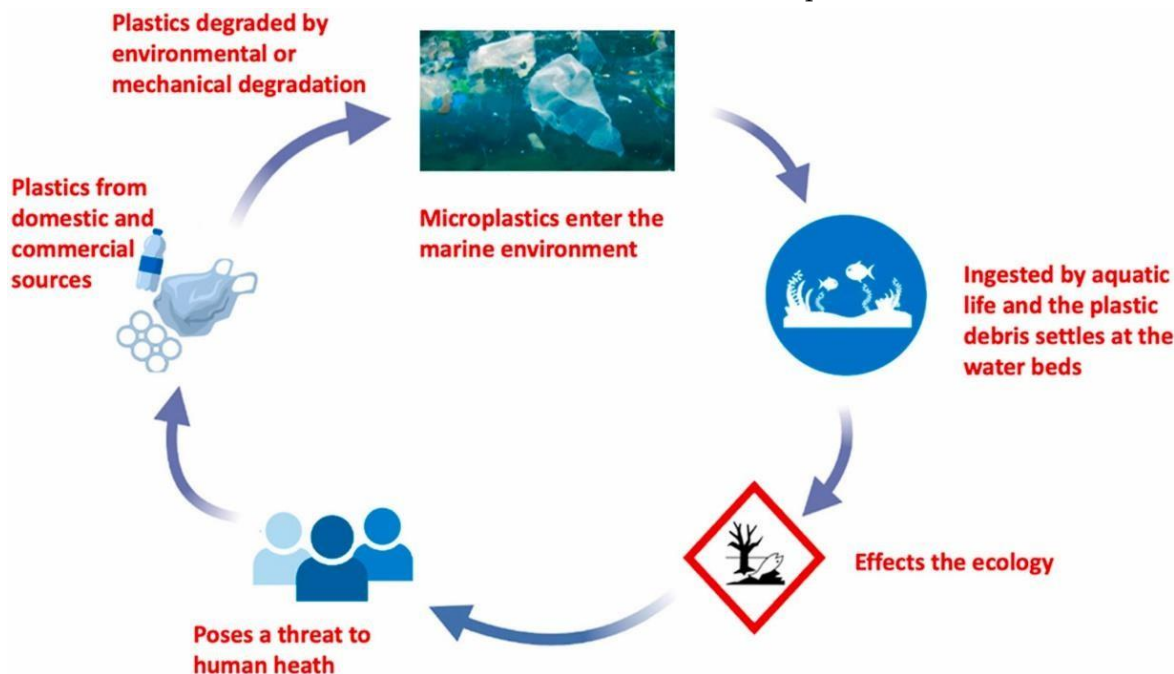


Fig. Effects of Microplastic on the environment (Merlin & Kandasubramanian, 2021) Effects of

microplastics on fish and other aquatic animals

Because of their small dimensions and tendency to be ingested, microplastics can have a variety of consequences for fish and other aquatic species. These outcomes can differ depending on the animal species, the amount and type of microplastics consumed, and the length of exposure. The following are some typical negative consequences of microplastics on fish and various aquatic animals.

#### Ingestion and toxicity

When fish and other aquatic species consume microplastics, they can be poisonous and physically harmful to them. The fish gut, liver, gills, and brain can sustain structural damage from microplastics, which can also have an impact on their behavior, reproduction, and metabolic balance (Zolotova *et. al.*, 2022). Additionally, microplastics can have harmful consequences, such as reduced food consumption, slowed development, damage from oxidation, and aberrant behavior.

#### Reduction in feeding activity

Microplastics can make marine species fewer active feeders, which can negatively impact both their development and survival. When non-nutritive microplastics clog their digestive tract, there is less space for natural food. This may result in the consumption of microplastics, which may interfere with regular eating habits. In the event of the accumulation of microplastics, the feeding habits of several aquatic species may change. Because of the presence of these plastic particles, they may preferentially avoid eating in locations with high microplastic concentrations or exhibit less interest in natural food items (Devi *et. al.*, 2022).

#### Genotoxicity



Microplastics can disrupt a cell's genetic material, which can result in mutations and other negative consequences. When sea trout *Salmo trutta* was subjected to microplastics made of various polymer types, genotoxicity endpoints such as nuclear buds, micronuclei, or blebbed nuclei cells were formed (Magdalena Jakubowska *et. al.*, 2020).

#### Behavioral changes

The reproductive success of aquatic animals may be affected by microplastics. Microplastic exposure in fish has been associated with altered reproductive behavior, decreased egg production, and lower hatching success. Fish and other aquatic species may exhibit altered eating habits, decrease activity levels, or alter interactions between predators and prey as a result of exposure to microplastics (Uy and Johnson 2022).

#### Immunotoxicity

The immune system and inflammatory processes of aquatic animals can be triggered by the presence of microplastics in their digestive systems. Fish exposed to microplastics are more susceptible to illnesses and parasites because immunotoxicity damages their immune systems (Wang *et. al.*, 2019).

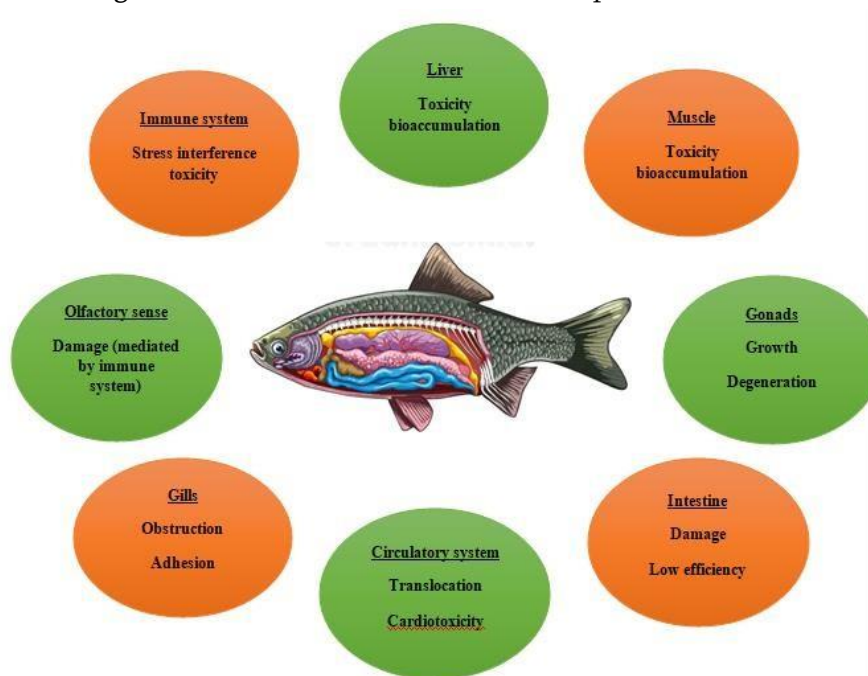
#### Chemical Transfer

Chemical contamination of marine food chains may result from the use of microplastics as a route for chemical transmission in aquatic environments (Koelmans *et. al.*, 2016). Microplastics can concentrate and absorb hazardous substances from nearby water or sediments because of their large surface areas. POPs and other hazardous compounds found in aquatic environments are among these (Gallo *et. al.*, 2018).

#### Reproductive Effects

In several fish species, interactions with microplastics have been associated with decreased egg production and hatching success (Ben Parker *et. al.*, 2019). Zebrafish exposed to microplastics showed altered gene expression that affected reproductive functions, as well as decreased egg output and hatching rates (Wang *et. al.*, 2019).

Figure- The various toxic effects of microplastics on fish



#### Microplastics effects on human health

The major sources of threats to human health are the synthetic chemical additives used in plastics and hazardous substances absorbed by microplastics (Kumar *et. al.*, 2020). They may enter the ecosystem through several different paths, such as sewage and stormwater runoff, and are present in a variety of products, such as

beauty products, cleaning products, and textiles. The possible negative consequences of microplastics on human health are as follows.

1. Microplastics are associated with breast cancer, obesity, cardiovascular disease, and other conditions. Numerous chemicals used to make plastics can also be harmful, and microplastics have been proven to physically stimulate the human body (Campanale *et. al.*, 2020).
2. Oxidative stress- Oxidative stress, which occurs when there is an imbalance between the production of reactive oxygen species (ROS) and the ability of the body to eliminate them, can result from human interaction with microplastics. As a result, both tissues and cells may be damaged (Jassim, 2022).
3. Immune system responses: Microplastics may cause the body to react in a disruptive manner. This may incorporate hypersensitivity responses and a dysfunctional immune system (Campanale *et. al.*, 2020).
4. Damage to the immune system, oxidative damage, cytotoxicity, neurotoxicity, and the spread of MPs to other tissues. These consequences may occur in those who have been exposed to microplastics (Bhuyan, 2022).
5. Inflammation: When the body is exposed to microplastics, it may become inflammatory. Numerous health issues such as diabetes, heart disease, and immunological illnesses are associated with chronic inflammation.
6. Endocrine disruption: The factors that control thyroid endocrine activity are weakened by prolonged exposure to particulates of plastic and related substances (Ullah *et. al.*, 2023). Microplastics can function as disruptors of the endocrine system, interfering with the normal functioning of hormones and leading to health problems.

#### Action plan to reduce microplastics in the marine environment

Aquatic habitats are affected by the problem of microplastics, which necessitates a diversified strategy to reduce their effects.

- Reduce single-use plastic items: The use of unwanted single-use plastic products, including water bottles, grocery bags, drinking straws, and utensils must be drastically reduced shortly. Campaigns to raise awareness, rewards for adopting reusable things, and laws that restrict both the production and utilization of single-use plastics can all help with this.
- Strengthening waste management systems: Enhancing waste management practices can help limit the environmental impact of plastic trash. This may encourage circular economy models, establish expanded producer responsibility programs, and invest in better infrastructure for trash collection and recycling.
- Raising awareness and education: Increasing public knowledge of the effects of microplastics and educating people about them can limit the use of plastic and encourage proper waste management. Public campaigns, educational initiatives, and community involvement may be a part of this.
- Develop alternatives to plastic: Creating plastic substitutes can aid in reducing the production of plastic trash. Utilizing recyclable or disposable components, designing items for longevity and recycling, and encouraging sustainable consumption habits are some ways to achieve this goal.

## VI. CONCLUSION

Microplastics are tiny plastic fragments that have developed into contaminants in the marine environment. They are produced by human activities, such as the creation, usage, and disposal of plastic, and it has been discovered that they can contaminate seafood. Because plastics take over 300 years to break down into

smaller nano plastics, plastic pollution will continue to hurt people and aquatic life for many decades. The existence of microplastics in the types of fish utilized for human consumption is a worldwide issue, and eating seafood puts us at risk of being exposed to microplastics. Additional pathways include air and other human dietary products. Microplastics are widely present in marine environments and are expected to become much more prevalent in the next few years. Collaborative efforts among several industries are required to reduce microplastic contamination in aquatic environments. Governments worldwide have implemented various measures to lessen the effects of microplastics on the ecosystem and the health of people, both recognized and unknown. The establishment of standardized techniques for sample selection, identification, and categorization of microplastics, the creation of a framework for evaluating the risk of microplastics, the use of the approach to uncover data gaps, and efficient policy adjustments to lower risks are all crucial.

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# An Effective and Ecofriendly One-Step Synthesis of Coumarinophosphorothioates Facilitated By Benzyltriethylammoniumchloride as the Catalyst

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## ABSTRACT

A novel approach has been devised to synthesize coumarinophosphorothioates (2a-g) from 7-hydroxy coumarin derivatives (1a-g). This method involves the utilization of O,O-diethyl phosphorochloridothiate in the presence of sodium hydroxide, with benzyltriethylammoniumchloride serving as the catalyst.

**Keywords:** Coumarinophosphorothioates, 7-hydroxy coumarin derivatives, O,O-diethyl phosphorochloridothiate, sodium hydroxide, triethylbenzylammoniumchloride

## I. INTRODUCTION

Coumarin-containing heterocyclic compounds have been identified to enhance the physiological characteristics, including antibiotic,[1] anticoagulant,[2] pesticidal,[3] and pharmaceutical chemistry[4] properties of the parent molecule.

Several coumarin derivatives have been identified for their diverse biological activities, including anticoagulant effects,[5] fungicidal properties,[6] bactericidal actions,[7] anthelmintic attributes,[8,9] and pesticidal capabilities,[10] among others. A study reported[11] that the direct attachment of a coumarin nucleus to a heterocyclic nucleus results in exhibited pesticidal activities.

However, the majority of the pesticides currently in use are organophosphorous compounds, specifically phosphate, dithiophosphate, and phosphorothioates [12-16], chosen for their biodegradable properties [17].

Phosphorothioates, especially those with a selective heterocyclic moiety, are noteworthy as the degraded compounds give rise to heterocyclic compounds, which have been identified as effective antimicrobials. Additionally, various phosphonic acids and their derivatives have demonstrated significant biological properties, encompassing antibiotic, antileukaemic, herbicidal, plant growth regulatory, and insecticidal activities, depending on the nature of substituents on the phosphonic group.[18,19].

Phosphorothioates have been synthesized in literature through various methods, such as the reaction of dialkylphosphites with sulfenyl chlorides,[20] sulfenyl cyanides,[21] thiosulphonates,[22] disulfides,[23] and elemental sulfur.[24] Another approach involves the condensation of phosphorochloridates with thiols.[25] However, these methods present challenges, including harsh reaction conditions and the occurrence of significant side reactions.

Benzyltriethylammonium chloride (TEBA) serves as a frequently employed phase transfer catalyst in both organic synthesis overall and specifically in the generation of carbenes within heterogeneous systems.[26] Its recent application involves functioning as an activator for fluorapatite, serving as a solvent-free Knoevenagel reaction's heterogeneous catalyst. Here we wish to report the use of a new catalytic agent, benzyltriethylammonium chloride (TEBA) [27], the reaction proceeds efficiently in high yields and the products are obtained in good purity.

## II. MATERIALS AND METHODS

O,O-Diethyl phosphorochloridothiate was obtained from Lancaster. Sodium hydroxide and benzyltriethylammoniumchloride were acquired from S.D. Fine-chem. Melting points were determined using Kumar's melting point apparatus in open capillaries, while boiling points were measured in open capillaries at atmospheric pressure. <sup>1</sup>H NMR spectra were recorded on a Varian Mercury Plus instrument in CDCl<sub>3</sub> at 400 MHz, with TMS serving as the internal standard. IR spectra were obtained using a Perkin-Elmer FTIR with KBr discs. Mass spectra were recorded on a Micromass Quattro II instrument using electrospray ionization, revealing the (m+1) peak as the molecular ion peak. Purity tests and reaction progress were monitored by TLC on Merck silica gel plates.

### General procedure:

#### *O,O*-diethyl *O*-4,8-dimethyl-2-oxo-2H-chromen-7-yl phosphorothioate (2d)

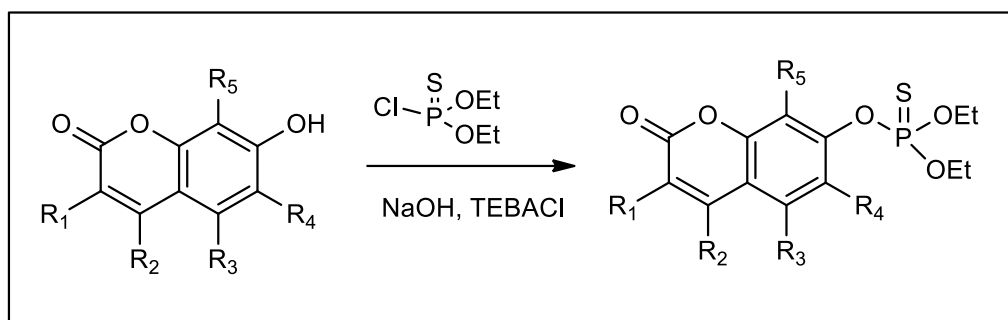
The procedure involved mixing 7-hydroxy-4,8-dimethyl-2H-chromen-2-one (1.0 gm, 5.2 mmol) and sodium hydroxide (0.256 gm, 6.2 mmol), followed by the addition of O,O-diethyl phosphorochloridothiate (1.95 gm, 10.4 mmol) with stirring. Benzyltriethylammoniumchloride (0.2 gm) was introduced into the reaction mixture. The reaction progress was monitored using TLC with Hexane: Ethyl acetate (8:2) as the solvent system. Upon completion, water was added to the mixture. The solid obtained was filtered off and washed with water to get product. The crude product (1.58 gm) was further purified by column chromatography.

## III. RESULTS AND DISCUSSION

In earlier laboratory work, coumarinophosphorothioates were synthesized in a two-step process. Initially, prepared the sodium salt of hydroxycoumarin by condensing it with powdered NaOH in dry acetone. Subsequently, treated this sodium salt with O,O-diethyl phosphorochloridothiate in dry dimethyl formamide.

Our current focus is on developing a more straightforward and efficient procedure for synthesizing coumarinophosphorothioates in a single step under ambient conditions, using Benzyltriethylammoniumchloride as a catalyst. In this study, coumarinophosphorothioates (2a-g, Scheme-1) were successfully synthesized by reacting hydroxycoumarin (1a-g) with O,O-diethyl phosphorochloridothiate in the presence of sodium hydroxide without solvent. Benzyltriethylammoniumchloride served as the catalyst, and the reaction took place at room temperature, yielding excellent product yields.

After the reaction completion, water was added to the mixture. The solid obtained was filtered off and washed with water to get product. The crude product (1.58 gm) was further purified by column chromatography. All synthesized compounds were thoroughly characterized based on analytical data. This streamlined method offers a more convenient approach to synthesizing coumarinophosphorothioates.



Scheme 1: Synthesis of Coumarinophosphorothioates

Table 1: Data of Coumarinophosphorothioates

Entry	R <sub>1</sub>	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>	Reaction Time (min)	Yield (%)
2a	H	H	H	H	H	20	95
2b	H	CH <sub>3</sub>	H	H	H	18	95
2c	Cl	CH <sub>3</sub>	H	H	H	15	96
2d	H	CH <sub>3</sub>	H	H	CH <sub>3</sub>	20	95
2e	H	CH <sub>3</sub>	H	C <sub>2</sub> H <sub>5</sub>	H	20	95
2f	H	H	CH <sub>3</sub>	H	H	20	96
2g	H	CO <sub>2</sub> Me	H	H	H	18	95

#### IV. CONCLUSION

In summary, a novel approach has been established for the production of coumarinophosphorothioates (2a-g) derived from 7-hydroxy coumarin derivatives (1a-g). This method involves the utilization of O,O-diethyl phosphorochloridithiate, with sodium hydroxide and benzyltriethylammoniumchlorideserving as phase transfer catalysts. The reactions were carried out under mild conditions, resulting in significantly reduced reaction times and achieving excellent yields, as illustrated in Table I. This developed methodology holds substantial promise for the field of combinatorial chemistry.

#### V. ACKNOWLEDGEMENT

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# Copper (II) Complexes of 2'- Hydroxychalcones : Synthesis, Spectral Analysis and Antimicrobial Activity

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## ABSTRACT

A new series of metal complexes of Cu (II) have been synthesized with newly synthesized biologically active ligands. These ligands were prepared by the condensation of substituted 2'- Hydroxy acetophenones and 3,4-dimethoxy benzaldehyde. The structures of the Complexes have been proposed by the analytical data and spectral analysis. Analytical data confirmed 1:2 (Metal: Ligand) stoichiometry and the Electronic spectral data suggested that all Cu (II) complexes have square planar geometry. Thermogravimetric analysis confirmed Absence of coordinated water molecules in Cu (II) complexes. The conductivity data Confirmed non electrolytic nature of the complexes. In vitro antimicrobial activities of all synthesized compounds have been evaluated against different bacterial and fungal strains. The compounds showed net enhancement in activity on coordination of metal with ligands.

Keywords: - Chalcones, Transition Metal Complexes, Spectral study and antimicrobial evaluation.

## I. INTRODUCTION

Chalcones structure includes two aromatic rings bound by  $\alpha$ ,  $\beta$ - unsaturated carbonyl groups. They are extracted from natural products or synthesized by several synthetic methods<sup>1</sup>. Chalcones represent a variety of biological activities<sup>2</sup> like antibacterial, antifungal, anticancer, anti-inflammatory, antitubercular, antihyperglycemic<sup>3</sup> and antimalarial agents<sup>4</sup>. The chalcones are also well-known intermediates in the synthesis of various heterocyclic compounds<sup>5,6</sup>. The most common method for the synthesis of Chalcones is the base-catalyzed Claisen– Schmidt condensation reaction<sup>7-9</sup>.

2'-Hydroxychalcones possess co- ordinating sites and are expected to form complexes with different metal ions. Habib et.al<sup>10</sup> reported that O- hydroxychalcones were much more reactive with metal ions than the ketones and aldehydes from which they were synthesized, several of the chalcones have been employed as useful analytical reagent.

We report here the synthesis of a series of Cu (II) complexes with substituted 2'-hydroxychalcones and their characterization based on analytical and Spectral studies are reported.

## METHODS AND MATERIAL

### Experimental:

All the reagents used were chemically pure and are of AR grade. All the melting points were determined in an open capillary tube and are uncorrected. Completion of the reaction was monitored by thin layer chromatography on pre-coated sheets of silica gel-G.

### Synthesis of metal complexes:

The ligand (0.02 mole) and the metal salt (0.01 mole) in 50 ml methanol was refluxed for 2 hours. The solid mass separated was filtered and the residue was washed with hot methanol. These complexes were finally dried under vacuum desiccator over fused  $\text{CaCl}_2$ . Analytical and Physical data is given in TABLE-3. Molar conductance measurements were carried out in  $10^{-4}$  M in DMSO solution. The magnetic susceptibility measurements of the complexes in the solid state were made on Guoy balance at room temperature using  $\text{Hg}[\text{Co}(\text{NCS})_4]$  as standard. Diamagnetic corrections were applied using Pascals constant. The IR spectra of the metal complexes in KBr pallets in the range of  $4000\text{-}350\text{ cm}^{-1}$  were recorded. UV-Visible spectra were recorded and TGA and DTA analysis of metal complexes were carried out.

### Result and discussion:

All the complexes were stable at room temperature, insoluble in water and in most of the common organic solvents but soluble in DMF and DMSO. The analytical data of the complexes (TABLE-3) indicated that their stoichiometry may be 1:2 metal to ligand ratio. The molar conductance values of the complexes in DMSO solvents were in the range of  $16.03\text{-}21.04\text{ S cm}^2\text{ mol}^{-1}$  suggesting their non-electrolytic nature<sup>10</sup>. Magnetic moment:

The  $\mu_{\text{eff}}$  values at room temperature for Cu(II) complexes are in the range of 1.78-1.86 B.M. usually observed for square planar geometry for Cu(II) complexes<sup>11</sup>. Electronic absorption spectra:

The electronic absorption spectra of Cu (II), indicated strong absorption bands at around  $13186\text{-}13605$  and  $24137\text{-}26809\text{ cm}^{-1}$  which may be assigned to transitions respectively, which is characteristics of square planar geometry<sup>12</sup>

$2B_{1g} - 2B_{2g}$

$2B_{1g} - 2E_g$ .

### IR spectra:

The ligand showed a weak broad band around  $3000\text{-}2910\text{ cm}^{-1}$ , but the IR spectra of Cu(II) complexes exhibited broad band of medium intensity near  $3340\text{-}3453\text{ cm}^{-1}$  due to  $\nu(\text{OH})$  stretching, vibration of hydrated water molecule<sup>13</sup>. In the IR spectra of all the ligands band around  $1656\text{ cm}^{-1}$  is due to  $\nu(\text{C}=\text{O})$ . This band is shifted to lower wave number in the spectra of the complexes indicating coordination through oxygen of (C=O) group. The medium intensity band appearing around  $1534\text{-}$

1592 cm<sup>-1</sup> in the ligands and the complexes are assigned to  $\nu(\text{C}=\text{C})$  (aromatic). The  $\nu(\text{M}-\text{O})$  band was observed in the complexes around 426-480cm<sup>-1</sup> 13,14.

#### <sup>1</sup>H NMR Spectra:

The <sup>1</sup>H NMR spectra of Cu(II) complexes showed only broad peaks indicating the formation of the complexes due to the presence of a metal ion, whereas the signal due to -OH proton is absent in the Cu(II) complexes confirms the coordination of the ligand to the metal ion through phenolic oxygen atom<sup>14</sup>. Intense absorption at high field and the other of less intensity at low field. From these spectra the values of  $g_{\parallel}$  and  $g_{\perp}$  have been calculated and are given in TABLE-1. The observed  $g$ -values point to the presence of the unpaired electron in the  $d_{x^2-y^2}$  orbital with  $g_{\parallel} > g_{\perp}$  characteristic of square planar or elongated tetragonal geometry.

#### Electron spin resonance study:

The ESR spectra of Cu (II) complexes showed two peaks, one of The  $g$  obtained for the Cu (II) complexes are less than 2.3 indicating covalent character of the metal-ligand bond<sup>12</sup>. The axial symmetry parameter ( $G$ ) for the complexes were found to be greater than 4, as shown in TABLE-1.

TABLE-1: - ESR Spectral data of Cu (II) Complexes.

Sr. No.	Complex	$g_{\parallel}$	$g_{\perp}$	$g_{av}$	G axial Symmetry Parameter
1.	Cu (L <sub>1</sub> ) <sub>2</sub>	2.2192	2.0132	2.1642	4.4014
2.	Cu (L <sub>3</sub> ) <sub>2</sub>	2.3944	2.0167	2.1522	4.4012
3.	Cu (L <sub>4</sub> ) <sub>2</sub>	2.2196	2.0921	2.1648	4.4123
4.	Cu (L <sub>5</sub> ) <sub>2</sub>	2.3192	2.0941	2.1625	4.4128

### Thermal analysis:

The thermogram of Cu(II) complexes showed that the complexes starts decomposing gradually, till it attains the temperature corresponding to 136-140 °C. After this the Cu(II) complexes showed sharp decrease in weight indicating decomposition of complex. The dry complexes lose a large part at 348-350 °C. Thereafter the complexes lose coordinated ligand in small fragments to give metal at around 984-990 °C.

### X-ray diffraction study:

The X-ray diffraction of the metal complexes of Cu(II) were scanned in the range 5-100 °C at a wavelength of 1.54 Å. The X-ray diffraction pattern of these complexes with respect to peaks of intensity have been indexed by using computer programme<sup>15</sup>. The Unit cell parameters of Cu(II) complexes showed monoclinic crystal system. Experimental density values of the complexes were determined by using specific gravity method and found to be 1.0195 g cm<sup>-3</sup> for Cu(II) complexes. On the basis of these studies the probable structures for the complexes have been proposed.

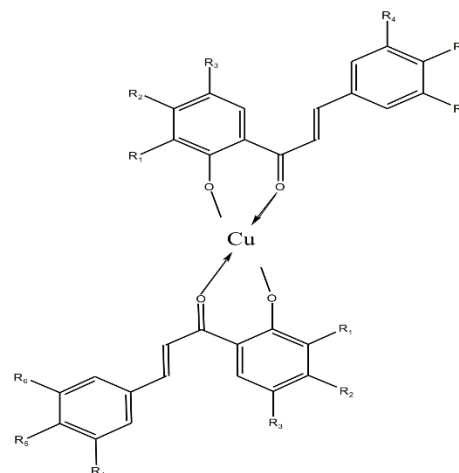


TABLE-2

Comple x	R 1	R <sub>2</sub>	R <sub>3</sub>	R <sub>4</sub>	R <sub>5</sub>	R 6
1) Cu (L <sub>1</sub> )	Cl	H	I	OCH 3	OCH 3	H
2) Cu (L <sub>2</sub> )	I	CH 3	Cl	OCH 3	OCH 3	H
3) Cu (L <sub>3</sub> )	I	H	Cl	OCH 3	OCH 3	H
4) Cu (L <sub>4</sub> )	I	H	Br	OCH 3	OCH 3	H
5) Cu (L <sub>5</sub> )	I	H	CH 3	OCH 3	OCH 3	H
6) Cu (L <sub>6</sub> )	I	H	I	OCH 3	OCH 3	H
7) Cu (L <sub>7</sub> )	Cl	H	Cl	OCH 3	OCH 3	H
8) Cu (L <sub>8</sub> )	H	OH	H	OCH 3	OCH 3	H
9) Cu (L <sub>9</sub> )	I	OH	I	OCH 3	OCH 3	H

**TABLE-3: -Magnetic moment, Conductivity and analytical data of Cu (II) complex.t**

Sr	Molecular Formula	Color	M.P/D.P. °C	Molar Conductivity S cm <sup>2</sup> Mol <sup>-1</sup> ×10 <sup>-4</sup>	μ <sub>eff</sub> B.M.
1.	C <sub>34</sub> H <sub>26</sub> O <sub>8</sub> L <sub>2</sub> Cl <sub>2</sub> Cu	Dark brown	230	16.032	1.78
2.	C <sub>36</sub> H <sub>30</sub> O <sub>8</sub> L <sub>2</sub> Cl <sub>2</sub> Cu	Brown	214	15.03	1.77
3.	C <sub>34</sub> H <sub>26</sub> O <sub>8</sub> L <sub>2</sub> Cl <sub>2</sub> Cu	Dark brown	260	16.032	1.82
4.	C <sub>34</sub> H <sub>26</sub> O <sub>8</sub> L <sub>2</sub> Br <sub>2</sub> Cu	Reddish brown	242	17.034	1.79
5.	C <sub>36</sub> H <sub>32</sub> O <sub>8</sub> L <sub>2</sub> Cu	Brown	268	14.028	1.81
6.	C <sub>34</sub> H <sub>26</sub> O <sub>8</sub> L <sub>4</sub> Cu	Brown	252	21.048	1.85
7.	C <sub>34</sub> H <sub>26</sub> O <sub>8</sub> Cl <sub>4</sub> Cu	Dark Brown	265	18.042	1.82
8.	C <sub>34</sub> H <sub>30</sub> O <sub>10</sub> Cu	Brown	255	20.014	1.84
9.	C <sub>34</sub> H <sub>26</sub> O <sub>10</sub> I <sub>4</sub> Cu	Brown	270	16.029	1.78

### Antimicrobial Activity:

**TABLE 4-Antimicrobial activity of the synthesized Cu (II) Complexes**

Product	Bacteria				Fungi			
	Ec	St	Sa	Bs	An	Af	Fm	Pc
Va	19	18	32	27	+ve	-	+ve	-
Vb	14	11	21	24	+ve	-	-	+ve
Vc	17	17	30	26	+ve	-	-	+ve
Vd	12	16	17	11	+ve	-	-	+ve

The antimicrobial activity was assayed by cup plate agar diffusion method<sup>16</sup> by measuring inhibition zones in mm. *In vitro* antimicrobial activity of all synthesized compounds and standard have been evaluated against four strains of bacteria which include *E. Coli*, *S. typhi*, *S. aureus* and *B. subtilis*, and against four fungal strains like *A. niger*, *A. flavus*, *F. moneliforme* and *P. chrysogenum*. The standard used were Penicillin and Grysofulvin.

From the results of antimicrobial activity of ligand and complexes it is clear that the complexes showed enhanced activity than the ligands. The increase in antimicrobial activity is due to faster diffusion of metal complexes as a whole through the cell membrane or due to the combined activity of the metal and ligand.

Ve	12	12	22	19	+ve	-	-	-
Vf	13	12	21	19	+ve	-	-	-
Vg	16	13	23	12	+ve	-	-	+ve
Vh	17	12	22	18	+ve	-	+ve	-
Vi	12	15	20	16	+ve	-	-	+ve
Penicillin	18	20	32	28	N	N	N	N
Grysofulvin	N	N	N	N	-	-	-	-

*Ec-E.coli, St-S.typhi, Sa- S.aureus, Bs- B.subtilis; An-A.niger, Af-A.Flavus Pc- P.chrysogenum, Fm-F.moneliformae;* -ve: No growth of fungi, +ve: Growth of fungi, RG-Reduced growth, NA-Not Applicable, Zone of inhibition was measured in mm.

#### CONCLUSION:

The Cu(II) complexes were coloured, insoluble in most of the organic solvents but soluble in DMF and DMSO. The stoichiometry of the metal complexes obtained has been found to be 1:2. The infrared spectral data indicate that all the ligands act as mono-negative bidentate species towards Cu(II) complexes. The electronic spectral data suggested that Cu(II) complexes have square planar geometry.

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# Screening Of Antifungal, Antioxidant and Phytochemical Properties of *Erythrina Indica* Lam

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## ABSTRACT

Various use of plants and their products as herbal medicine is the traditionally important mode of treatment all over the world. The present work is aimed to evaluate the pharmacological potential of *Erythrina indica* leaves extracts. The crude extract of *Erythrina indica* leaves was evaluated for antioxidant, phytochemical and antifungal analysis like *Aspergillus niger*, *Aspergillus fumigatus*, *Candida albicans*, *Saccharomyces cerevisiae* and *Microsporum gypseum*. Antioxidant activity of methanol extract of *Erythrina indica* leaves was found lower than ascorbic acid by DPPH free radical scavenging activity. Phytochemical screening of the *Erythrina indica* leaf extract confirmed the presence of various bioactive compounds including reducing sugars, terpenoids, alkaloids, steroids, flavonoids, and phenolic compounds. In antifungal assay, all the organisms respond to the plant extract but inhibitory zone develop. This study supports its pharmacological potential and suggests its use in the development of new drugs and phytomedicine; it could imply that *Erythrina indica* contains bioactive compounds with therapeutic properties.

**Key words:** Antifungal activity, antioxidant activity, agar well diffusion method, phytochemical screening.

## I. INTRODUCTION

Phytochemicals are bioactive compounds found in plants that are not considered essential nutrients but have been shown to have various health benefits. They are often responsible for the colour, flavour, and scent of plants. Research has indeed demonstrated that many phytochemicals possess protective or disease-preventive properties. Natural plants are significantly important for their role in medicine and plant metabolites. Because they are important source of noble drugs compounds which results in plant derived medicines. It is well known that secondary metabolites are a source of biologically active natural products with various functions, including antibacterial, antifungal, antiviral, antineoplastic and anticancer activities, acting also as inhibitors and plant growth promoters.

*Erythrina indica* Lam. also known as Paribhadra (Sanskrit) and Coral tree (English) belongs to the family "Papilionaceae." It is a fast-growing tree up to 18 meters in height, the leaves are trifoliolate and flowers are borne in dense racemes, coral red with small conical dark coloured prickles, commonly found in the wild tropics and deciduous forests of India. *E. indica* bark is traditionally used as febrifuge, anti-bilious, anti-diarrheal and anti-rheumatic, also used for treatment of liver trouble, asthma, dysentery, joint pain, fever and leprosy and known to have analgesic, anthelmintic, anti-ulcer, antioxidant and sedative properties [1,2,3]. Therefore, this

study was conducted to evaluate antifungal and antioxidant activities of *E. indica* in different extracts. Screening for phytochemical constituents provide more widespread knowledge on the antifungal and antioxidant properties of plant extracts.

## II. MATERIAL AND METHODS

### Plant collection

Fresh and healthy stem of *E. indica* were collected from in and around Deglur region randomly. The samples were washed with tap water to remove dust and contaminant. The plant samples were shade dried until all the moisture evaporated and pulverized by using mechanical grinder and stored in air tight jar for further use.

### Extraction of plant material:

The plant materials were extracted with ethanol using Soxhlet apparatus continuously for 6 to 8 hours. 50 gm of dried plant material was packed in filter paper and loaded into the thimble of Soxhlet apparatus. 250 ml of different extract viz; aqueous, ethanol, methanol and acetone were poured into the flask and the all apparatus was set. The extraction was performed for 6-8 hours. Later the extracted solvent was evaporated under reduced pressure. Then the extract was kept in refrigerator for further use.

### Phytochemical analysis

The qualitative analysis of tannins, phenols, glycosides, alkaloids, steroids, and flavonoids were analysed by standard method [4,5,6]

### Selected test microorganisms

Extracts were tested against pathogenic microbes, including the fungi *Aspergillus niger*, *Aspergillus fumigatus*, *Candida albicans*, *Saccharomyces cerevisiae* and *Microsporum gypseum*.

### Antifungal activity using disc diffusion method:

The modified paper disc diffusion was employed to determine the antifungal activity of solvent extract of leaves of *E. indica*. For antifungal properties, 0.1 ml fungal suspension of  $10^5$  CFU ml<sup>-1</sup> was uniformly spread on PDA plate to form lawn cultures. The petroleum ether, chloroform, ethyl acetate and methanol extracts were prepared in their respective solvents in such a manner that ultimate amount (in dry form) in each disc came to 10mg, 8mg, 6mg, 4mg and 2mg. The blotting paper discs (10mm diameter) were soaked in various dilute extract, dried in oven at 60°C to remove excess of solvent and tested for their antifungal activity against fungal pathogens by disc diffusion technique. After incubation of 24 h at 37°C, zone of inhibition of growth was measured in mm. The antifungal activity was classified according to the zone of inhibition such as strong (19-22mm), moderate (15-18mm) and mild (11-14mm). Griseofulvin 10mcg (Hi-Media disc) was used as positive control while discs soaked in various organic solvents and dried were placed on lawns as negative control [7].

### Diphenyl-1-picrylhydrazyl (DPPH) assay

The DPPH assay was employed to evaluate the free radical scavenging activity of *E. indica*, following the protocol outlined by Basma et al [8]. Plant extract solutions ranging from 0.031 to 2 mg/mL were mixed with 5 millilitres of 0.004% DPPH radical solution and incubated at room temperature in the dark for 30 minutes. The optical density (OD) was measured at 517 nm using a UV/Vis spectrophotometer. Methanol served as the blank, while a mixture of methanol and DPPH solution represented the baseline control ( $A_0$ ), with Ascorbic acid used as the positive control. The scavenging effect (%) =  $(A_0 - A_1) \times 100\% / A_0$ , where  $A_0$  is the absorbance of the control reaction and  $A_1$  is the absorbance in the presence of the tested extracts. The IC<sub>50</sub> (concentration

providing 50% inhibition) was determined graphically from a calibration curve plotting extract concentration against scavenging effect within the linear range.

### III.RESULTS AND DISCUSSION

#### Phytochemical screening of *E. indica*

Presence and absence of primary phytochemical viz., alkaloids, flavonoids, glycosides, steroids, phenols, tannins, saponins and resins was confirmed in the laboratory tests. The preliminary phytochemical results of selected solvent extracts of *E. indica* were showed in the Table 1. It has been mentioned that antioxidant activity of plants might be due to their phenolic compounds [9]. Flavonoids are most known for their antioxidant activity. They are modifiers which modify the body's reactions to allergens, viruses, and carcinogens [10]. They show anti-allergic, anti-inflammatory, antimicrobial and anticancer activity [11]. The presence of alkaloids explains its anti-bacterial activity, since this phytochemical is reported to have anti-bacterial activity. Tannins are reported to have various physiological effects like anti-irritant, antifungal and antimicrobial and antiparasitic effects. Phytotherapeutically tannin-containing plants are used to treat nonspecific diarrhoea, inflammations of mouth and throat and antimicrobial [12].

#### Antifungal activity of *E. indica*

The antifungal activity has been screened because of its great medicinal relevance with the recent years, infections have largely increased and resistance against antibiotics, become an ever-increasing therapeutic problem [13,14]. Plant based antimicrobials have enormous therapeutic potential as they can serve the purpose without any side effects that are often associated with synthetic antimicrobial compounds.

Table.2 represents the antifungal effect of selected solvent extracts of *E. indica* by paper disc diffusion method against selected fungal strains and the zone of inhibition was assessed in millimetre diameter. The aqueous extract of plant showed best zone of inhibition against *Aspergillus niger* and *A. fumigatus*. Methanolic extract showed significant activity against *Aspergillus niger* and *A. fumigatus*. and same zone of inhibition result against *Candida*, *Saccharomyces* and *Microsporum*. The ethyl acetate and dichloromethane showed moderate zone of inhibition against fungi. The antifungal activity of n-hexane of *E. indica* showed maximum zone of inhibition against *Microsporum gypseum* comparison to others. The chloroform showed constantly best zone of inhibition in all fungi among all other solvents. The standard antibiotic "Griseofulvin" showed good antifungal activity and it is considered as standard antibacterial drugs as used today which is taken as positive control against others fungal sps.

#### Diphenyl-1-picrylhydrazyl (DPPH)

Within the realm of medicinal plants, a vast array of bioactive compounds exhibits antioxidant properties, effectively terminating free radical chain reactions. In this study, we assess *E. indica* as a novel antioxidant agent through various in vitro antioxidant tests. The DPPH radical, a free radical, undergoes reduction by accepting an electron or hydrogen radical, resulting in the formation of a stable diamagnetic molecule. Antioxidants induce a decrease in the absorbance of DPPH at 517 nm, leading to its reduction to a pale-yellow colour through hydrogen atom abstraction from the antioxidant compound [15-22]. The extent of DPPH reduction correlates with the abundance of antioxidants in the extract, indicating higher scavenging activity in samples with greater antioxidant content. The IC50 value, representing the amount of antioxidant required to decrease the initial DPPH concentration by 50%, serves as a measure of antioxidant activity. A lower IC50 value indicates higher antioxidant activity. Notably, *E. indica* leaf extract exhibited the lowest IC50 value,

indicating the highest antioxidant activity. Additionally, the reducing power assay was employed to assess the antioxidant capacity of the extract. Appear as yellow spots on purple background.

#### IV. CONCLUSION

*E. indica* is an essential medicinal plant used traditionally for therapeutic purpose from ancient times. *E.indica* exhibits antifungal activity, possibly owing to the presence of diverse phytochemical constituents within them. As a result, these extracts could be proposed as a potential source for pharmaceutical and traditional medicine materials used in the formulation of antifungal agents. This plant different solvents extract recommended further as best antifungal drug. The medicinal plant *E. indicashowed* good antifungal against several organisms like *Aspergillus niger*, *Aspergillus fumigatus*, *Candida albicans*, *Saccharomyces cerevisiae* and *Microsporum gypseum* as supported by previous studies. Additionally, comprehensive studies including toxicity assessments, pharmacokinetic analyses, and clinical trials would be necessary to evaluate the safety and efficacy of these extracts for use as antifungal drugs in medical practice.

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**Table.1 Preliminary phytochemical screening of selected solvent leaf extracts of *E. indica***

S. No.	Phyto-chemicals	n-Hexane	Chloroform	Dichloromethane	Ethyl acetate	Methanol	Aqueous
1.	Alkaloids	-	-	-	+	-	-
2.	Flavonoids	+	+	+	+	+	-
3.	Glycosides	+	+	+	-	+	+
4.	Steroids	-	-	-	-	-	-
5.	Phenols	-	+	+	+	+	+
6.	Tannins	-	+	+	+	+	+
7.	Saponins	+	-	-	-	-	-
8.	Resins	-	-	-	+	+	-

**Table.2 Antifungal activity of selected solvent extracts of *E. indica* (10mg/ml)**

S. No.	Fungal sps.	Control	n-Hexane	Chloroform	DCM	Ethyl acetate	Methanol	Aqueous
1.	<i>Aspergillus niger</i>	30mm	15mm	11mm	8 mm	14mm	18mm	17mm
2.	<i>Aspergillus fumigatus</i>	30mm	10mm	11mm	8 mm	8mm	18mm	20mm
3.	<i>Candida albicans</i>	28mm	7mm	12mm	8 mm	11mm	10mm	8mm
4.	<i>Saccharomyces cerevisiae</i>	30mm	12mm	10mm	10 mm	10mm	10mm	8mm
5.	<i>Microsporum gypseum</i>	26mm	13mm	11mm	11 mm	8mm	11mm	9mm

Control= Griseofulvin 10mg/ml

# Investigating Cosmological Solutions in $f(R)$ Theory: A Focus on Bianchi Types

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## ABSTRACT

In this study, we investigate the cosmological implications of Bianchi type metrics within the framework of  $f(R)$  gravity theory. The  $f(R)$  theory extends general relativity by introducing a function of the Ricci scalar, providing a more comprehensive description of gravitational interactions. Our focus on Bianchi type cosmologies allows us to explore the anisotropic and homogeneous nature of the universe. We analyze the field equations derived from the  $f(R)$  action for Bianchi type I, II, and III metrics, uncovering the impact of the modified gravity theory on the evolution of the cosmic scale factor. Through a thorough mathematical analysis, we identify the key features that distinguish  $f(R)$  gravity from traditional general relativity in the context of these specific Bianchi type geometries. We apply our theoretical findings to real-world cosmological scenarios, investigating the implications for the cosmic microwave background radiation, large-scale structure formation, and other observational aspects. This study contributes to a deeper understanding of the  $f(R)$  gravity theory's role in shaping the dynamics of the early and late universe within the context of anisotropic Bianchi type metrics. The insights gained from this research have the potential to refine our comprehension of the fundamental forces governing the cosmos.

## I. INTRODUCTION

The study of cosmological models within the framework of alternative gravity theories has gained considerable momentum in recent years, offering a nuanced perspective on the dynamics of the universe. Among these theories, the  $f(R)$  gravity theory stands out as a compelling extension of general relativity, introducing a gravitational action that is a function of the Ricci scalar. This departure from the conventional Einstein-Hilbert action allows for a richer description of gravitational interactions and opens new avenues for exploring the fundamental nature of the cosmos.

This investigation focuses on the application of  $f(R)$  gravity theory to Bianchi type cosmological models. Bianchi type metrics provide a mathematical description of the spatial homogeneity and anisotropy of the universe, making them particularly suitable for studying the large-scale structure and evolution of cosmic structures. By incorporating the  $f(R)$  modification into the field equations governing these cosmologies, we aim to discern the distinctive features and consequences of this alternative gravity theory. The study primarily considers Bianchi type I, II, and III metrics, each characterized by different degrees of isotropy and anisotropy. These metrics serve as crucial frameworks for understanding the geometry of the universe and are instrumental

in deciphering the dynamics of cosmic evolution. Through a detailed mathematical analysis, we derive and examine the field equations governing the gravitational interactions in these specific Bianchi type geometries within the context of  $f(R)$  gravity. The motivation behind this research is not only to explore the theoretical implications of  $f(R)$  gravity on Bianchi type cosmologies but also to bridge the gap between theory and observation. In the subsequent sections, we will delve into the specific mathematical formulations, explore the dynamics of the cosmic scale factor, and subsequently, apply our findings to astrophysical phenomena such as the cosmic microwave background radiation and large-scale structure formation. This investigation is poised to contribute valuable insights into the broader understanding of gravitational theories and their role in shaping the observable universe.

## II. NEED OF THE STUDY

The study of Bianchi type cosmological models within the framework of  $f(R)$  gravity theory holds significant importance for several reasons. Alternative gravity theories, such as  $f(R)$  gravity, provide a theoretical avenue to address longstanding questions and discrepancies in our understanding of gravitational interactions. Exploring these theories in the context of Bianchi type metrics allows for a comprehensive examination of both isotropic and anisotropic aspects of the universe. Bianchi type geometries offer a realistic representation of the large-scale structure of the cosmos, making them invaluable for understanding the evolution of the universe. By applying  $f(R)$  gravity to these cosmological models, we can assess the impact of modified gravity on the cosmic dynamics, potentially revealing insights into the early and late-time behavior of the universe. This study not only contributes to theoretical advancements but also establishes connections between alternative gravity theories and observable astrophysical phenomena, fostering a more complete and nuanced understanding of the cosmos.

## III. LITERATURE REVIEW

**Chandel, S., & Ram, S. (2013).** Anisotropic Bianchi Type-III cosmological models within the  $f(R, T)$  theory of gravity provide a more complex description of how the cosmos operates. This modified general relativity theory departs from traditional General Relativity by defining the action in terms of both the Ricci scalar ( $R$ ) and the trace of the energy-momentum tensor ( $T$ ). Anisotropic Bianchi Type-III geometries, which contain distinctive spatial patterns, can provide a more accurate representation of cosmic structures. In this case, ideal fluid models allow matter to be incorporated, making the cosmological image more realistic. Changes in anisotropy, fluid content, and modified gravity in the  $f(R, T)$  system contribute to our understanding of dark energy and cosmic acceleration. To learn more about the complex relationships between geometry, matter, and gravity at cosmological scales, we must investigate these anisotropic Bianchi Type-III models in  $f(R, T)$  theory.

**Adhav, K. S. (2012).** The LRS (Locally Rotationally Symmetric) Bianchi Type-I cosmological model, which is examined inside the  $f(R, T)$  theory of gravity, provides a detailed look at how the universe has evolved over time. The LRS Bianchi Type-I model, which considers both the Ricci scalar ( $R$ ) and the trace of the energy-momentum tensor ( $T$ ), depicts the cosmos as uniform in space but not uniformly distributed. The LRS assumption produces rotational symmetry on a local scale, making it easier to define the structure mathematically. Changing  $f(R, T)$  to account for gravitational pull results in complex processes that have a huge impact on the structure of the cosmos. Looking at the LRS Bianchi Type-I model in the context of  $f(R, T)$

theory teaches us more about how rotationally symmetric geometries, altered gravity, and the universe's complex dynamics interact. This opens the door to new theories on dark energy and cosmic acceleration.

**Kiran, M., & Reddy, D. R. K. (2013).** The fact that there is no Bianchi Type-III bulk viscous string cosmological model that works with  $f(R, T)$  gravity demonstrates how complex the theory is and how it limits viable cosmological solutions. In this modified gravity theory, where the action depends on both the Ricci scalar ( $R$ ) and the trace of the energy-momentum tensor ( $T$ ), the absence of a feasible Bianchi Type-III solution with bulk viscous strings reveals constraints or incompatibilities within the chosen theoretical framework. There may not be one due to the complex interaction between uneven forms, bulk viscosity, and  $f(R, T)$ 's unique functional form. Understanding the causes for the absence of such a cosmological model allows us to better comprehend the theory's faults and pushes scholars toward more logical and physically viable answers. The investigation into why the Bianchi Type-III bulk viscous string model does not occur in  $f(R, T)$  gravity is a significant step in unraveling the puzzles of how the universe formed in modified gravity theories.

**Sahoo, P. K., & Sivakumar, M. (2015).** Adding a variable cosmological constant  $\kappa(T)$  to the Locally Rotationally Symmetric (LRS) Bianchi Type-I cosmological model makes it possible to see a lot more about how the universe works within the structure of the  $f(R, T)$  gravity theory. With the addition of a varying cosmological constant, the action in this modified gravitational paradigm is stated as a function of both the Ricci scalar ( $R$ ) and the trace of the energy-momentum tensor ( $T$ ). At the local level, the LRS Bianchi Type-I geometry shows spatial homogeneity and isotropy. It interacts with the changing cosmological constant, which changes the general evolution of the universe. The variable  $\kappa(T)$  gives the cosmological constant a time-dependent part that shows how dark energy changes over time. Insights into the interconnected roles of geometry, matter, and varying cosmological constants in determining the large-scale structure of the universe within the framework of  $f(R, T)$  gravity can be gained by studying this cosmological model.

**Sharma, N. K., & Singh, J. K. (2014).** The Bianchi Type-II string cosmological model, coupled with a magnetic field and embedded within the framework of  $f(R, T)$  gravity, offers a captivating exploration of cosmic evolution. In this modified gravity theory, where the action is a function of both the Ricci scalar ( $R$ ) and the trace of the energy-momentum tensor ( $T$ ), the inclusion of cosmic strings and a magnetic field introduces additional complexities to the cosmic dynamics. The anisotropic Bianchi Type-II geometry, characterized by two spatial dimensions expanding at different rates, interacts with the energy-momentum contributions of cosmic strings and the magnetic field, influencing the overall large-scale structure of the universe. The  $f(R, T)$  gravity modifications bring forth novel gravitational interactions that play a role in shaping the cosmic landscape. Investigating this cosmological model provides valuable insights into the interplay between anisotropy, cosmic strings, magnetic fields, and modified gravity, offering a comprehensive framework for studying phenomena such as dark energy, cosmic acceleration, and the formation of cosmic structures.

**Aditya, Y., & Reddy, D. R. K. (2018).** Locally Rotationally Symmetric (LRS) Bianchi Type-I string cosmological models, within the framework of  $f(R)$  theory of gravity, offer a fascinating exploration of the interplay between cosmic strings and modifications to the gravitational action. In this modified gravity theory, where the gravitational action is expressed as a function of the Ricci scalar ( $R$ ), the LRS assumption brings rotational symmetry at the local level, simplifying the mathematical description of the geometry. The incorporation of cosmic strings, one-dimensional topological defects, adds a unique dimension to the model, influencing the cosmic dynamics and structure formation. The  $f(R)$  modifications introduce non-trivial gravitational effects, shaping the evolution of the universe. Investigating LRS Bianchi Type-I string cosmological models in  $f(R)$



gravity contributes to our understanding of the role of cosmic strings in the cosmic fabric and provides insights into how modifications to gravity influence the large-scale structure and evolution of the universe.

**Bhardwaj, V. K., & Yadav, A. K. (2020).** Bianchi Type-V accelerating cosmological models within the  $f(R, T) = f_1(R) + f_2(T)$  formalism present a captivating exploration of cosmic dynamics, blending modifications to gravity with contributions from the trace of the energy-momentum tensor ( $T$ ) and the Ricci scalar ( $R$ ). In this framework, the gravitational action is expressed as the sum of two distinct functions,  $f_1(R)$  and  $f_2(T)$ . The inclusion of Bianchi Type-V geometry, known for its anisotropic nature, offers a realistic representation of the universe's large-scale structure. The acceleration of the cosmic expansion, a phenomenon associated with dark energy, is a central focus in these models. By considering the combined effects of  $f_1(R)$  and  $f_2(T)$ , researchers delve into the intricate interplay between geometry and matter content, shedding light on the cosmic acceleration mechanism within the context of modified gravity. Studying these accelerating cosmological models contributes to a more nuanced understanding of the underlying principles governing the cosmic evolution in the  $f(R, T) = f_1(R) + f_2(T)$  formalism.

**Sahoo, P., & Reddy, R. (2018).** Locally Rotationally Symmetric (LRS) Bianchi Type-I bulk viscous cosmological models within the  $f(R, T)$  gravity framework offer a profound exploration of the universe's dynamics, considering both modified gravity and dissipative effects. In this theoretical framework, the gravitational action is expressed as a function of both the Ricci scalar ( $R$ ) and the trace of the energy-momentum tensor ( $T$ ). The LRS assumption brings rotational symmetry at the local level, simplifying the mathematical description of the geometry. The incorporation of bulk viscosity accounts for non-ideal fluid behavior, introducing dissipative effects within the cosmic medium. These models provide a comprehensive platform for studying the impact of viscosity on the large-scale structure, cosmic acceleration, and the behavior of dark energy. Investigating LRS Bianchi Type-I bulk viscous cosmological models in  $f(R, T)$  gravity contributes to our understanding of how modified gravity and dissipative processes jointly influence the cosmic evolution, offering insights into the complex interplay between geometry, matter content, and gravitational modifications on cosmological scales.

**Godani, N. (2019).** The Locally Rotationally Symmetric (LRS) Bianchi Type-II cosmological model within the  $f(R, T)$  gravity framework represents a fascinating exploration of cosmic dynamics, considering modifications to gravity and the influence of the energy-momentum trace ( $T$ ). In this modified gravitational paradigm, where the action depends on both the Ricci scalar ( $R$ ) and the trace of the energy-momentum tensor ( $T$ ), the LRS assumption imparts rotational symmetry at the local level, simplifying the mathematical representation of the spatial geometry. The Bianchi Type-II geometry, characterized by anisotropy in two spatial dimensions, interacts with the modified gravity, influencing the evolution of the universe on both small and large scales. Investigating this cosmological model provides valuable insights into the complex interplay between rotationally symmetric geometries, energy-momentum contributions, and modified gravity, enhancing our understanding of the large-scale structure and cosmic dynamics within the  $f(R, T)$  gravity framework.

### The gravitational action for the $f(R, T)$ takes the following form

$$S = \int \left( \frac{1}{16\pi} f(R, T) + S_m \right) \sqrt{-g} dx^4,$$

where  $f(R, T)$  is an arbitrary function of the Ricci tensor  $R$  and energy momentum tensor  $T$ .

Where  $f(R, T)$  is an arbitrary function of the Ricci tensor  $R$  and energy momentum tensor  $T$ . Consider the succeeding conditions taken by Harko et al.

$$f(R, T) = \begin{cases} R + 2h(T), \\ h_1(R) + h_2(T) \\ h_1(R) + h_2(R)h_3(T). \end{cases}$$

Assumed that  $f(R, T) = R + 2h(T)$ , and put  $h(T) = \alpha T$ , where  $\alpha$  is called coupling constant of  $f(R, T)$  theory of gravity.

$$f_R(R, T)R_{ij} - \frac{1}{2}f(R, T)g_{ij} + (g_{ij}\square - \nabla_i\nabla_j)f_R(R, T) = 8\pi T_{ij} - f_T(R, T)T_{ij} - f_T(R, T)\Theta_{ij}.$$

$$\Theta_{ij} = g^{lm} \frac{\delta T_{lm}}{\delta g^{ij}}.$$

Let us consider that the matter content in the universe is a perfect fluid and

$$\Theta_{ij} = -2T_{ij} - pg_{ij},$$

where  $T_{ij}$  is energy momentum tensor with perfect fluid and defined as

$$T_{ij} = (\rho + p)u_i u_j - pg_{ij},$$

where  $\rho$  and  $p$  are ED and cosmic pressure.  $u_i$  is four velocity vector such that  $u_i u_i = 1$ . The field equation takes the form

$$R_{ij} - \frac{1}{2}Rg_{ij} = 8\pi T_{ij} + 2f_T T_{ij} + [f(T) + 2pf_T]g_{ij}.$$

The Bianchi type-I model of universe is given as

$$ds^2 = -dt^2 + X^2 dx^2 + Y^2 dy^2 + Z^2 dz^2,$$

Where  $X, Y$  and  $Z$  are functions of time  $t$  only. The modified field equations are given by

$$\dot{H}_y + H_y^2 + \dot{H}_z + H_z^2 + H_y H_z = -(8\pi + 3\alpha)p + \alpha\rho,$$

$$\dot{H}_x + H_x^2 + \dot{H}_z + H_z^2 + H_x H_z = -(8\pi + 3\alpha)p + \alpha\rho,$$

$$\dot{H}_x + H_x^2 + \dot{H}_y + H_y^2 + H_x H_y = -(8\pi + 3\alpha)p + \alpha\rho,$$

$$H_x H_y + H_y H_z + H_z H_x = (8\pi + 3\alpha) - \alpha p,$$

The average scale factor ( $a$ ) for the Bianchi type-I model is

$$a^3 = XYZ.$$

#### IV. JUSTIFICATION OF THE STUDY

The justification for this study lies in the critical need to expand our understanding of the universe's dynamics beyond the confines of traditional gravity theories. The incorporation of  $f(R)$  gravity into the investigation of Bianchi type cosmological models addresses a gap in current cosmological research and offers a more comprehensive framework for gravitational interactions. Alternative gravity theories like  $f(R)$  gravity provide a theoretical foundation to explore phenomena such as dark energy and dark matter. By applying these theories to specific cosmological models, like Bianchi types I, II, and III, we gain a deeper understanding of how modifications to the gravitational action influence the large-scale structure and evolution of the universe. The

study is justified by the relevance of Bianchi type metrics in representing realistic cosmic scenarios. These metrics, with their anisotropic and homogeneous features, enable a more accurate portrayal of the universe's diverse stages. Investigating  $f(R)$  gravity within this context allows us to discern its impact on cosmic dynamics, potentially revealing novel insights into the early and late-time behavior of the cosmos. The application of theoretical findings to observable phenomena, such as the cosmic microwave background radiation and large-scale structure formation, ensures practical implications. Bridging theory with observational data is crucial for advancing our cosmological understanding and refining models to align with empirical evidence. This study, therefore, justifies its significance by contributing to the broader exploration of alternative gravity theories and their role in shaping the fabric of the universe.

## V. RESEARCH PROBLEM

The research problem addressed in this study revolves around the investigation of the cosmological implications arising from the integration of  $f(R)$  gravity theory with Bianchi type metrics. The primary challenge lies in understanding how modifications to the gravitational action, introduced by the  $f(R)$  theory, influence the evolution and structure of the universe within the context of different Bianchi types. Bianchi type cosmologies exhibit varying degrees of anisotropy and homogeneity, making them crucial for studying the diverse scenarios that the universe may have experienced during its evolution. The research problem seeks to uncover how the anisotropic features of Bianchi type I, II, and III metrics respond to the modifications introduced by the  $f(R)$  gravity theory. This involves formulating and solving the field equations that govern the dynamics of these cosmological models. The study aims to address the broader issue of reconciling theoretical predictions with observational data. Bridging the gap between  $f(R)$  gravity predictions and astrophysical observations poses a significant challenge, requiring a careful examination of the implications for phenomena such as the cosmic microwave background radiation and large-scale structure formation. By addressing these research problems, the study aims to contribute to a more profound understanding of the interplay between alternative gravity theories and the observed universe.

## VI. CONCLUSION

The exploration of Bianchi type cosmological models within the framework of  $f(R)$  gravity theory has provided valuable insights into the nuanced interplay between modified gravity and the structure of the universe. This study addressed the research problem by deriving and analyzing the field equations governing the dynamics of Bianchi type I, II, and III metrics under the influence of  $f(R)$  gravity modifications. The examination of these cosmological scenarios revealed distinct features, emphasizing the role of modified gravity in shaping the anisotropic and homogeneous aspects of the universe. The findings from this study hold implications not only for theoretical advancements but also for observational astrophysics. The application of the theoretical framework to phenomena such as the cosmic microwave background radiation and large-scale structure formation establishes a crucial link between  $f(R)$  gravity predictions and observable features of the cosmos. This connection contributes to the ongoing dialogue between theory and experiment, refining our understanding of gravity and cosmology. The study underscores the significance of considering alternative gravity theories in exploring the vast cosmic landscape. The insights gained pave the way for further investigations, fostering a deeper appreciation of the intricate relationship between gravitational theories and the observed universe. As

we continue to probe the mysteries of the cosmos, the study of  $f(R)$  gravity within Bianchi type cosmologies serves as a valuable avenue for expanding the boundaries of our cosmological understanding.

## VII. FUTURE SCOPE

The exploration of Bianchi type cosmological models within the framework of  $f(R)$  gravity theory opens avenues for intriguing future research. Extending the analysis to higher Bianchi types and more complex geometries could offer a deeper understanding of the universe's evolution under the influence of modified gravity. Investigating diverse scenarios can uncover novel features and contribute to a more comprehensive theoretical framework. The study's application to specific astrophysical observations, such as gravitational wave signatures and galaxy clustering, presents an exciting direction for future investigations. Integrating  $f(R)$  gravity predictions with advanced observational data allows for a stringent test of the theory's viability on different scales. Exploring the interplay between  $f(R)$  gravity and other fundamental forces, like dark energy, could enhance our understanding of the broader cosmic landscape. Future studies may also delve into the implications of  $f(R)$  gravity in the early universe, shedding light on its role in cosmic inflation and addressing fundamental questions about the universe's initial conditions. The multifaceted nature of this research promises a rich and evolving field with significant contributions to our comprehension of gravity and cosmology.

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# A Chemical Synthesis of CdSnO<sub>3</sub> Nanoparticles and Their Performance in Hydrogen Sensing

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## ABSTRACT

CdSnO<sub>3</sub> nanoparticles were successfully synthesized without any templates by simple co-precipitation synthesis route. Further characterized by using X-ray diffraction (XRD) measurements, field emission scanning electron microscopy (FESEM) and Fourier transform infrared (FTIR) spectroscopy and their hydrogen sensing properties were investigated. The CdSnO<sub>3</sub> nanoparticles exhibited outstanding gas sensing characteristics such as, higher gas response, extremely rapid response, fast recovery, excellent repeatability, good selectivity and at ambient operating temperature (~ 375°C). Furthermore, the CdSnO<sub>3</sub> nanoparticles are able to detect up to 5 ppm for hydrogen with reasonable sensitivity at a lower operating temperature.

**Keywords:** - Cadmium stannate, Hydrogen sensing, XRD, FTIR, TEM

## I. INTRODUCTION

In last two decades zero- and one-dimensional metal nanostructures, such as ZnO, TiO<sub>2</sub> and SnO<sub>2</sub>, have attracted enormous interest due to their unique properties and potential use in various applications such as photocatalysis, solar cells and gas sensors [1–5]. However, with keen research in nanotechnology, there is a demanding requirement for specially designed metal oxides to better match the properties of emerging materials. This has led to a transformed interest in ternary metal oxides of the form ABO<sub>3</sub> such as cadmium stannate, zinc stannate and cadmium stannate.

Because of these metal stannates having high electron mobility [6], high electrical conductivity, chemically more stable than binary metal oxides and attractive optical properties that makes it suitable for a wide range of applications in solar cells, sensors for the detection of humidity and gases, negative electrode material for battery and as a photocatalyst [7–9]. The sizes and shapes of nanostructures are crucial as it may affect their overall properties [10]. Therefore synthesis of nanostructures has considerably progressed over the last decade, to achieve different variety of shapes of nanomaterials. However, the synthesis of complex or ternary structures still remains a challenge for researchers [11]. CdSnO<sub>3</sub> is *n*-type semiconductors with a band gap of 2–3 eV, which, due to a high concentration of native defects, are characterized by a rather high conductivity among all metal stannates [12].

The aim of present article is synthesize  $\text{CdSnO}_3$  nanoparticles by co-precipitation method. Further, characterized by various characterization techniques and evaluate the hydrogen sensing performance of  $\text{CdSnO}_3$  thin film. As per our knowledge nobody studied the hydrogen sensing properties of  $\text{CdSnO}_3$  thin film.

## II. EXPERIMENTAL

### 2.1. Materials

All chemicals were of analytical grade. The cadmium chloride, stannous chloride and ammonia were purchased from E-Merck (India) and were used without further purification.

### 2.2. Synthesis of the $\text{CdSnO}_3$ nanoparticles

In this work, the  $\text{CdSnO}_3$  nanoparticles were synthesized without any templates by using cadmium chloride, stannous chloride and ammonia as starting materials through a simple and low cost co-precipitation synthesis route. The cadmium chloride was used as the source of  $\text{Cd}^{2+}$ , the stannous chloride was used as the source of  $\text{Sn}^{2+}$  and ammonia was used as the precipitating agent to release hydroxyl ions slowly during the reaction. In a typical experiment, the aqueous solution containing 0.2 M Cadmium chloride, 0.6 M stannous chloride and 15 ml ammonia (30 %) dissolved in 15ml distilled water and added drop wise in the mixture of cadmium chloride and tin chloride to maintain the pH of the solution  $\sim 7$  during the reaction and continuously stirred for 1 hour at room temperature  $30^\circ\text{C}$  to obtain white colored cadmium hydroxyl stannate powder. The resulting cadmium hydroxyl stannate powder was washed with double distilled water and alcohol several times to remove impurities and by products present in the product. The precipitate, thus formed was dried at  $80^\circ\text{C}$  in hot air oven for 12 h and grinded into a powder, which was then calcinated in air at calcinating temperature  $400^\circ\text{C}$  for 2 h to obtain the  $\text{CdSnO}_3$  nanoparticles.

### 2.3. Characterization

X-ray diffraction (XRD) analysis was performed with a Bruker diffractometer (D8, Advance, Bruker AXS model) with  $\text{CuK}\alpha$  radiation ( $\lambda=1.5406$  nm) operating at 40 kV and 40 mA. The FTIR spectroscopy analysis was performed with a Nicolet FTIR spectrometer (IMPACT 420 DSP) by the conventional KBr method in the spectral range  $4000\text{--}400$   $\text{cm}^{-1}$ . The field emission scanning electron (FE-SEM) microscopy analysis was carried out with a Hitachi (S-4800, Hitachi, Japan) microscope. The surface morphological study was performed by a high resolution transmission electron microscope (HRTEM, Tecnai G2 20 Twin, FEI, USA).

### 2.4. Hydrogen sensing properties

The cadmium stannate nanoparticles powder was spin coated on the alumina substrate and the ohmic contacts were made with the help of silver paste to form gas sensing element. For the preparation of spin coated cadmium stannate thin films, the cadmium stannate powder was dissolved in mixture of acetyl-acetone and ethanol in the ratio 8:2 to form a suspension in which 0.1 gm of p-hydroxy benzoic acid was added and the suspension was sonicated for one hour. The mixed suspension of cadmium stannate was spin coated using spin coater (SPN2000, Milman Thin Film Systems, Pvt. Ltd., Pune, India) forms the paste then the paste was coated on the alumina electrode and heated at  $800^\circ\text{C}$  to remove water from the film for the hydrogen sensing study. The electrical contact leads were fixed 0.7 cm apart with the help of silver paste on the surface of the film. The electrical resistance of the film was measured as a function of gas response by using a simple two probe configuration with a sensitive digital multimeter (2000 Digital multimeter, Keithley) controlled by a personal computer. The continuous variation in resistivity in the presence of hydrogen gas was achieved in a simple experimental set-up fabricated in our laboratory in order to investigate the hydrogen sensing properties.

### III. RESULTS AND DISCUSSION

#### 3.1 Characterizations:

The XRD pattern of as-prepared product annealed at temperature 400°C is depicted in Fig.1. All the diffraction peaks in the XRD pattern shown in Fig. 1 is indexed to cadmium stannate (JCPDS No.: 34-0885), indicating the formation of orthorhombic crystal structure (space group: Pbnm(62),  $a=5.4578$ ,  $b=5.5773$ ,  $c=7.8741$ ) of distorted perovskite type structure. No other peaks were observed, indicating that no impurities were present and confirming that the adopted synthesis method gives pure CdSnO<sub>3</sub> nanoparticles. The average crystallite size was calculated by fitting the [2 0 0] diffraction peak ( $2\theta = 32.9^\circ$ ) with a Gaussian function and using the values of the diffraction angle and peak full line width at half of maximum (FWHM) in the Debye-Scherrer formula –

$$t = \frac{k\lambda}{B \cos \theta} \dots \dots \dots (1)$$

where  $D$  is the average size of the crystallite, assuming that the grains are spherical,  $\lambda$  is the wavelength of the X-ray radiation,  $B$  is the peak FWHM in radian and  $\theta$  is the diffraction peak position. The average crystallite size of the CdSnO<sub>3</sub> nanoparticles was found to be in the range of 3.65 nm at 400°C.

The FT-IR spectrum of the CdSnO<sub>3</sub> powder form nanostructured sample, heated at 400°C are shown in Fig.2. The FTIR spectrum for calcinated perovskite CdSnO<sub>3</sub> sample at 400°C is exhibits a broad band of which is mixing of three non significant maxima of absorption between 630 and 690 cm<sup>-1</sup>, the first peak at 638 cm<sup>-1</sup> (Sn–O bond stretching along the  $b$  axis), the second at 661 cm<sup>-1</sup> (Sn–O bond stretching along the  $a$  axis, the 654 cm<sup>-1</sup> peak is very small), and the third at 687 cm<sup>-1</sup> (Sn–O bond stretching along the  $a+c$  direction). Mainly the wide band at 440 cm<sup>-1</sup> is due to Sn–O–Sn scissoring. The peaks at 800–1400 cm<sup>-1</sup> are assigned to CdO. The bands in the region of 520–670 cm<sup>-1</sup> can be ascribed to the stretching vibration of Sn–O. An upward shift (527.84–551.03 cm<sup>-1</sup>) in the frequency of the present system is due to the presence of Sn in Cd–O lattice [13-14].

The FESEM/TEM image of as-prepared product [Fig. 3(a)] exhibits a uniform morphology showing the very small tiny nanoparticles having size  $\sim 5$  nm. The TEM image of as-prepared product [Fig.3(b)] exhibits a uniform morphology and narrow sized distribution of the nanoparticles at 400°C. The average grain size of the CdSnO<sub>3</sub> nanoparticles is estimated to be around 3-5 nm, which supports the XRD result. The corresponding selected area electron diffraction (SAED) pattern (as shown in inset of Fig.3(b)) shows spots in particular direction which confirms that the single crystalline random orientations of the CdSnO<sub>3</sub> nanoparticles and there is no secondary phase observed.

#### 3.2 Hydrogen sensing characteristics

The H<sub>2</sub> gas sensing experiments were performed at different temperatures in order to find out the optimum operating temperature for H<sub>2</sub> gas detection. Before exposing to the H<sub>2</sub> gas, the sensing element was allowed to equilibrate inside the gas chamber at an operating temperature for 1 h. The effect of an operating temperature on the gas response to 50 ppm H<sub>2</sub> gas of the synthesized CdSnO<sub>3</sub> nanoparticles is shown in Fig.4. The relationship between the gas response and the operating temperature exhibits a trend of “increase–maximum–decay” behavior to 50 ppm H<sub>2</sub> gas. To investigate the H<sub>2</sub> sensing properties of this sample such as response and recovery characteristics, reproducibility and selectivity, operating temperature is optimized 375°C. The response and recovery characteristics of the CdSnO<sub>3</sub> nanoparticles to 50 ppm H<sub>2</sub> gas at an operating temperature 375°C is shown in Fig. 5. It was observed that the resistance of the sensing element decreases when exposed to the H<sub>2</sub>. As can be seen from Fig. 5, the sensor responds very rapidly after introduction of H<sub>2</sub> and recovers slowly when it is exposed to air. The CdSnO<sub>3</sub> nanoparticles have response time of  $\sim 2-3$  s and the



recovery time of  $\sim 15-17$  s. The CdSnO<sub>3</sub> nanoparticles show good reproducibility and reversibility upon repeated exposure and removal of H<sub>2</sub> under same conditions. This suggests that the CdSnO<sub>3</sub> nanoparticles can be used as a reusable sensing material for the detection of H<sub>2</sub>.

The gas response of the CdSnO<sub>3</sub> nanoparticles versus H<sub>2</sub> gas concentration at an operating temperature of 375°C is shown in Fig. 6. It was observed that the gas response increases linearly in the range 5-50 ppm H<sub>2</sub> gas. It is found that the response of CdSnO<sub>3</sub> nanoparticles can be empirically represented as,

$$y = -12.72 + 7.072 * x, R2 = 0.99224$$

Where x, y and R2 represents the H<sub>2</sub> concentration, gas response and correlation coefficient, respectively. The broken curve shows the linear fit to the experimental data, illustrating clearly good quality of the fit. The linear relationship between the gas response and the H<sub>2</sub> concentration at low concentrations (5-50 ppm) may be attributed to the availability of sufficient number of sensing sites to act upon the CdSnO<sub>3</sub> nanoparticles.

Selectivity is an important parameter of gas sensors and it is the ability of a sensor to respond to a certain gas in presence of other gases. Theoretically, the sensors should have high response to some gases and little or no response to other gases in the same surroundings. To study the selective behaviour of the CdSnO<sub>3</sub> nanoparticles to H<sub>2</sub> at an operating temperature of 375°C, the gas response towards LPG, CO, CO<sub>2</sub> and ethanol with concentration 50 ppm each were also measured.

The selectivity property of CdSnO<sub>3</sub> nanostructured thin film at various pollutant gases is shown in Fig. 7. The CdSnO<sub>3</sub> nanoparticles exhibit higher response to H<sub>2</sub> (331), whereas it shows a considerably lower response (<7.62) to LPG, CO, CO<sub>2</sub> and ethanol. The selectivity coefficient (K) of H<sub>2</sub> to another gas is defined as [15, 16]:

$$K = \frac{S_{H_2}}{S_B}$$

Where S<sub>H<sub>2</sub></sub> and S<sub>B</sub> are the responses of sensors in H<sub>2</sub> and B gas, respectively. The selectivity coefficients for the CdSnO<sub>3</sub> nanoparticles were 187.21 to LPG, 2.21 to CO<sub>2</sub>, 1.62 to CO and 131.21 to ethanol. The experimental results indicate that the CdSnO<sub>3</sub> nanoparticles based sensor has a good selectivity to H<sub>2</sub>. The reproducibility and stability of the CdSnO<sub>3</sub> nanoparticles were measured by repeating the measurement many times.

In literature possible hydrogen sensing mechanisms are explained on the basis of adsorption and desorption mechanisms. The probable gas sensing mechanism is upon exposure to H<sub>2</sub> gas, much more number of trapped electrons are released once the adsorbed surface O species are chemically reduced by the H<sub>2</sub> molecules leading to lowering of the barrier height and increasing the conductivity. Therefore, change in the current as well as the magnitude of the highest current in CdSnO<sub>3</sub> nanoparticles is much higher resulting in the enhanced gas response. The Cd involves in Sn-O lattice is already observed in FTIR and XRD result. An increase in the surface-to-volume ratio of the CdSnO<sub>3</sub> nanoparticles which would increase number of adsorbed O molecules and an increase in the surface defects, which can influence the chemical as well as electronic properties, the adsorption behaviour. Further these defects also control the carrier concentration via effective near surface electron depletion. Thus these are main reasons due to which H<sub>2</sub> gas response enhanced [17-20].

#### IV. CONCLUSIONS

- We have successfully synthesized the CdSnO<sub>3</sub> nanoparticles at low cost by using a simple co-precipitation method by calcination of CdSnO<sub>3</sub> nanoparticles.
- XRD and FTIR results clearly indicating formation of CdSnO<sub>3</sub> nanostructure. TEM study revealed the formation of single crystalline nanostructures.

- The gas response to 50 ppm of H<sub>2</sub> gas is found to be ~ 331.44. The response time was nearly 3-4 sec and the recovery time was found to be 15-16 sec.
- The synthesized CdSnO<sub>3</sub> nanoparticles are able to detect up to 5 ppm for H<sub>2</sub> with reasonable response at 375 °C temperature. Further, it was shown that the CdSnO<sub>3</sub> nanoparticles can be reliably used to monitor the concentration of H<sub>2</sub> gas over the range (5-60 ppm).
- These results indicate that the CdSnO<sub>3</sub> nanoparticles are indeed very attractive H<sub>2</sub> gas sensing materials.

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### Figure captions

Fig.1: XRD pattern of CdSnO<sub>3</sub> powder ( calcinated ~ 400 °C) prepared using co-precipitation synthesis method

Fig.2: FTIR spectrum of CdSnO<sub>3</sub> nanoparticles calcinated at 400°C

Fig.3 : (a) FE-SEM image(b) TEM image of 400°C calcinated CdSnO<sub>3</sub> nanoparticles

Fig.4: Effect of operating temperature on the gas response of CdSnO<sub>3</sub> nanoparticles (calcinated at 400°C ) powder to 50 ppm H<sub>2</sub> gas.

Fig.5: Repetitive response of CdSnO<sub>3</sub> nanoparticles to 50 ppm H<sub>2</sub> gas at an operating temperature of 375 °C

Fig.6: Response of CdSnO<sub>3</sub> nanoparticles to 50 ppm H<sub>2</sub> gas at an operating temperature of 375 °C

Fig.7: Bar chart showing the gas response of CdSnO<sub>3</sub> nanoparticles for different gases. The gas concentration and operating temperature in all cases were 50 ppm and 375 °C, respectively.

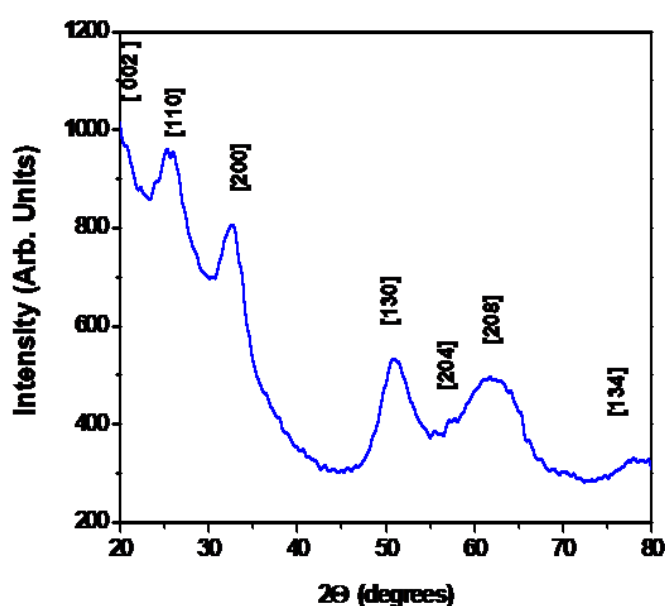
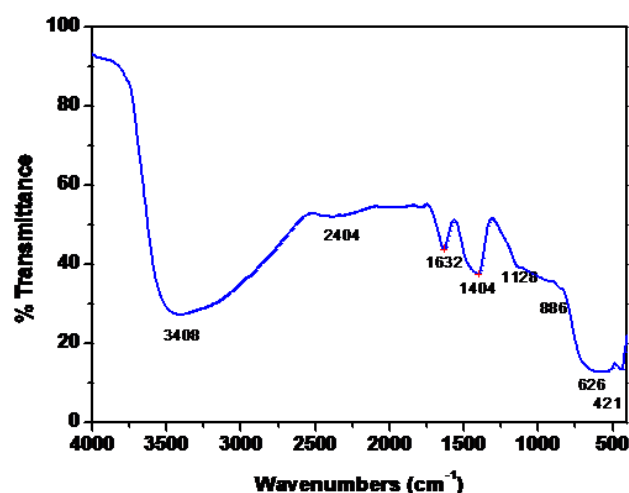
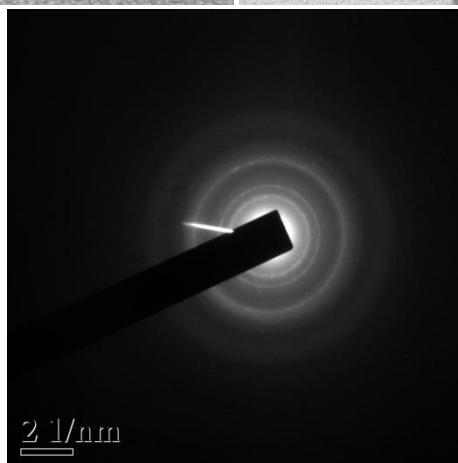
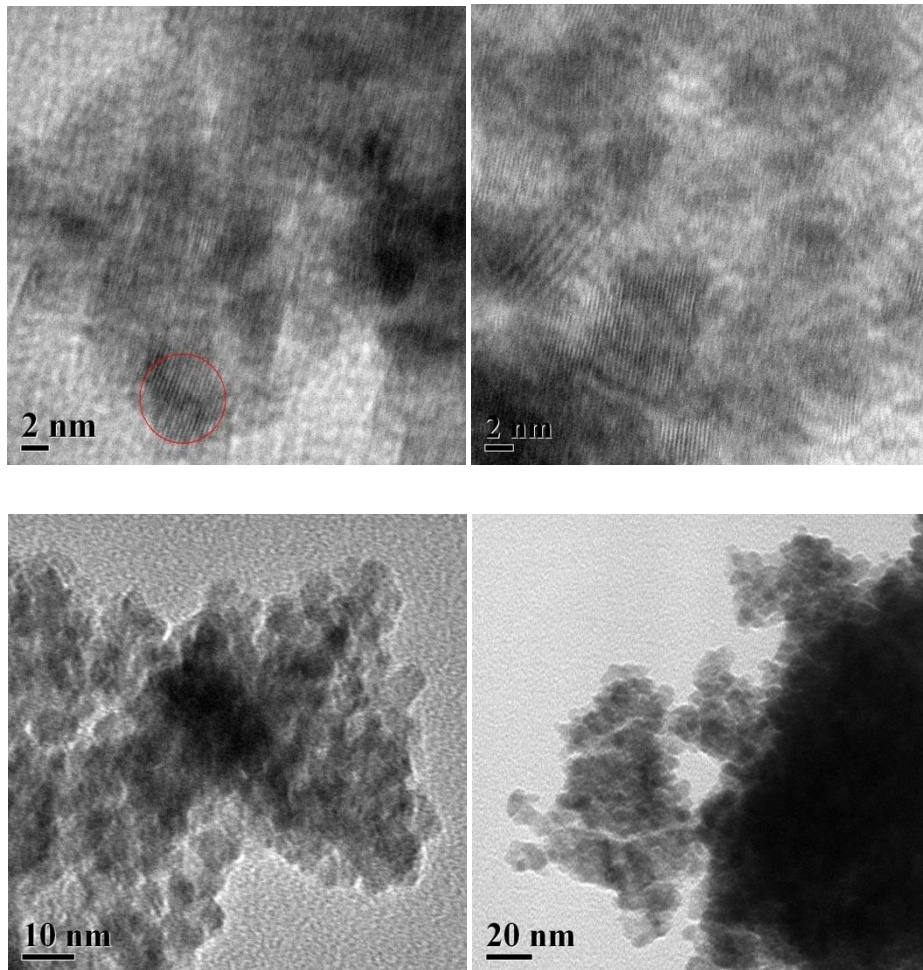


Fig. 1 XRD pattern of CdSnO<sub>3</sub> powder ( calcinated ~ 400 °C) prepared using co-precipitation synthesis method



**Fig. 2** FTIR spectrum of CdSnO<sub>3</sub> nanoparticles calcinated at 400 °C



**Fig. 3** FESEM and (b) TEM

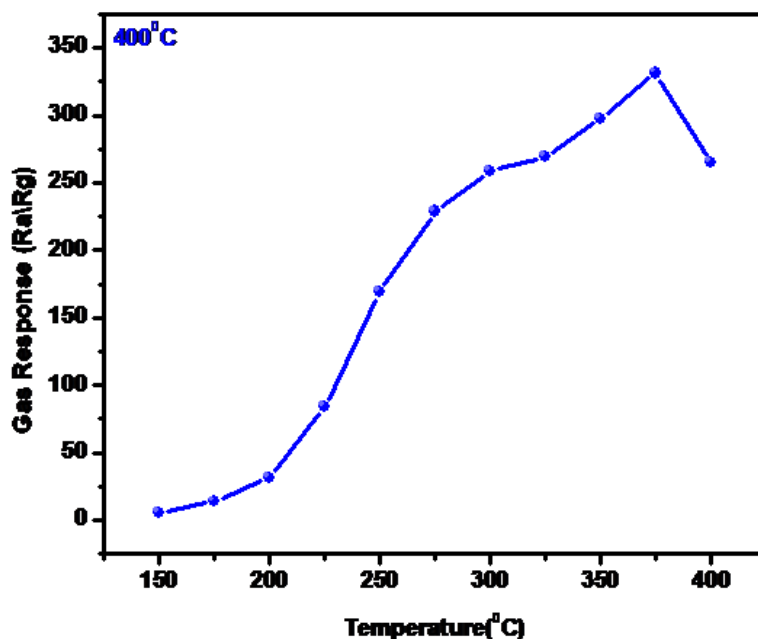


Fig. 4 Effect of operating temperature on the gas response of CdSnO<sub>3</sub> nanoparticles (calcinated at 400°C ) powder to 50 ppm H<sub>2</sub> gas.

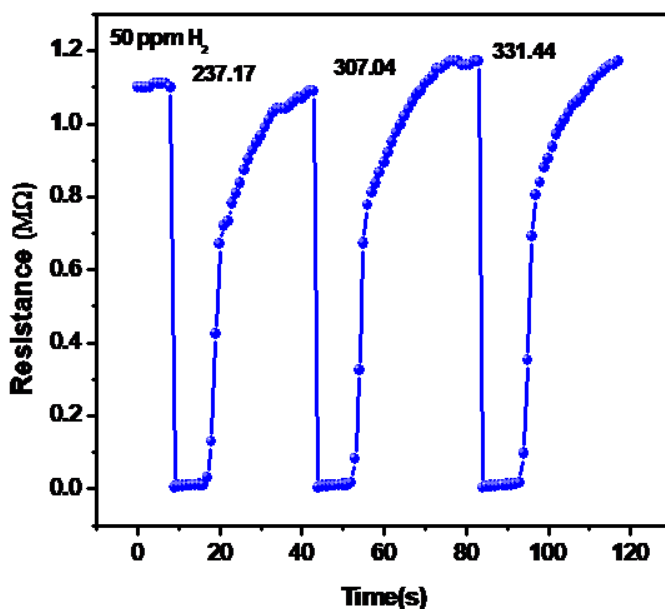


Fig. 5 Repetitive response of CdSnO<sub>3</sub> nanoparticles to 50 ppm H<sub>2</sub> gas at an operating temperature of 375 °C

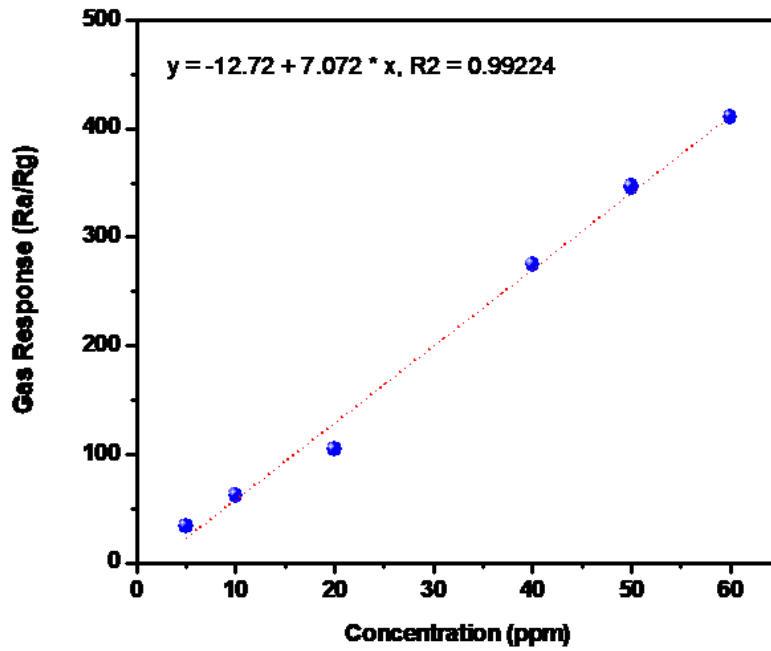


Fig. 6 Response of CdSnO<sub>3</sub> nanoparticles to 50 ppm H<sub>2</sub> gas at an operating temperature of 375 °C

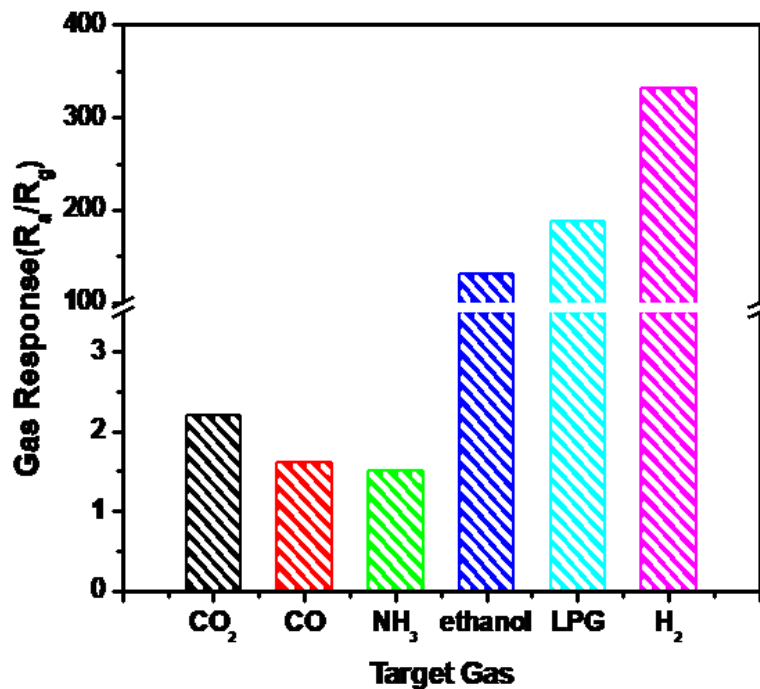


Fig. 7 : Bar chart showing the gas response of CdSnO<sub>3</sub> nanoparticles for different gases. The gas concentration and operating temperature in all cases were 50 ppm and 375 °C, respectively.

# Discovering The Diversity And Potential Of Medicinal And Aromatic Plants In India: A Scientific Assessment

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## ABSTRACT

India, endowed with diverse ecosystems and a rich heritage of traditional medicine systems, harbors an extensive array of medicinal and aromatic plants (MAPs) that have been utilized for centuries to promote health and well-being. India's rich biodiversity and millennia-old traditional medicine systems have bestowed upon it a vast array of medicinal and aromatic plants (MAPs), holding significant potential for healthcare and industry. This review provides a comprehensive analysis of India's MAPs, covering their botanical diversity, traditional uses, phytochemical composition, pharmacological properties, and modern applications. This paper aims to provide a comprehensive overview of the medicinal and aromatic plants in India, highlighting their botanical diversity, traditional uses, phytochemical composition, pharmacological properties, and current applications in modern medicine and industries. Through an analysis of recent scientific literature and ethnobotanical studies, this paper elucidates the immense potential of Indian MAPs in addressing various health conditions, supporting sustainable livelihoods, and contributing to economic development. Furthermore, considerations regarding conservation, cultivation, sustainable harvesting, and commercialization strategies are discussed to ensure the preservation and responsible utilization of these valuable plant resources. Overall, this review underscores the significance of harnessing the wealth of medicinal and aromatic plants in India for the advancement of healthcare, pharmaceuticals, and allied industries while promoting biodiversity conservation and socio-economic well-being.

**Keywords:** biodiversity, Medicinal and aromatic plants, phytochemistry, pharmacology, traditional medicine

## I. INTRODUCTION

India, with its diverse agro-climatic zones and rich cultural heritage, boasts a treasure trove of medicinal and aromatic plants (MAPs) that have been integral to traditional healing practices and cultural rituals for millennia. The Indian subcontinent is home to a myriad of plant species renowned for their therapeutic properties, aromatic compounds, and cultural significance. This paper aims to explore the botanical diversity, traditional uses, phytochemical composition, pharmacological properties, and current applications of medicinal and aromatic plants in India, shedding light on their immense potential in healthcare, pharmaceuticals, cosmetics, and allied industries.

## II. BOTANICAL DIVERSITY AND TRADITIONAL PRACTICES

India's diverse geography, encompassing Himalayan foothills, coastal plains, and tropical forests, fosters a rich tapestry of flora, including a plethora of medicinal and aromatic plants (MAPs). Traditional medicine systems such as Ayurveda, Siddha, Unani, and various indigenous tribal healing practices have extensively utilized indigenous plant species for centuries. These traditional systems have documented the uses of numerous MAPs, including but not limited to Neem (*Azadirachta indica*), Tulsi (*Ocimum sanctum*), Ashwagandha (*Withaniasomnifera*), Turmeric (*Curcuma longa*), Amla (*Phyllanthusemblica*), and Brahmi (*Bacopamonnieri*), which hold sacred status in Indian culture and are revered for their multifaceted medicinal properties. The traditional knowledge surrounding these plants encompasses a wide range of applications, including treatments for digestive disorders, respiratory ailments, skin conditions, and stress-related disorders, as well as promoting general health and well-being. Furthermore, indigenous communities have developed intricate practices for plant identification, collection, preparation, and administration, often passed down through generations, highlighting the deep-rooted cultural significance of MAPs in India's traditional healing heritage.

## III. PHYTOCHEMICAL COMPOSITION

Indian MAPs are characterized by a diverse array of phytochemicals, including alkaloids, flavonoids, terpenoids, phenolic compounds, and essential oils, which confer them with therapeutic efficacy. Extensive research has elucidated the pharmacological properties of these plants, including antioxidant, anti-inflammatory, antimicrobial, antidiabetic, anticancer, hepatoprotective, and neuroprotective activities. The bioactive compounds present in MAPs act through various molecular mechanisms, targeting key pathways involved in disease pathogenesis and immune regulation.

## IV. CURRENT USES IN MODERN MEDICINE

Indian MAPs continue to play a significant role in modern healthcare, with many traditional remedies being validated through scientific research and incorporated into mainstream medicine. Plant-derived drugs and phytochemicals are utilized in the treatment of diverse health conditions, ranging from common colds and digestive disorders to chronic diseases like cancer and diabetes. Furthermore, the aromatic compounds extracted from MAPs are extensively used in perfumery, cosmetics, flavoring agents, and aromatherapy, contributing to the multi-billion-dollar global fragrance and flavor industry.

## V. CONSERVATION, CULTIVATION, AND SUSTAINABLE UTILIZATION

Despite their cultural and economic importance, many medicinal and aromatic plants in India are facing threats due to habitat loss, overexploitation, unsustainable harvesting practices, and climate change. Conservation efforts, including in situ and ex situ conservation, community-based conservation initiatives, and legal frameworks such as biodiversity hotspots and protected areas, are imperative to safeguarding these invaluable plant resources. Additionally, promoting sustainable cultivation practices, organic farming, certification schemes, and fair trade practices can ensure the long-term viability of MAPs while empowering local communities and enhancing socio-economic resilience.



## VI. CONCLUSION

Medicinal and aromatic plants in India represent a valuable reservoir of biodiversity and traditional knowledge, offering immense potential for improving human health, supporting sustainable livelihoods, and driving economic growth. Harnessing the therapeutic and economic benefits of these plants requires concerted efforts towards conservation, cultivation, research, and responsible utilization. By integrating traditional wisdom with modern science and embracing principles of sustainability and biodiversity conservation, India can leverage its botanical heritage to address contemporary healthcare challenges and foster inclusive development.

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# A Study of Efficient Phosphate Solubilizing Microorganism on Groundnut Plant Growth

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## ABSTRACT

Phosphorus is macro nutrient for plant growth and the availability of phosphorus in soil is less due to its insoluble form. The phosphorus Solubilizing microorganisms have the efficiency to make soluble form of phosphorus which increase fertility of soil and promote plant growth. This paper evaluates the importance of availability of soluble phosphorus in soil and impact of phosphorus solubilising organism on the groundnut plant growth. The microorganisms were isolated from rhizospheric soil, pure culture selected, identified based on morphological characters, staining characters and biochemical test. Soil phosphorus level measured and applied to groundnut plant. The application of PSM increased the groundnut plant growth and phosphorus uptake compared to the control plant. The phosphorus solubilisation Efficiency varies as *Aspergillus* strain is more efficient than *Bacillus* and *Pseudomonas*. This study shows the Phosphate solubilising microorganism improves the cultivation of groundnut and soil fertility contributing sustainable Agriculture practices.

**Keywords:** Groundnut, Phosphorus Solubilising Microorganism, Rhizospheric soil, Soil Fertility, Sustainable Agriculture practices.

## I. INTRODUCTION

Groundnut plant is a major crop grown and used all over the world as it having very high nutritional value (1). In several region of India ground nut production is very low because of several factors. One major factor is the non availability of nutrient in soil required for plant growth. As phosphorus is the primary nutrient required for the plant growth. Phosphorus is manly supplied to the plant as a fertilizer. In order to maintain the amount of phosphorus in soil we applied large amount of phosphorus based fertilizer but most of the phosphorus is converted into insoluble form (2). Therefore it requires frequently application of fertilizer in soil.

The phosphorus is essential for plant growth and is present in insoluble form in soil that why it is unavailable for plant. The microorganism having ability to convert insoluble form of phosphorus to soluble form and the soluble form of phosphorus is uptake by plant and plant growth can improve (3).

The microorganism like *Bacillus*, *Pseudomonas*, *Aspergillus*, *Penicilium* sp. etc have been isolated and studied for their phosphorus solubilisation efficiency. The fungal species like *Aspergillus* have been reported better solubilising efficiency than bacteria (4, 5). Ability of solubilization of inorganic insoluble phosphate salts by different microorganisms depends on their ability to produce and release organic acids to their respective environments. These organic acids decrease soil or any medial pH (9). The present work have designed with

following objecting as to isolate and identified the efficient phosphate solubilising microorganism. Then we estimated the phosphate solubilising efficiency of isolated micro organisms. Further we examine the effect of phosphate solubilising micro organism on growth and development of groundnut plant.

## II. MATERIALS AND METHODS

### 1) Collection of Soil Samples:

The rhizospheric soil samples were collected from two different soya bean cultivating areas of wadwani dist. Beed regions of Maharashtra, India. The rhizospheric soil samples were collected from random soya bean plants. The soil samples were air dried under shade and used for isolation of microorganisms.

### 2) Isolation of PSM:

The collected soil samples were dissolved in sterile distilled water. After that this sample is serially diluted up to 5 times. Then this serially diluted soil sample spread on pikovskaya agar plates. The PVK agar plates were incubated at 37°C for 2-4 days. After incubation the colonies having clear zone of phosphate solubilisation were selected for pure culture preparation of phosphate solubilising microorganism (19-20).

### 3) Identification of PSM:

Microorganisms having clear zone were efficient microorganism for phosphate solubilisation. These efficient micro organisms are identified based on morphological characters staining characters and biochemical test (14).

### 4) Estimation of Phosphate Solubilisation efficiency on Solid Medium:

The phosphate solubilisation efficiency of microorganisms was tested on pikovskaya agar medium containing tri calcium phosphate as a source of phosphate. The purified cultures of microorganisms were placed in the centre of the plate having PVK agar medium. The inoculated plates were incubated at 37°C for 4 days. After incubation the plates were observed for clear zone formation around the colonies. The phosphate solubilisation was analysed by determining the phosphate solubilisation efficiency (6).

The phosphate solubilisation efficiency = 
$$\frac{\text{Colony diameter} + \text{Clear zone diameter}}{\text{Colony diameter}}$$

### 5) Estimation of phosphate solubilisation in liquid medium:

For measurement of phosphate solubilisation the prominent micro organism selected in previous step were inoculated in PVK broth medium containing Tri calcium phosphate as a source of phosphate (11, 12). The pH was adjusted to 7. One control broth was also prepared. The medium was incubated at 37°C for 5 days. After incubation the culture were harvested and centrifuge at 1000 RPM for 15 min and recorded the change in pH, titrable acidity and concentration of P released in medium. The pH of the supernatant was measured with pH meter; the concentration of P was determined by Olsen's method (7). The titrable acidity was measured using phenolphthalein indicator and titrated against 0.01 N NaOH (10).

### 6) Pot Experiment:

Pot experiment was carried out in college laboratory area. The efficient micro organisms were selected for treatment of Groundnut seeds. The Groundnut seeds were washed with sterile distilled water and dried. The

seeds were treated with isolates of 24 hr old culture. The seed were soaked in culture for 30 min. Three seeds were sown in every pot containing soil and peat along with tri calcium phosphate as a phosphate source. The plants were watered when required. After 3 months the vegetative growth parameters such as seed germination, height of plant, number of leaves length of roots and number of nodules were measured for each treatment.

### III.RESULT AND DISCUSSION

#### 1) Isolation of Phosphate Solubilising Microorganism:

The soil samples from rhizosphere of soya bean plant were collected for isolation of phosphate solubilising microorganism. Out of total PSM five isolates were selected for further study based on phosphate solubilisation.

#### 2) Identification:

The isolated strains were identified by comparing morphological, cultural and biochemical characters up to the genus level. The isolated five strains were identified as two strains belong to Bacillus genera, two strains belongs to Pseudomonas genera and one strain belongs to Aspergillus genera.

The Bacillus strains were gram positive, motile, spore forming and aerobic in nature. These were positive to catalase, gelatine hydrolysis and starch hydrolysis. The Pseudomonas strains were gram negative, motile, aerobic and non spore forming and positive to catalase and gelatine hydrolysis and negative to starch hydrolysis. The Aspergillus strains were blackish colony and having candida with septate mycelium and chain of canidia and canidia were globase and rough.

#### 3) Estimation of phosphate solubilising on solid medium:

The phosphate solubilising efficiency of microorganism were tested on pikovskaya agar medium having tri calcium phosphate as a source of phosphate. After 4 days incubation the micro organism formed a clear zone around the colonies. The isolates formed a clear zone ranges from 1.5 cm to 3 cm. The Aspergillus strain having largest clear zone of 2.9 cm, Bacillus strains having 2.1 to 2.4 cm and Pseudomonas strains having lowest zone of 1.6 to 2.1cm. That is the Aspergillus strain is more efficient than Bacillus and Pseudomonas.

**Table: 1 Phosphate solubilising efficiency of isolates on solid medium.**

Isolates	Diameter of Clear zone	Phosphate Solubilising efficiency
Bacillus Strain 1	2.1	2.90
Bacillus Strain 2	2.4	3.40
Pseudomonas Strain 1	1.6	2.52
Pseudomonas Strain 2	2.1	2.61
Aspergillus Strain 1	2.9	4.42

#### 4) Estimation of Phosphate Solubilisation Efficiency in Liquid Medium:

The Selected microorganisms were inoculated in pikovskaya liquid medium containing tri calcium phosphate. The medium was incubated at 37°C for 5 days. After incubation the culture was harvested and recorded the change in pH, titrable acidity and Concentration of P released in medium.

The phosphate solubilisation results in organic acid production that's why the pH of the medium decreases. Maximum decrease in the pH was occurred due to the Aspergillus Strain inoculation followed by the Bacillus

and Pseudomonas Strains. The growth of microorganism results in the increase in available phosphorus in the medium. An Aspergillus and Bacillus strain gives more available phosphorus i.e. 46.96 and 45.80 and Pseudomonas gives 44.86 available phosphorus. The maximum titrable acidity has been observed by Aspergillus Strain followed by Bacillus and Pseudomonas.

**Table: 2 Quantitative Estimation of Phosphate Solubilisation Efficiency**

Isolates	Change in pH	Conc. Of P (PPM)	Titrable Acidity
Bacillus Strain 1	5.43	45.06	2.5
Bacillus Strain 2	4.87	45.80	2.8
Pseudomonas Strain 1	6.20	43.06	2.4
Pseudomonas Strain 2	6.41	44.84	2.4
Aspergillus Strain 1	4.30	46.95	3.3

#### 5) Pot Experiment:

The effect of phosphate solubilising micro organisms on vegetative growth parameters of ground nut plant were measured in culture pots. As compared to the non inoculated pot the inoculated pot affects significantly. The analysis of vegetative growth parameters i.e. seed germination, height of plant, length of root, number of leaves, number of nodules etc were recorded after 3 months.

The phosphate solubilising micro organisms increases the germination seeds. The treated seed of ground nut plant increase the height of plant significantly over control plant. The seed treated with Aspergillus strain having maximum height than Bacillus and Pseudomonas strain. The number of leaves was also more in Aspergillus treated seed. The significant difference in root length of ground nut plant was observed due to the inoculation of isolates. The root length of plant treated with Aspergillus was more than Bacillus and Pseudomonas Strain. The nodules formation was also affected due to the treatment of isolates. The root nodules were increase in Bacillus treatment than others. All parameters of ground nut plant were significantly affected due to the inoculation and Aspergillus strain treatment affects more on plant growth than others.

**Table: 3 Variation in Vegetative Growth Parameters of Ground nut Plant**

Observation	Control	Bacillus Strain 1	Aspergillus Strain 1
No. of Seed Germination	1	3	3
Height of Plant	20	61.59	64.30
No. of Leaves	24	77	80
Length of Roots	7	18.13	18.55
No. of Nodules	2	14	11

#### IV. CONCLUSION

This investigation highlighted that efficient phosphate solubilising micro organism could be easily isolated from local agricultural field. The agricultural field contains various phosphates solubilising micro organism. These microorganisms like Bacillus, Pseudomonas, Aspergillus etc positively affect on the growth of ground nut plant. The yield of ground nut crop could be increase because of the treatment of phosphate solubilising micro organism. Therefore in future these phosphates solubilising micro organism cab be used as bio fertilizer for

different plants. The combined use of phosphate fertilizer i.e. tri calcium phosphate and phosphate solubilising micro organism shows great effect as compared to separate use on yield of crops.

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# Exploring the Multifaceted Snake Population in Maharashtra, India

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## ABSTRACT

This study investigated the diversity of venomous, semi-venomous, and non-venomous snake species in various habitats across Pusad, Vidarbha, India. Field surveys were conducted during both day and night time from July 2018 to August 2020. A total of seventeen species were identified, including the Common Kukri, Common Wolf Snake, Green Keelback, Russell's Viper (venomous), Worm Snake, Bamboo Pit Viper (venomous), Common Trinket, and Indian Rat Snake. Understanding the distribution of these species across different habitats is crucial for their individual survival and conservation. This information can be used to raise awareness and develop effective conservation strategies for snakes in Maharashtra.

**Keywords:** snakes, Maharashtra, India

## I. INTRODUCTION

Every year, approximately 5.4 million snakebites are reported globally, resulting in up to 2.7 million cases of envenomation, nearly 138,000 fatalities, and 400,000 instances of long-term sequelae or disability.[1,2] Annually, Asia experiences two million snakebites, with India accounting for over 46,000 fatalities each year. [1,3]. A diverse array of snake species inhabit various habitats worldwide. It is estimated that there are approximately 3,000 terrestrial snake species globally, with a prevalence in warm climates and lush-green tropical regions. India, for instance, is home to around 278 snake species, among which 58 species are venomous [1]. Across the globe, there are approximately 3,000 species of snakes, with 500 of them possessing venom. Within the Indian subcontinent, 52 species of venomous snakes are documented.[2]. Snakebites pose an acute, life-threatening medical emergency, constituting a significant occupational hazard frequently encountered by farm laborers and farmers. This issue is endemic in tropical countries like India. Annually, India witnesses 250,000 snakebites, resulting in 35,000 to 50,000 fatalities. Identified in India are 216 snake species, of which 52 are recognized as venomous. The prominent families of poisonous snakes in India include Elapidae, comprising the common cobra (*Naja naja*), King cobra, and common krait (*Bungarus caeruleus*); Viperidae, which includes Russell's viper (*Echiscarinatus* or saw-scaled or carpet viper) and pit viper; and Hydrophidae, representing sea snakes. [4]. The current study holds significant importance for the conservation of snake species.



## II. MATERIALS AND METHODS

The study begins with the necessity of well-trained snake rescuers for observation. This requires courage, self-daring, confidence, and most importantly, experience and skill in understanding the behavior and nature of the targeted snake species. Snake rescue records were compiled from July 2016 to August 2017, with sampling conducted based on the requirements, requests of local communities, or distress calls from residents, spanning twenty-four hours. Individual snake species were located and attempted to be captured by hand, using sticks, or through pitfall traps in conjunction with drift fences. Upon capturing the snakes, their characteristics and predominant features were observed and recorded for taxonomical analysis. Photographs were taken, and species were identified using keys and other relevant publications.[5], [6],[7],[8]. Following the study, the captured snake species were released into forested or safe areas in accordance with the guidelines provided by the wildlife and forest department. It was ensured that the rescued snakes were released into their appropriate habitats without causing harm to them.

## III.RESULTS AND DISCUSSION

A total of sixteen species from sixteen genera belonging to five families of snakes were recorded in and around the human habitations of Pusad Tehsil, as indicated in Table I. Among these rescued species, four were identified as poisonous, two as semi-venomous, and the remaining ten as non-venomous. Due to the unavailability of suitable habitat and prey base, snakes often have to venture outside, leading to conflicts that sometimes result in the death of a snake. However, some environmentally conscious citizens or those under stress call upon expert snake catchers for the escape and survival of these species.

Sr. No.	Family	Genus	Species	Common name	Local Name	Nature	Status
1	Elapidae	Naja	naja	Spectacled cobra	Naag	***	C
		Bungarus	caeruleus	Common krait		***	C
2	Viperidae	Daboia	russelii	Russell's viper	Ghonus	***	C
		Echis	carinatus	Indian saw-scaled viper	Furase	***	C
3	Colubridae	Boiga	trigonata	Common cat snake	Manjarya	**	C
		Ahaetulla	nasuta	Common vine snake	Harantol	**	C
		Ptyas	mucosa	Indian rat snake	Dhaman	*	C
		Coelognathus	helena	Common trinket snake	Taskar	*	C
		Macropisthodon	plumbicolor	Grass snake	-	*	U
		Amphiesma	stolatum	Striped keelback	Iral/Pandhivad	*	R
		Lycodon	aulicus	Common wolf snake	Kawadya	*	C
<i>Xenochrophis</i>	<i>piscator</i>	Checkedred keelback water snake		*	C		
4	Boidae	Eryx	johnii	Earth boa/Red sand boa	Mandul	*	C
		Gongylophis	conicus	Common Sand boa		*	C

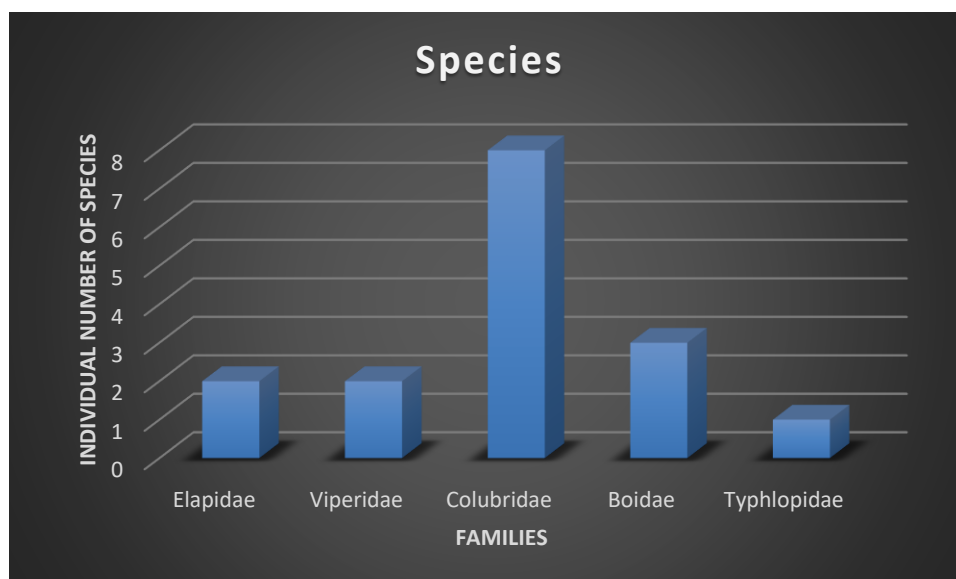
		Python	morulus	Indian rock python	Ajgar	*	R
5	Typhlopidae	Ramphotyphlops	braminus	Brahminy worm snake		*	U

**Table No.I: Diversity of Snakes from Maharashtra, India(Note1: C- common, U-uncommon, R-rare.)**

**(Note2:Non-venomous=\*, Semi-venomous=\*\*,Venomous=\*\*\*)**

Families	Species
Elapidae	2
Viperidae	2
Colubridae	8
Boidae	3
Typhlopidae	1

**Table No.2: Species recorded according to families**



**Graph No.I: Showing number of individuals according to families**

Within the non-venomous snake category, rare species such as the Indian rock python (*Python morulus*) and Stripedkeelback (*Amphiesmastolatum*) were reported, belonging to the Boidae and Colubridae families, respectively. Anthropogenic activities, physical development, urbanization, and notably changing environmental conditions, including global warming, are impacting the habitat of these animals. Consequently, this ecological conflict against humans becomes a crucial aspect. The present investigation, focusing on the abundance of rescued snake fauna, indicates that snakes evoke unimaginable fear and anxiety. From the earliest human settlements, snakes likely posed the initial threat of poisoning.[9]. The present study also observed distress calls and concerns regarding infrastructural development, including the establishment of townships, which often result in habitat disturbance. Consequently, various types of snakes, including poisonous, semi-poisonous, and non-poisonous species, are frequently encountered in residential areas during monsoons and winter seasons. These areas are susceptible to habitat loss, which exacerbates the human-snake conflict. The current studies aim to assess information, occurrence, abundance, and species richness, thereby contributing to knowledge, awareness, and conservation efforts concerning snake fauna in this region. There is

a notable lack of established work and data on this subject until now, highlighting the importance of such research initiatives.

Snakebite remains an acute, life-threatening medical emergency and an occupational hazard frequently encountered by farm laborers and farmers. It is endemic in tropical countries like India, where approximately 250,000 snakebites occur annually, leading to 35,000 to 50,000 deaths per year. The lack of information among the populace exacerbates this issue, underscoring the critical need for enhanced awareness and education regarding snakebite prevention and management.

#### IV. CONCLUSION

The study of snakes in Maharashtra, including remote areas, is crucial due to the region's rich diversity of snake species. There is an urgent need to provide accurate knowledge regarding snakes, especially distinguishing between venomous and non-venomous species. With proper knowledge, people will be less likely to panic and kill snakes unnecessarily. Instead, they will understand the importance of leaving them undisturbed in their natural habitat. This article aims to contribute to the conservation of snake species and their role in the ecosystem, which is essential for maintaining ecological balance.

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# Underwater-Coastal Diversity Pattern of Molluscan species, India

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## ABSTRACT

The study investigated the diversity of bivalve and gastropod mollusks during four seasons-monsoon, post-monsoon, winter, and summer-spanning from July 2018 to June 2019. Species diversity was examined at multiple locations, including Bhatye estuary, Shirgaon creek, Mirya, Bhawati-bander, and local markets. The study encompassed various habitats such as rocky terrain, muddy environments, sandy beaches, and mangrove areas. These diverse study locations provide ample opportunities for further research, exploring potential commercial value and contributing to ecosystem conservation efforts.

**Keywords:** edible bivalve, gastropod molluscs, diversity.

## I. INTRODUCTION

The 'index of diversity' as conceptualized by Fisher comprises two metrics assessing the extent of concentration or diversity within a population when individuals are categorized into groups. These metrics are statistical measures calculated from sample data, not derived from population constants. The index of diversity is predominantly applied in cases involving the logarithmic distribution. However, its applicability is constrained, as it does not consistently yield values independent of sample size. In situations where it is applied to an infinite population of individuals categorized into a finite number of groups, this index may not provide reliable results.[26]. Mangroves stand out as among the most biologically diverse ecosystems globally, characterized by an abundance of organic matter and nutrients that sustain substantial biomass of both flora and fauna.<sup>1</sup> Locally, there is widespread collection of edible oysters, mussels, cockles, and gastropods to meet the community's dietary needs. The blood clam, *Anadara granosa*, and various other types of cockles are abundant in mudflats along mangrove strands, often partially submerged in the sediment.<sup>2</sup> In Indian mangroves, the collective count of faunal species inhabiting mangrove ecosystems amounts to 3,111, encompassing diverse organisms such as prawns, crabs, mollusks, fish, fish parasites, insects, reptiles, amphibians, and mammals.<sup>3</sup> Oysters, mussels, and clams serve as a valuable nutritional source, providing essential minerals, proteins, glycogen, and easy digestibility when compared to other types of animal-based food.<sup>4</sup> As of today, India has documented a total of 5,070 mollusk species, with 3,370 of them identified in marine habitats.<sup>5</sup> From the Indian marine region, exploitation includes the harvesting of eight oyster species, two mussel species, seventeen clam species, six pearl oyster species, four giant clam species, one window pane oyster species, as well as fifteen gastropod species and cephalopods<sup>6</sup>

The current papers examine the diversity of bivalve and gastropod mollusks within the mangrove ecosystem along the selected study area of Raigad district's coastline.

## II. MATERIALS AND METHODS

Live specimens were collected biannually across different seasons—monsoon, post-monsoon, winter, and summer, during the period from July 2016 to June 2017. Sampling sites included Bhatye estuary, Shirgaon creek, Mirya (rocky shore), and Bhagwati bander (rocky shore) along the Ratnagiri coast, specifically where the Kajali river meets the sea. After retrieval, the animals were transported to the laboratory immediately following fishing activities. The shells were meticulously cleaned of fouling biomass and mud using brushing techniques. Subsequently, they were placed in filtered seawater pumped from the estuary for observation. The animals were later preserved in 70% alcohol for taxonomical identification, focusing on the external structures such as lunal, umbo, and operculum. Additionally, internal components such as teeth, adductor muscles, and hinged scars were examined. Identification of the shells was carried out with reference to the Zoological Survey of India, Kolkata.

## III.RESULT

A total of 12 bivalves belonging to 7 families and 13 gastropod species from 8 families, all classified as edible mollusks, were documented across four different localities in Ratnagiri. (Tables 1 & 2).

Class	Bhatye (1)	Shirgaon (2)	Mirya (3)	B. bander (4)
Bivalve	6	5	3	2
Gastropod	2	1	6	6

Table 1. Localities wise family distribution of Ratnagiri coast.

Study site	Bivalve	Gastropod
1	9	2
2	8	1
3	4	11
4	3	10

Table 2 Localities wise species distribution of Ratnagiri Coast.

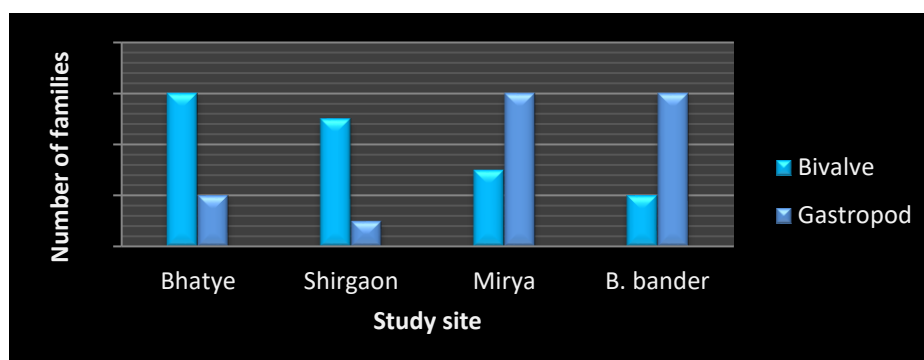


Figure no. 1 Showing edible bivalve and gastropod by localities of Ratnagiri coast.

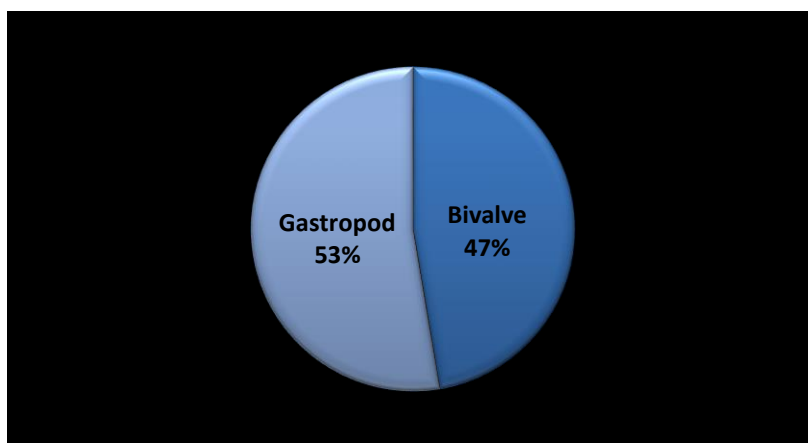


Figure no. 2 Showing edible bivalve and gastropod in percentage of Ratnagiri coast.

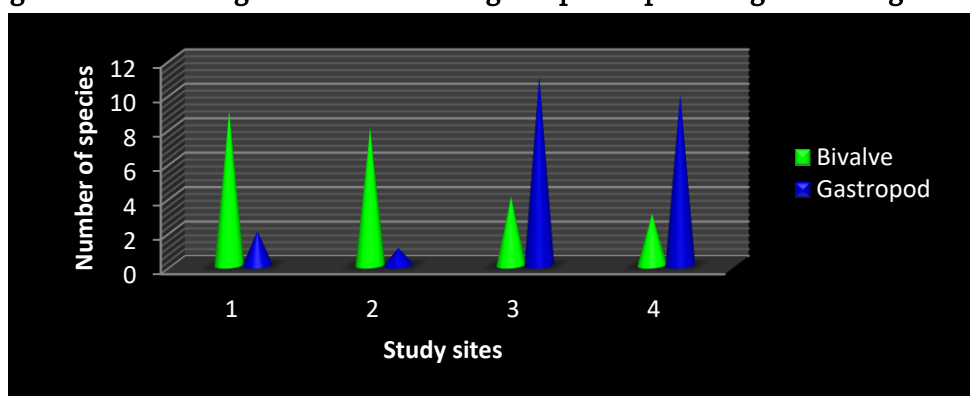


Figure no. 3 Showing localities wise edible bivalve and gastropod of Ratnagiri coast.

#### IV. DISCUSSION

Among the selected study localities along the Ratnagiri The diversity of edible mollusks across four localities in Ratnagiri exhibits significant variation. During the study period, 53% of the recorded species were gastropods, while 47% were bivalves in the selected localities along the Ratnagiri coast (refer to Figure 1). Notably, there was considerable diversity variation among the study localities, with higher species diversity observed in specific areas attributed to the presence of a greater number of different species.

Molluscs indigenous to the Bhatye estuary hold significant commercial value and biodiversity importance. The total number and types of edible mollusks are likely influenced by habitat and geographical conditions. Shirgaon creek and Bhatye estuary appear to provide suitable habitats supporting a large diversity of edible mollusks.coast, 52% of the species were gastropods, and 48% were bivalves. Bivalve species exhibited a higher presence at Bhatye estuary, whereas gastropod species were more prevalent in Mirya, possibly due to habitat variations. The overall mollusk diversity was greater (13 species, including both bivalves and gastropods), while it was comparatively lower at Mirya bander. Decomposed plant litter, starting from August onward, plays a crucial role in nutrient cycling in wetlands, hosting a diverse array of species. In July, a decrease in salinity and temperature created unfavorable conditions for mollusks. Mirya is identified as a promising harvesting site for a variety of molluscan species.<sup>7</sup> Assessing the populations of mollusks within the mangrove ecosystem is crucial for understanding their status and condition.<sup>11</sup> In Malaysia, certain marine bivalves, like *Anadara granosa*, are actively cultured for commercial purposes. The mangrove forests in Sarawak extend over 173,792 hectares of land, providing a suitable habitat for mollusks.<sup>12</sup> Bivalves tend to favor the more active and thus more

conspicuous mangrove habitats, where they establish chemo-symbiotic associations.<sup>13</sup> Hard substrates such as prop-roots, pneumatophores, and oyster beds are present and accessible in the environment<sup>14</sup>. The numerical abundance and biomass of mollusks can be equally remarkable.<sup>15</sup>

Numerous investigations worldwide have focused on mangrove-associated mollusks. For example, Australian mangroves host 39 species of gastropods.<sup>16</sup> Twenty-eight species inhabit the mangroves of China.<sup>17</sup> Twenty three molluscs species from the mangrove forest in Hong Kong<sup>18</sup>. Twenty nine bivalves from the mangrove root on the Atlantic coast of Colombia and Wood-boring bivalves are also common in the mangrove forest<sup>19</sup>. Forty four species of Sematan mangrove forest of Malaysia<sup>20</sup>. In general, numerous surveys of Indian mangrove molluscs were reported by<sup>21&22</sup>. A total account of Sundarban 56 species of molluscs including 31 gastropods and 25 bivalves<sup>23</sup>. In Ratnagiri, 12 bivalves and 13 gastropods are associated with mangroves. Gastropods, being one of the dominant and conspicuous macrofauna in mangrove systems, occupy a wide range of ecological niches.<sup>25</sup>

## V. CONCLUSION

The diversity of edible mollusks across four localities in Ratnagiri exhibits significant variation. During the study period, 53% of the recorded species were gastropods, while 47% were bivalves in the selected localities along the Ratnagiri coast (refer to Figure 1). Notably, there was considerable diversity variation among the study localities, with higher species diversity observed in specific areas attributed to the presence of a greater number of different species.

Mollusks indigenous to the Bhatye estuary hold significant commercial value and biodiversity importance. The total number and types of edible mollusks are likely influenced by habitat and geographical conditions. Shirgaon creek and Bhatye estuary appear to provide suitable habitats supporting a large diversity of edible mollusks.

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# Study of Abundance of Avian Faunal Diversity Chirag Shah Darga Lake District Hingoli, Maharashtra, India

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## ABSTRACT

Avian diversity of Chirag Shah Darga lake studied during the study period of January 2016 to December 2017 in district Hingoli. In this study total 39 bird species observed which belongs to 10 order and 28 different families were recorded during this study period. The Dam is used for the various purposes like fish cultures, agricultural aspects washing of clothes, bathing of cattle's. In Chirag Shah Darga lake the fishes like Catla-catla, Labeo rohita, Wallago attu, etc. are present. The majority of birds are attracted towards these lake for the purpose of their feeding. The birds are Little grebe, Grey heron, Red Wattled lapwing, Little egret, Small Blue Kingfisher, Spot billed duck etc.

Keywords: Avian diversity, Chirag Shah Darga lake, Abundance

## INTRODUCTION

Bird communities have been studied comparatively well both in temperate and tropical forests. The avian species diversity of in ecosystems reflects the well being of its habitat. Indian subcontinent is well known designed for diverse and rich avian variety whose taxonomy, distribution and their general habitat characteristics are well documented. Avian community evaluation has become an important tool in biodiversity conservation and for identifying conservation actions in areas of elevated human and animals pressure especially aquatic resources. The birds are the indicators of environment hence used conservation and to assess environmental impact (Gregory et al., (2003).

Many researchers have studied on avianfaunal diversity in Marathwada region of Maharashtra like Yardi, et al., 2004 reported 64 species of birds in Salim Ali Lake, Aurangabad. Kulkarni, et al., 2005 reported 151 species of birds in and around Nanded city. Kulkarni et al., 2006 recorded 18 Piscivorous bird species in Dongarkheda irrigation tank. Dist. Hingoli. Kulkarni, et al., 2006 also recorded; 93 species of birds in

Shikhachiwadi Wadi, reservoir Dist. Nanded Kulkarni et al., (2010) listed 62 bird species in forest Jaldhara, Kinwat. Dist.Nanded. 53 species of birds on river Godavari near Dhangar Takli recorded by Balkhande et al., (2012); 50 species of birds near river Purna Dist. Parbhani recorded by Balkhande et al., (2013)

## Methodology

The present study avian diversity identified at the spots as per guidelines given by Ali and Ripley (1996), By using binocular NIKON D40 (6.1MP DSLR camera 3.1x optical zoom AF-S DX Zoom-NIKKOR 18-55mmf/3.5-5.5.6G EDII lens) and NIKON D90 (12.3MP DSLR camera AF-S DX –CMOS sensor Zoom 18-105mm VR lens) cameras captured bird photos. The present study observed during period January 2016 to December 2017 regular visits for the survey and identification were done in morning (7am-10am) and evening(4 to 5- 30pm by direct observations and species noting was made by walking on channel of lake areas.

The avian faunal study will be observed during the study period of. Identification bird will be carried with the help of Ali, (2003), Grimmette et al., (1999), Tiwari, (2005) The preparation of checklist of the birds done by using information of Abdulali, (1981); Gaikwad et al., (1997). Cattle egret, Red wattled lapwing, Black drango etc are the common birds found near Hingoli and Nanded district (Kulkarni et al, (2005).

TABLE 1: CHECKLIST OF AVIAN FAUNAL DIVERSITY CHIRAG SHAH DARGA LAKE HINGOLI

Order	Family	Common name, (Abundance)	Scientific name	IUCN status	Migratory status
1.Podicipediformes	1.Podicipidae	1. Little Grebe (C)	<i>Tachybaptus ruficollis</i>	LC	RMC
2.Ciconiformes	2.Ardeidae	2.Grey Heron (C)	<i>Ardea cinerea</i>	LC	WMU
		3.Indian pond Heron (A)	<i>Ardeola grayii</i>	LC	RC
		4.Little Egret (C)	<i>Egretta garzetta</i>	LC	RC
		5.Median Egret(A)	<i>Mesophoyx intermedia</i>	LC	RMC
	3.Ciconidae	6. Asian Open bill Stork(R)	<i>Anastomus oscitans</i>	LC	PMr
		7. White Necked/Woolly Stork(O)	<i>Ciconia episcopus</i>	LC	WMr

5. Pelecaniformes	7. Phalacrocoracidae	12. Little Cormorant(A)	<i>Phalacrocorax niger</i>	LC	RMC
6. Charadriiformes	8. Recurvirostridae	13. Black Winged Stilt(A)	<i>Himantopus himantopus</i>	LC	RMC
	9. Charadriidae	14. Red Wattled Lapwing(C)	<i>Venellus indicus</i>	LC	RC
	10. Scolopacidae	15. Common Sandpiper(C)	<i>Actitis hypoleucos</i>	LC	WMr
		16. Wood Sandpiper(O)	<i>Tringa glareola</i>	LC	WMr
	11. Sternidae	17. River Tern(R)	<i>Sterna aurantia</i>	NT	RMC
7. Columbiformes	12. Columbidae	18. Blue Rock Pigeon/Dove(C)	<i>Columba livia</i>	LC	RC
		19. Laughing Dove(C)	<i>Streptopelia senegalensis</i>	LC	RU
8. Psittaciformes	13. Psittacidae	20. Blossom Headed parakeet(C)	<i>Psittacula roseate</i>	LC	RC
	14. Cuculiformes	21. Common koel(C)	<i>Eudynamys scolopacea</i>	LC	RC
		22. Brain Fever Bird(C)	<i>Hierococcyx varius</i>	LC	BMU
9. Coraciiformes	15. Alcedinidae	23. Common Kingfisher(C)	<i>Alcedo atthis</i>	LC	RC
	16. Meropidae	24. Little Green Bee eater(C)	<i>Merops orientalis</i>	LC	RMC
		25. Blue tail Beater(C)	<i>Merops philippinus</i>	LC	RMU
10. Passeriformes	17. Alaudidae	26. Black crown sparrow lark(O)	<i>Eremopterix nigriceps</i>	LC	RU
	18. Cisticolidae	27. Common Tailor Bird(R)	<i>Orthotomus sutorius</i>	LC	RC
	19. Dicruridae	28. White Bellied Drongo(O)	<i>Dicrurus caerulescens</i>	LC	RU
	20. Laniidae	29. Longtailed/Rfous-back Shrike(C)	<i>Lanius schach</i>	LC	WMr
	21. Sturnidae	30. Common Myna(C)	<i>Acredotheres tristis</i>	LC	RC
	22. Muscicapidae	31. Magpie Robin(R)	<i>Copsychus saularis</i>	LC	RC
	23. Corvidae	32. House Crow(O)	<i>Corvus splendens</i>	LC	RC

	24.Pycnonotidae	33.Red-Vented Bulbul(C)	<i>Pycnonotus cafer</i>	LC	RC
	25. Parida	34. Great Tit(R)	<i>Parus major</i>	LC	Rr
	26. Motacillidae	35. Yellow wagtail(C)	<i>Motacilla flava</i>	LC	WMC
		36.White browed wagtail(R)	<i>Motacilla aderaspatensis</i>	LC	RMC
		37.Paddy Field Pipit(R)	<i>Anthus rufulu</i>	LC	WMr
	27. Passeridae	38. House Sparrow(C)	<i>Passer domesticus</i>	LC	RC
	28. Estrildidae	39.White throated Munia(O)	<i>Lonchura malabarica</i>	LC	RC

Abbreviation in ACOR are: A -Abundant, C -Common, O - Occasional, R – Rare. Migratory status species is categorized as RC - Resident Common, RU -Resident Uncommon, RMC- Resident Migrant Common, Rr-Resident rare, PMr- Passage Migrant rare, WMC- Winter Migrant Common, WMU- Winter Migrant Uncommon, WMr- Winter Migrant rare, BMU- Breeding Migrant Uncommon. IUCN status: LC - Least Concern, NT - Near Threatened.

Abbreviation for IUCN Status are LC= Least Concern, NT = Nearly Threatened, T = Threatened, VU = Vulnerable, EN = Endangered, CR = Critically Endangered.

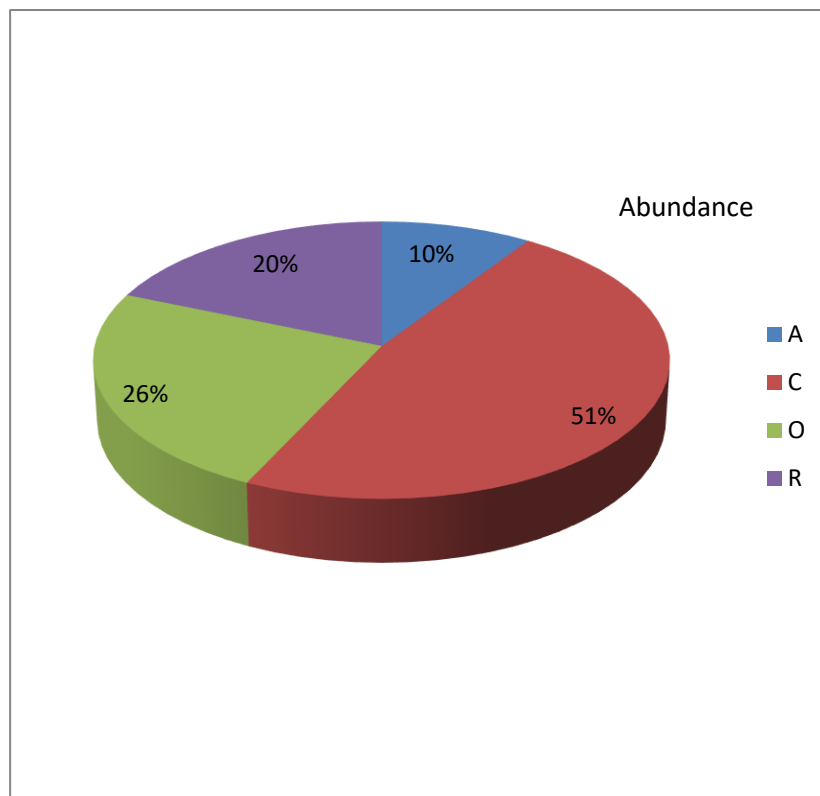
## Result

Bird has a potential to sense aspect of any condition they are commonly used as biological indicators. So, birds are the indicators of environment and for conservation of environment impact assessment (Borale et al., (1994). Birds are of great economic importance also they play an important role to control the population of different insects and pests and play various roles as scavenger, pollinators (Padmavati et al., (2010).In this study order and family wise list of the total birds species with their common names, scientific names, status, and abundance given in table1.

There are to 39 bird species were recorded during this study. It belongs to 10 different orders and 28 families respectively. Abundance of bird species is categorized as 4-A (Abundant), 20-C (Common), 7-O (Occasional), 8-R (Rare). IUCN status consists of 37 –LC (Least Concern) and 2 –NT (Near Threatened) species. Out of 39 bird species 17- RC (Resident Common), 3-RU (Resident Uncommon), 7-RMC (Resident

Migrant Common), 1-Rr (Resident rare), 1-PMr Passage Migrant rare ), 1-WMC (Winter Migrant Common), 2-WMU ( Winter Migrant Uncommon), 5WMr (Winter Migrant rare), and 1BMU ( Breeding Migrant Uncommon ). Figure 1: Abundance of bird species of Chirag Shah Darga lake in % about 51 % (C) of common bird species is abundant from total observed bird species. They belong to different family and their migratory status shows special. Little Egret, Spot Billed Duck, Common Coot, Red Wattled Lapwing, Blue Rock Pigeon/Dove, Blossom Headed parakeet, Common koel, Common Kingfisher, Common Myna, Red-Vented Bulbul and House Sparrow. All are the resident common birds. Little Grebe, Little Green Bee eater which is residential migratory commonly found. Similar observed carried out by Varsha Dabhade et al., (2017).

Figure 1: Abundance of bird species of Chirag Shah Darga lake in %



## Discussion

Birds provide a wonderful doorway into nature and scientific study. They engage in interesting behaviors and play important roles in the ecosystems that sustain life. Birds are excellent indicators of environmental health. Their changing populations often provide clues to the overall health of their habitat. Bird population status of species and abundance is observed which is categorized as: A - Abundant, C - Common, U - Uncommon, O - Occasional, R - Rare. Migratory status species is categorized as RC - Resident Common, RU - Resident Uncommon, RMC - Resident Migrant Common, Rr - Resident rare, WMC - Winter

Migrant Common, WMU- Winter Migrant Uncommon, WMr- Winter Migrant rare, BMU- Breeding Migrant Uncommon. IUCN status as LC - Least Concern, NT - Near Threatened. Avifauna of Jagtung sagar, Kandhar after refilling of water, 48 species of birds belonging to 30 families were recorded during the study (Balkhande et al., (2013). Piscivorous birds of Dongarkheda irrigation tanks studied in district Hingoli by (Kulkarni et al., (2006). (Balkhande et al., (2012) make a Check list of Birds near the river Purna, Dist. Parbhani. The fishes are food of birds therefore they affecting reservoir fishery. Also it feed pathogens to reduce their population in that area Lagler, (1978): Jhingran, (1988).

Indian ponds Heron, Median Egret, Little Cormorant, and Black Winged Stilt are abundant bird species found in 10% (A) of abundance which easily identify. 26% (O) of occasional birds White Necked/Woolly Stork, Wood Sandpiper are winter migrant rare. Asian Open bill Stork Passage Migrant observed there abundance is rare, Oriental White/Black Head Ibis uncommon winter migrant where as Paddy Field Pipit rare winter migrant total 20%(R) rare bird species identify. The 2(NT) near threatened bird species Oriental White/Black Head Ibis (*Threskiornis melanocephalus*) and River Tern (*Sterna aurantia*) are observed also reported (Shivaji P. Chavan et al., (2015). 37(LC) species are least concern. Brain Fever Bird (*Hierococcyx varius*) is (BMU) breeding migrant uncommon are single bird found. 10 different orders reported here, out of 39 birds about 17 birds belong to Order- Coraciiformes.

### Conclusion

Total 39 bird species observed during study period of January 2016 to December 2017 in 2 year. In the study of avian faunal diversity of Chirag Shah Darga lake indicate abundance of most of the common species e.g. Little Egret, Spot Billed Duck, Common Coot, Red Wattled Lapwing, Blue Rock Pigeon/Dove, Blossom Headed parakeet, Common koel, Common Kingfisher, Common Myna, Red-Vented Bulbul and House Sparrow also found (NT) near threatened bird species Oriental White/Black Head Ibis and River Tern by IUCN status and other was LC – least concern .

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# A Review: Heavy Metals Concentration in the Vermillion (Sindoor) Used In India

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## ABSTRACT

The crimson pigment vermilion contains a number of heavy metals that can be dangerous to the environment and human health. It has historically been utilized in art and cultural practises. With a focus on lead (Pb), mercury (Hg), cadmium (Cd), and arsenic (As), this study sought to examine and assess the presence and concentration levels of heavy metals in vermilion samples. Utilizing the method known as atomic absorption spectroscopy (AAS) Vermilion samples were gathered and prepared for analysis from a variety of sources and production processes. The vermilion samples had various amounts of heavy metals. Lead was determined to be a common heavy metal, and in some samples, its quantities were found to be higher than allowed by regulatory bodies. Additionally found, albeit often in less quantities than lead, were mercury and cadmium. In very small quantities, arsenic recognized carcinogen was found. The results of this investigation have significant ramifications for both human and environmental health. Vermilion-based artworks that leak heavy metals may cause environmental contamination and subsequent bioaccumulation in ecosystems, especially in humid or acidic environments. Additionally, handling or consuming goods containing vermilion may expose one to harmful levels of heavy metals that can cause organ damage, neurological and developmental issues, and even cancer.

**Keywords:** Vermilion, Heavy Metals, Health Implications.

## I. INTRODUCTION

The origin of excess use of various substances in beauty, skin, body, hair, and nail care products can be found in ancient times. To achieve better variety and to enhance their quality, some supplements like various compounds, stabilizers, material pigments, stains, and shine were induced in these products. Some of these substances can have allergic, irritation, and hazardous effects on human health. This study aims to optimize potentiometric stripping analysis (PSA) to reduce the content of heavy metals (lead, cadmium, zinc), and some commercial cosmetic products are lipsticks, eye shadows, and henna hair dye, etc. [6]. Kumkum is an integral part of the religious beliefs of the Hindu community. Sindoor is also popularly referred to as Kumkum in the southern part of India. [11]. Sindoor is a frequently used product in the Indian market. Some women place a dot on the forehead, called a bindi. In the olden days, sindoor was made at home using turmeric powder, alum, calcium salt, camphor, saffron, sandalwood, and beet extracts. However, presenting this product must be carefully used vermilion is of various colors, orange, red and maroon. [10]. The composition of sindoor includes turmeric, a calcium compound, alum, iodine, camphor, and Chandan. The synthetic dye industry grows low-

priced red dyes termed sindoor which are available everywhere and mainly contain the following: -Vermillion, (a reddish-orange element that is a powdered form of cinnabar), Chemical dye, lead, and other synthetic materials, Powdered crude red lead, Pb304, Rhodamine B dye, Mercury sulfite.

But on the other hand, there are many unbranded blood-red powders available at cheap rates within the market because the manufacturers aim at producing any local dye which is quickly available with toxic substances. These elements can render rich color that is attractive and most women ignore ingredients when buying sindoor. Traditional sindoor was naturally produced with turmeric and alum or lime, or from other herbal ingredients. Modern material being sold as sindoor mainly uses vermilion, an orange-red pigment, the purified and powdered sort of cinnabar, which is the chief form during which mercury sulfide naturally occurs while on the other hand, Sindoor is a poisonous chemical, made up of burnt of mercury and lead both are harmful to health. [14]

The adulterated sindoor contained chemical dyes, artificial materials, and lead salts. In maximum cases, the poisonous low-grade business minimal oxide became observed. The Drug Technical Advisory Board (DTAB) says sindoor fabricated from business dyes and artificial chemical substances can purpose rashes, routine pigmentation, pores, and skin cancer. The sacred sindoor (vermilion), an emblem of married Hindu ladies and additionally liberally used at Hindu shrines, will want to fit protection standards. The Drug Technical making plans board (DTAB) has determined to control the sale and quality of sindoor being sold. Sindoor is introduced below the Schedule of the Drugs and Cosmetics Rules, certainly making it a "cosmetic." A Union fitness ministry professional stated the Drug Controller General of India's workplace became receiving court cases concerning the sale of poisonous and ecologically unfriendly sindoor at shrines and shops. Sindoor or roll became observed to comprise one hundred percent poisonous chemical substances. It can purpose nearby infection, pores, and skin toxicity. The nature of sindoor or kumkum can with publicity to the surroundings over time, and this may bring about blisters, itching, rashes and pigmentation, and, at times, severe dermatological disorders.

## II. QUALITATIVE AND QUANTITATIVE ANALYSIS

Qualitative and Quantitative analysis It is concluded that the adulteration in sindoor is of heavy metals which are detected by both preliminary and confirmatory methods. Preliminary methods include thin-layer chromatography in which 4 types of solvent systems are used 1. Methanol: Acetone 2. Acetonitrile: Acetone: Methanol 3. Acetonitrile: Methanol 4. Benzene: Methanol: Acetic acid and in confirmatory methods, various sophisticated analytical methods can be used such as HPLC, Gas chromatography, Atomic Absorption Spectrometer (AAS), Fourier Transform Infra-Red Spectrometer (FTIR), etc. in the examination of Sindoor (Vermillion) stains on white cotton fabric using thin-layer chromatography. The usefulness of thin-layer chromatographic analysis within the differentiation of samples of fifteen different brands of sindoor (vermilion) was evaluated. The power of varied solvent systems to separate the constituents of selected sindoor samples was studied. Twenty solvent systems were examined from which a solvent system comprising butanol: propanol: water in the ratio 60:30:10 (v/v/v) was found to be the best, as it showed a high degree of separation of the constituents. It was also found that the simplest visualizing method for studying TLC chromatograms of sindoor samples is the iodine fuming technique. In the suggested course, 15 sindoor samples of the numerous brands were solicited. 10 solvent systems were worked on each sample of sindoor during which the four solvent systems [methanol: acetone (8:2), Acetonitrile: Acetone: methanol (2:4:4), Acetonitrile: methanol (2.5:7.5) and benzene: methanol: acetic acid (8;1:1)] were established for the evaluation of sindoor specimens by employing

Thin Layer Chromatography sindoor tints that are encountered at the crime scene can be singled out or scrutinized by testing it with its substantive origin by thin-layer chromatography with a newly improved solvent system. Chemical examinations done on the samples seized by Investigating Agency (Delhi Police) disclosed an abnormally high level of mercury by Instrument Atomic Absorption Spectrometer (AAS). A detailed comparative analysis was again undertaken using Fourier Transform Infra-Red Spectrometer (FTIR) which further confirmed the same chemical composition present in both the samples.

Heavy Metals	Lead (Pb)	Cadmium (Cd)	Copper (Cu)	Cobalt (Co)	Iron (Fe)	Chromium (Cr)	Nickel (Ni)	Zinc (Zn)	Arsenic (As)	Mercury (Hg)
Atomic No.	82	48	29	27	26	24	28	30	33	80
Atomic Weight	207.2 $\mu$	112.40 $\mu$	63.54 $\mu$	58.9 $\mu$	55.84 $\mu$	51.99 $\mu$	58.70 $\mu$	65.38 $\mu$	74.92 $\mu$	200.59 $\mu$
Density	11.4Mg/m <sup>3</sup>	8.65Mg/m <sup>3</sup>	8.96g/cm <sup>3</sup>	8.9g/m <sup>3</sup>	7.87g/cm <sup>3</sup>	7.19	8.9g/cm <sup>3</sup>	7.13g/cm <sup>3</sup>	2811mg/g	13.5g/ml
Concentration of heavy metals in Vermillion Samples	30 ppm Banerjee, <i>et.al</i> (2017)	<1 ppm	NA	NA	NA	6 ppm	NA	NA	NA	NA
	8329 mg/g Mathew, <i>et.al</i> (2021)	NA	NA	3.1mg/g	NA	3.2mg/g	NA	NA	2811mg/g	1320mg/g
	644.86 ppm Saidalavi, <i>et.al</i> (2017)	NA	NA	NA	NA	NA	NA	NA	6.40ppm	NA
	106 Pratinidhi, S. A., <i>et.al</i> (2018)	<LOD	NA	NA	NA	NA	NA	NA	NA	<LOD
	10 ppm Breen, A. K. <i>et.al</i> (2021)	NA	NA	NA	NA	NA	NA	NA	NA	65 ppm
	82.09 $\mu$ G/GM	1.65 $\mu$ G/GM	NA	NA	NA	NA	NA	NA	NA	NA

Salve, K. S., <i>et.al</i> (2015)										
0.1 $\mu\text{gg}^{-1}$ Iwegbue, <i>et.al</i> (2016)	0.23 $\mu\text{gg}^{-1}$	0.08 $\mu\text{g g}^{-1}$	0.05 $\mu\text{gg}^{-1}$	5 $\mu\text{gg}^{-1}$	NA	0.8 $\mu\text{gg}^{-1}$	2.4 $\mu\text{gg}^{-1}$	NA	NA	NA
NA Singh, <i>et.al</i> (2006)	NA	1.0mg/L	NA	0.4mg/L	NA	0.007mg/L	60.84mg/L	NA	NA	NA

**Table: Different Concentrations of Heavy Metals in Vermillion**

*Abbreviation:NA-Not Applicable*

### III.HEALTH IMPLICATIONS

Public health interventions should focus on primary prevention to ensure that lead-adulterated sindoor is not available for sale. This involves eliminating leadadulterated sindoor from stores, substituting other ingredients determined to be safe in lieu of lead, and conducting premarket testing of powders. Secondary prevention (i.e., routine screening for elevated blood lead levels) also plays a role. Although the United States has federal- and state-level requirements for screening children, implementation and compliance are not uniform.<sup>9–12</sup> Physicians who treat patients exposed to sindoor should encourage routine blood lead level screening. In addition, raising awareness through education is important in reducing risk. For example, health inspectors may educate owners and managers of South Asian stores to limit sales of sindoor to brands found to be lead free and about the importance of placing signs outlining possible risks of sindoor use. Moreover, returning travelers should be advised that sindoor purchased in both India and the United States may contain lead.

### IV. CONCLUSION

After reviewing all the research articles, it was found that a common adulterant that was used in sindoor is lead. Many studies focus on finding minute quantities of lead in sindoor as per the available literature the authors conclude that the most adulteration in sindoor is of heavy metals which are detected by both preliminary and confirmatory methods. Preliminary methods include thin-layer chromatography in which 4 types of solvent systems are used i.e., Methanol: Acetone; Acetonitrile: Acetone: Methanol; Acetonitrile: Methanol; Benzene: Methanol: Acetic acid and in confirmatory methods, various sophisticated analytical methods can be used such as HPLC, Gas chromatography, Atomic Absorption Spectrometer (AAS), Fourier Transform InfraRed Spectrometer (FTIR), etc. In the review article, it is found that the common adulterant in sindoor is lead. Proper Quality checks must be done on sindoor manufacturing therefore, in this review work, we concluded several authors did a forensic analysis of sindoor to provide an overview of its significance. The examination of Heavy Metal Adulteration in sindoor is conducted by simple and manual tests in the research papers. The research article aimed to detect some common adulterants to present Heavy Metal Adulteration in sindoor that was collected from different areas. This paper tried to detect the adulteration of sindoor samples by tests such as

detection of heavy metals, detection of effects on the human being, detection of harmful for our skin, hairs, etc. The purpose of this paper was to detect adulterants from the sindoor by Thin-layer chromatography. All of these tests were non-expensive and perform in a short period. This test can be done by many more techniques like HPLC, Gas chromatography, Atomic Absorption Spectrometer (AAS), and Fourier Transform Infra-Red Spectrometer (FTIR) to know which metal is present in the sindoor and which an adulterant

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# Prevalence of Gastrointestinal Nematodes in Goats In and Around Degloor Taluka, Maharashtra State, India

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## ABSTRACT

Gastrointestinal (GI) parasitism is seen to be one of the main issues in India, resulting in ongoing financial losses for the livestock production sector. In Degloor taluka, the prevalence of goat GIT parasites was investigated using a cross-sectional design from March 2023 to February 2024. The goal of the current study was to determine the prevalence of GI nematodes in goats in and around Degloor. In the present study, the overall prevalence of gastrointestinal nematode was found to be 63.92%. The prevalence GI nematode was found to be significantly greater during the monsoon season (83.51%) compared to the winter (69.07%) and summer (39.18%) seasons. It was found that goats with adult age (more than 2 years) were more prone to nematode prevalence than goats with younger age, ( $\chi^2=8.0$  and P-value = 0.004). It was also found that goats with poor body conditions were more vulnerable to nematode prevalence than goats with medium and good body conditions. The present investigation, however, discovered no statistically significant variation in the degree of infestation between the male (64.67%) and female (62.62%) goats ( $\chi^2=0.12$  and P-value = 0.724).

**Keywords:** Gastrointestinal nematodes, Goats, Degloor, Prevalence, Maharashtra.

## I. INTRODUCTION

Small ruminants play a significant role in sustainable agriculture in developing countries and contribute to a range of socioeconomic activities globally (Hassanen, 2020).

One of the first animals that humans domesticated was the goat, which is now found all across the world, but is more common in arid and tropical regions (Di Cerbo, 2010). Goats make great meat choice for humans as they are an important source of protein and can aid in reducing protein malnutrition.

Gastrointestinal Infections in goats have serious economic implications as raising small ruminants like goat been a significant source of income, particularly for the nation's marginal farmers (Pathak, 2008). Gastrointestinal (GI) infections are frequent in the goats, which results in significant economic losses because of mortality in the infected animals. Helminths and coccidia are the most prevalent gastrointestinal parasites in goats (Ozung, 2011). Although GI nematodes are thought to be among the most significant categories that consistently cause livestock to suffer financial losses worldwide production systems because of mortality and illness.

The goal of the current study was to detect the incidence of GI parasites in goats living in the regions in and around Degloor taluka of Nanded district, considering the importance of GI parasites, which results in

significant financial losses and mortality of goats. Thus, in order to apply future control measures, data on the epidemiology of GI nematodes in goats must be developed.

## II. MATERIALS AND METHODS

Degloor is one of the prominent talukas of the Nanded district in Maharashtra state, has a population of 2,27,862 at the 2011 census. In Degloor taluka, the prevalence of goat GIT parasites was investigated using a cross-sectional design from March 2023 to February 2024. A total of 291 faecal samples were collected from the goats in and around the research area and brought into the lab for additional analysis. Goat faeces samples were taken every month during the three distinct seasons of the year. The animals used in the study were raised in conventional animal production systems.

Ages of goats were traditionally classified as young (less than two years) and adult (over two years). Biographical information about the animals was recorded, including the goats' bodily condition, age, and species. The age of the study animals was found out using dentition based on eruption pattern, as stated by (Badaso T, 2015). A 10 g sample of faeces was randomly taken from the recta of goats spent three months without being dewormed. By using flotation and sedimentation procedures as given by (Soulsby E JL, 1982), samples were analysed to determine the eggs and cysts of helminths and protozoa (MAFF, 1986). The acquired data was examined using SPSS version 20 statistical tools, such as the mean, and chi-square test of independence for comparing the positive cases in various animal species. Outcome was significant at  $p < 0.05$ .

## III. RESULTS AND DISCUSSION

The present study demonstrates that major gastrointestinal nematodes present in goats in and around the Degloor taluka in Maharashtra, with an overall incidence of 63.92 percent. Additionally, it was found that the prevalence was not sex-specific, with female goats having a slightly higher prevalence (64.67 percent) than male goats (62.62 percent). At the 0.005 confidence level, the prevalence was not significant.

**Table 1 Sex specific prevalence of GI nematodes of goats in and around Degloor taluka, Nanded, Maharashtra.**

Sex	Number Examined	Number Infected with (%)	Chi-Square	p-value
Female	184	119 (64.67%)	0.12	0.724
Male	107	67 (62.62%)		
Total	291	186 (63.92%)		

As Shown in the above table 1, total 291 faecal samples of goats were analysed with the help of simple floatation technique. Where, a variety of nematode egg types were found in 186 samples out of 291 samples representing 63.92% of the total faecal samples. The prevalence of nematode eggs was slightly more in the female goats than male goats. Out of 184 faecal samples of female goats, 119 (64.67%) were found to be positive with variety of nematodes eggs and out of 107 faecal samples of male goats, 67 (62.62%) were found to be positive with various nematode eggs. It was Found that, ( $\chi^2 = 0.12$  and P-value = 0.724) indicating was no significant difference in the infestation level between the female goats and the male goats. Similar findings were recorded by Bansal in the goats of Malwa region of Madhya Pradesh (Bansal DK, 2012).

**Table 2 Body condition specific prevalence of GI nematodes of goats in and around Degloor taluka, Nanded, Maharashtra.**

Body Condition	Number Examined	Number Infected with (%)	Chi-Square	p-value
Poor	67	59 (88.06%)	23.87	< 0.0001
Medium	73	46 (63.01%)		
Good	151	81 (53.64%)		
Total	291	186 (63.92%)		

The above table 2, represents the prevalence of GI nematodes in relation with the body condition of the goats. A total 67 goats having poor body condition were examined out of which 59 (88.06%) found to be infected with nematodes. A total 73 goats having medium body condition were examined out of which 46 (63.01%) found to be infected with nematodes and a total 151 goats having good body condition were examined for nematodes, out of which 81 (53.64%) found to be infected with nematodes. With the help of statistical analysis, it was Found that, ( $\chi^2=23.87$  and P-value = < 0.0001) denoting there was very significant difference in the prevalence of nematodes having different body conditions in the goats. It was found that goats with poor body conditions were more vulnerable to nematode prevalence than goats with medium and good body conditions.

**Table 3 Age specific prevalence of GI nematodes of goats in and around Degloor taluka, Nanded, Maharashtra.**

Age Group	Number Examined	Number Infected with (%)	Chi-Square	p-value
Young	87	45 (51.72%)	8.0	0.004
Adult	204	141 (69.12%)		
Total	291	186 (63.92%)		

An association between the age group of the goats living in and around Degloor taluka and the prevalence of GI nematodes is displayed in Table 3 above. A total of 87 young goats were examined out of which 45 (51.72%) were found to be infected with nematodes. A total of 204 adult goats were examined out of which 141 (69.12%) found to be infected with nematodes. With the help of statistical analysis, it was found that, ( $\chi^2=8.0$  and P-value = 0.004) denoting there was a significant difference in the prevalence of nematodes having different age groups in the goats. It was found that goats with adult age (more than 2 years) were more prone to nematode prevalence than goats with younger age.

The statistical significance in this study indicated that older animals had a higher chance of infection than younger animals. Similar finding was recorded by (Almalaik AHA, 2008). This could be explained by the fact that, although adult animals were exposed to a high infection pressure from the L3-contaminated environment, young animals have a less developed immune system than adult animals, which are immune competent to tolerate the infection (Risso A, 2015). The current study's findings, which show that adult infections are higher than those in children, may be the consequence of young kids may not graze on the grazing land; instead, they are kept at home.

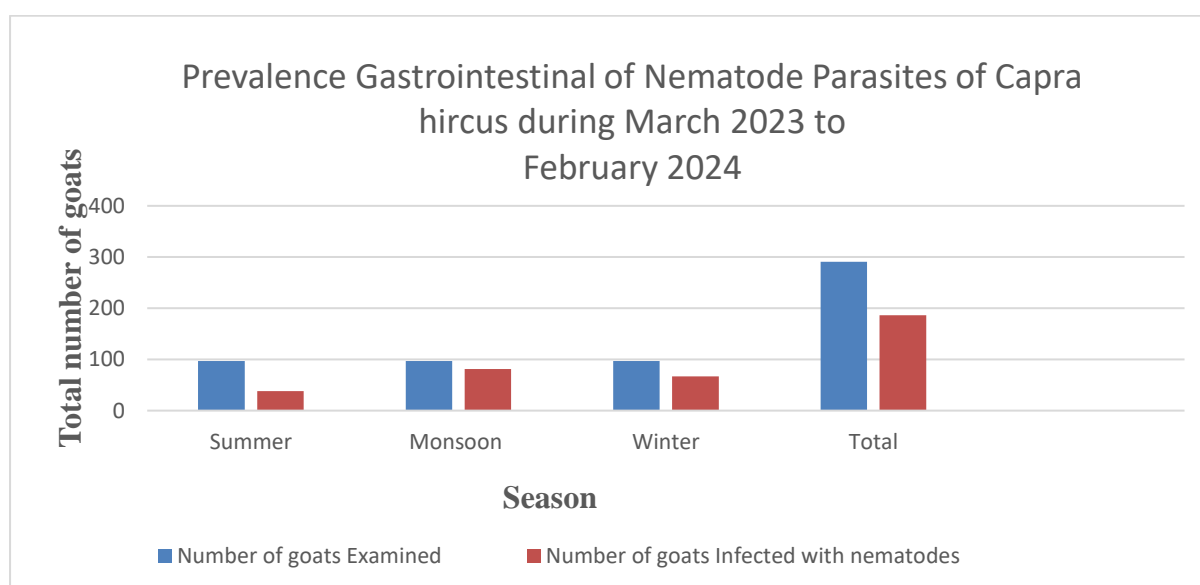
**Table 4 Seasonal prevalence of GI nematodes of goats in and around Degloor taluka, Nanded, Maharashtra.**

Season	Number Examined	Number Infected with (%)	Chi-Square	p-value
Summer	97	38 (39.18%)	43.00	< 0.0001
Monsoon	97	81 (83.51%)		



Winter	97	67(69.07%)		
Total	291	186 (63.92%)		

The incidence of GI nematodes in the goat population in and around Degloor Taluka during different seasons is summarised in Table 4. The lowest percentage of nematode infections was found in summer when 97 goats were examined, of which 38 (39.18 percent) tested positive for the helminths; the highest prevalence was found in the monsoon season when 97 goats were examined, of which 81 (83.51 percent) tested positive for nematodes. In the winter season, a total 97 goats were examined out of which 67 (69.07%) were found to be infected with helminths. With the help of statistical analysis, it was found that, ( $\chi^2=43.00$  and P-value = < 0.0001) denoting there was very much significant difference in the prevalence of nematodes in the goats in different seasons. It was found that in monsoon season, goats were more prone to nematode prevalence than winter and summer season as shown in fig.1.



**Figure 1** Prevalence Gastrointestinal of Nematode Parasites of Capra hircus during March 2023 to February 2024

The current study found that GI nematodes were far more common in the monsoon season than they were in the summer and winter (Table 4), which is in similar findings with (Thakuria M, 2015) and (Sharma DK, 2009). The existence of sufficient moisture and temperature in the environment may have led to an enhanced frequency of transmission of the infectious larvae to the ultimate host, which may have caused the highest prevalence of GI nematodes during the monsoon.

#### IV. CONCLUSION

These results indicate the high prevalence rate of gastrointestinal parasites in the goats in and around Degloor taluka, district Nanded, Maharashtra. The prevalence GI nematode was found to be significantly greater during the monsoon season compared to the winter and summer seasons. It was found that goats with adult age were more prone to nematode prevalence than goats with younger age. It was also found that goats with poor body conditions were more vulnerable to nematode prevalence than goats with medium and good body conditions.

The present investigation, however, discovered no statistically significant variation in the degree of infestation between the male and female goats. The current research calls for routine monitoring. Additional coordinated and efficient control procedures to monitor the parasite population is necessary.

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# Antimicrobial Activity of *Seasamum Indicum L.* against Seed Microflora of Chick Pea

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## ABSTRACT

The indiscriminate use of pesticides all over the world in general and in India particular has badly damaged our environment for the last forty years. The increased use of pesticides in the field of agriculture has become major source of environmental pollution affecting the ecosystem; Consumption of organomurcurial fungicides which are primarily used for seed treatment is gradually increasing. A wide variety of fungicides used for seed treatment are being produced in India. These include organomurcurial, thiram, mancozeb etc. These fungicides applied to crop are long lived and residues persist in soil causing pollution.

To solve this problem in the present studies evaluation of queen of oil (*Seasamum indicum L.*) is used for seed treatment which shows maximum efficacy against seed mycoflora of chick pea (*Cicer arietinum* 3% Extract was found to be significantly effective at all concentrations against various fungi.

**Key- Words:** Antimicrobial, Essential oil, Seed Mycoflora, Chick pea

# Conservation of Biodiversity in India

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## ABSTRACT

India is among the most biodiverse countries of the world. About 18% biodiversity prevails in India while only 2% of world's forests exist in India. India is a home to about 81000 species of animals which is about 6.5% of the world's biodiversity. Numerous animal species such as Asiatic lions, white tigers are found in India only. Home to nearly eight percent of global biodiversity on just 2.3 percent of global land area, India contains sections of four of the 36 global biodiversity hotspots. India's unique and diverse ecosystems, distributed across many landscapes, rivers, and oceans are also very valuable economically. However, due to ever increasing demands of humans because of population explosion, forests in general are being destroyed rapidly since last few decades and hence many plants and animals are facing threat of extinction. The loss of biological diversity is a global crisis. There is hardly any region on the Earth that is not facing ecological catastrophes. Of the 1.7 million species known to inhabit the Earth, 25-33% is likely to extinct within the next few decades. Though biological extinction has been a natural phenomenon in geological history, but the rate of extinction previously was one species every 1000 years. Man's intervention has speeded up the rates of extinction. Between the year 1600 and 1500, the rate of extinction went up to one species every 10 years. About 50 species are estimated to be driven to extinction every year, mostly in tropical forests, due to human interference.

**Key words-** Biodiversity, forest conservation, species etc.

# Antifungal Efficacy Evaluation of Zineb Against *Taphrina Maculans* Butler Causing Leaf Spot of Turmeric

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## ABSTRACT

In the present investigation, antifungal efficacy evaluation of Zineb was carried out against the fungal pathogen *Taphrina maculans* Butler causing leaf spot of turmeric by food poisoned technique. The linear growth of fungal mycelium was measured daily and the results were expressed in terms of Percent control efficacy (PCE) up to 8 days of incubation for *Taphrina maculans* Butler. Different concentrations of Zineb show variable effect on the linear growth of *Taphrina maculans* Butler. It was found that the percent control efficacy (PCE) was decreased with increase in incubation period. The minimum inhibitory concentration (MIC) was found at 800ug/ml and PCE was 89.60 on 8th day of incubation. At 100ug/ml the growth of the fungus stopped completely.

**Keywords:** *Taphrina maculans*, Zineb

# Biodiversity and Conservation

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## ABSTRACT

Biodiversity conservation is the protection and management of different kinds of organisms present on the earth including flora and fauna in their natural environment to obtain resources for sustainable development. The term biodiversity is popularised by Edward Wilson to describe the heterogeneity at the levels of biological organisation. It would hard to believe that there are 20.000 species of ants. But know a day's need of humans turned into a greed and we start losing such a huge no of species, humans already have finished almost half of the biodiversity till date. Thankfully most people are now beginning to recognise that diversity needs to be conserved.

**Key words:** Biodiversity, Extinction, Species, Ecosystem.

## I. INTRODUCTION

### There are three most important levels of biodiversity

1. **Genetic diversity:** Genetic diversity is measure of variety within the same species, For example 1000 varieties of mango occurs in India itself due genetic variation
2. **Species diversity:** species diversity refers to the variety of species within a particular region. For example Western Ghats contains more amphibian species as compared to Eastern Ghats.
3. **Ecological diversity:** it is also known as community diversity. It indicates food web, nutrient cycles, niches and trophic levels of ecosystem

### How many species are there on Earth:

According to (IUCN,2004) International Union of Nature and Natural Recourses ----- total no of species described so far is more than 1.5 million, but we don't have any clear idea of how many species are yet to be discovered. Some scientists have estimated that total number of species in the world ranges from 20 to 50 million. According to **Robert May** number of global species diversity at about 7 million. In the list of 12 mega-diversity countries India holds 8<sup>th</sup> position. India with 2.4 % of world's land area possesses 8.1%species diversity of the world.

Number of animal species is more than 70%. Animals have achieved greater diversification then plants due to reasons like

1. Nervous system
2. Ability to move
3. Subjected to less seasonal and more constant environment.

## II. PATTERNS OF BIODIVERSITY

1. **Latitudinal Gradient:** As we move from equator to the poles that is from low to high altitude diversity decreases. Biodiversity is minimum at Arctic region, moderate at temperate region and maximum at tropical regions. Tropical Amazon rain forest in South America has the greatest biodiversity on earth.

### Why the tropics have such a great biodiversity

1. Tropical regions continued to flourish and evolve undisturbed for millions of years, whereas temperate areas have undergone frequent disturbance or glaciations in the past
  2. Tropical regions are less seasonal, relatively more predictable and constant as compared to temperate regions
  3. Tropical areas receive more solar energy as they are near to equator
2. **Species area relationship:** Given by the German naturalist and geographer Alexander von Humboldt. Relationship between the species richness and area turned out to be rectangular hyperbola, and the relationship is straight line on a logarithmic scale.

$$S = CA^Z$$

$$\log S = \log C + Z \log A$$

Where, S= Species richness, A= Area, Z = Slope of the line, C = Y intercept.

### The Importance of Species Diversity to the Ecosystem

Species diversity really matters for the proper functioning of the ecosystem cause rich biodiversity is important for productivity, resilience, stability, alternative pathways and overall health of ecosystem. A region with more species diversity shows less year to year variation and increased diversity contributes to higher productivity.

The effect of reduction of biodiversity explains by Paul Ehrlich through his Rivet popper hypothesis. He explained this hypothesis by giving the example of **airplane, where airplane** is equals to the ecosystem and rivets is equals to the species.

## III.LOSS OF BIODIVERSITY

1. **Natural extinction:** some species get adapted to the changes in environment but some are disabled to do this task and disappear from ecosystem. This loss of species occurred at very slow rate, is called natural extinction
2. **Mass extinction:** Mass extinction is dying of large number of species due natural calamities. Since the origin of life on earth, there were five episodes of mass extinction.
3. **Anthropologic extinction:** Recently human interference is increased which directly or indirectly causes extermination of species due human activities like hunting, population, over exploitation, habitat destruction. Presently 32% of all amphibians, 31 % of all gymnosperms,23% of all mammals and 12% of all birds are facing the threat of extinction. If sixth mass extinction is occurred human interference will be the major cause and it is 100 to 1000 times more faster that the rate of natural extinction

#### IV. CAUSES OF BIODIVERSITY LOSSES

Four major causes of biodiversity losses are called as **The Evil Quartet**

1. **Habitat loss and fragmentation:** This is the major or main reason for the extinction of species diversity. The forest once occupied 14% of the earth now it is on only 6% of land area. Lungs of the planet (Amazon rain forest) harbours millions of species but it is cut and cleared for soya bean or for conversion to grassland for raising beef cattle. Humans are directly cutting of forests for their needs. Large habitats are broken into small fragments due human activities like digging of canals, building of roads etc.
2. **Alien species invasion:** Entry of new species into a particular geographical area is called exotic or non native or alien species .when such non native species are introduced unintentionally or intentionally for whatever purpose they Causes disappearance of native species. Some examples of alien species are *parthenium*, *Echhornia( water hyacinth)*, *Lantana*.
3. **Co extinction:** There are so many species that shows obligate association with another species. When one of them becomes extinct, the species associated with it will extinct ultimately.

#### V. WHY SHOULD WE CONSERVE BIODIVERSITY?

1. **Broadly utilitarian:** Also known as Ecosystem services. Biodiversity shows major role ecosystem services like
  - (I) Oxygen
  - (II) Aesthetic pleasure
  - (III) Pollination
  - (IV) Erosion and flood control
2. **Narrowly utilitarian:** These are also known as Direct or economic uses .
  - (I) Drugs
  - (II) Food
  - (III) Construction material
  - (IV) Fibre
  - (V) Industrial product
3. **Ethical:** We share this planet with plants, animals, microbes. No organism is useless, so it is our ethical and moral duty to don't harm them or destroy them.

**How Do We Conserve Biodiversity:** Two basic methods such as ex situ (off side), in situ (on side)

1. **Ex situ conservation:** In this type of strategies threatened species are taken out from their natural habitat and then placed at more protected and special care environment. If species is threatened or endangered then ex situ conservation is the desirable approach. Seed banks, cryopreservation, gene banks, Botanical gardens, zoological parks, wild life safari parks are the some examples of ex situ conservation.
2. **In situ conservation:** In situ conservation strategy is applied on whole ecosystem which means to save the tiger save the entire
3. Forest. In situ conservation two types of strategies are there
  - (I) **Hot spots:** Basically hot spots are the regions where species richness is very rich, high degree of endemic is present and requires protection for the endangered or threatened species. Initially there



were 25 hotspots globally but now 34 hot spots are there. In India there are three hot spots Western Ghats, Indo Burma and Himalaya.

- (II) **Protected areas:** These are areas of land or sea dedicated for protection of biological diversity these are managed through legal or other effective means. Sacred groves, Biosphere reserves, National parks, Wild life sanctuaries are the some examples of protected area in situ conservation.

## VI. CONVENTIONS ON BIODIVERSITY

There are no political boundaries are known for Biodiversity therefore conservation of biodiversity is collective responsibility of all the nations. The historical convention on biological diversity (the Earth Summit) is held at Rio de Janeiro in 1992, next world summit held at Johannesburg in 2002, 190 countries pledged for significant reduction in the current rate of biodiversity loss at local, regional and global levels.

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# The Clinical Impact of Melioidosis in Urine Culture at Agra, Uttar Pradesh : A Case Study

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## ABSTRACT

**Background:** Melioidosis is a glanders like infectious disease that can affect both animals and humans. *B. Pseudomallei* is the Gram Negative Bacillus that causes the disease. The risk of developing the disease is higher in those with Diabetes mellitus especially bacteremic melioidosis frequently. The disease has been misdiagnosed and treated in overlooked in India. *B. Pseudomallei* is predominantly seen in tropical climates, especially in Southeast Asia, where it is endemic & is ubiquitous in contaminated water & soil.

**Methodology:** In this case study, Sterile urine sample collected from patient. The sample was processed for routine microscopy & aerobic urine culture, For isolation of bacteria. Freshly prepared HiChrom agar media was used for urine culture. We used Vitek-2 compact instrument for further identification of the isolated organism. AST was done on Muller Hinton Agar after ID & absence of AST from Vitek-2.

**Result:** Urine Culture result showed mucoid, oxidase positive, non-colored colonies obtained on MacConkey agar and incubated at 37°C. Moist, big, oxidase positive & non-coloured colonies with a colony count of 20000 CFU/mL. These colonies are late lactose fermenting in nature. Vitek-2 automated Instrument was used to process the sample with GN ID/ N406 and the organism identified was *B. Pseudomallei* with 95% probability (Excellent Identification) but AST was not given by Vitek2 due to AES data limitation on the system. Enable test strain identification. The isolate used for AST test on Mueller Hinton Agar. Organism is resistant to gentamicin and polymyxin B; also resistant to ceftazidime; susceptible to trimethoprim-sulfamethoxazole, carbapenems, tetracycline, and amoxicillin-clavulanic acid; and intermediate to amikacin and chloramphenicol.

**Conclusion:** Melioidosis is a multi-symptom, potentially fatal condition that is more common in diabetics. This case emphasizes the need for tracking melioidosis cases in India. A wide range of challenges confront physicians, such as clinical symptoms that mimic other chronic illnesses like tuberculosis, test confirmation delays, misdiagnosis, low reporting, and a lack of suspicion.

## I. INTRODUCTION

Whitmore's illness, or melioidosis, is an infectious disease that can affect both human and animals. *Burkholderiapseudomallei* is the Gram-negative bacillus that causes melioidosis, often known as the "Whitmore disease" or the "Vietnamese time bomb." (1, 2).

The Gram-negative bacillus *Burkholderiapseudomallei*, which can be found in tainted soil and water and spreads through ingestion, inoculation, and inhalation, is the cause of melioidosis. Immunocompetent and

immunocompromised patients with melioidosis present with a variety of symptoms, ranging from non-existent to potentially fatal respiratory distress, septic shock, localised tissue infection, necrotizing pneumonia, and abscesses in soft organs (3).

The risk of developing melioidosis is higher in those with diabetes mellitus. Diabetes mellitus patients' compromised innate immunity and inadequate glycaemic management may be the cause of the link between melioidosis and the disease. Compared to acute melioidosis instances in people without diabetes, patients with acute melioidosis and diabetes mellitus had a lowered cellular adaptive immune response (3).

In Sri Lanka, first human case of melioidosis was discovered in 1927 as microbiological services developed (4). The current scenario in India is comparable to that of other South East Asian countries like Thailand, Sri Lanka etc. at that time (4,5).

The disease has been misdiagnosed and treated inappropriately in nations like India due to a lack of knowledge among microbiologists and doctors mainly owing to limitation of technology available at hand. It can also be mistaken with other endemic illnesses due to its wide variety of symptoms, which include both acute septicemic and chronic granulomatous forms. There is scant evidence to support governments in developing melioidosis-specific public health policies, despite the abundance of melioidosis case reports and short series that have been published from India. This is because there are no voluntary or mandatory surveillance systems in place to notify the cases (5).

### Global Burden

According to a 2016 modelling study, there are around 165,000 occurrences of melioidosis in people annually, 89,000 (or 54%) of which are thought to be fatal (6).

Figure 1 :- Milestones in the history of Melioidosis (6).

Years	Details	Years	Details
1911	The first case of disease reported (In Myanmar).	2002	Formally known as B, pseudomallei, the pathogen.
1927	Melioidosis is the newly coined name.	2003	B, pseudomallei, a significant biological agent categorised as category B; a live-attenuated vaccine developed using mouse models.
1936	Sri Lanka reported the first human case in south Asia.	2004	Multilocus sequence typing developed for B. pseudomallei.
1937	First case of an animal (pig) reported in Africa (Madagascar).	2012	B. pseudomallei's first sequence.
1947	B, Pseudomallei, identified to live in soil and water.	2014	Trimethoprim-sulfamethoxazoles developed as a treatment for oral eradication.
1982	First case of an animal (sheep) reported in Australia.	2017	Australia is identified as an early reservoir by whole-genome sequencing, which maps the geographic distribution of B. pseudomallei.
1992	The first record of B. pseudomallei in South America (Brazil) found in soil.	2018	B. pseudomallei, first Rapid Diagnostic Test (RDT).

### Burden in India

Though underreported and underdiagnosed, melioidosis is common in several regions of India. In 1991, Mumbai reported the detection of the first native case from India.

An increase in instances of melioidosis has been found along the coastal regions of Tamil Nadu, Kerala, and Karnataka as a result of improvements in diagnostic facilities. Melioidosis is a risk factor in India due to its favourable climate, high rate of diabetes mellitus, and vast rural areas. With 20,000–52,000 new cases and an estimated 32,000 deaths annually, India was expected to have the largest disease burden (7).

In Udipi, South India, sero-surveillance studies revealed asymptomatic sero-conversion to the degree of 29% among adults aged 18-65. This indicates that *Burkholderiapseudomallei* exposure is rather prevalent, despite cross-reaction with closely similar viruses (7).

**History:** - In Feb -2024, a case was diagnosed at Scientific Pathology Agra and verified to be the first in Uttar Pradesh.

**Case Report:** The patient, a 43-year-old man with a history of diabetes mellitus, living in rural area. The patient complained of Urine Infection with severe dysuria.

A cleancatch midstream urine specimen was given for urine aerobic culture by the patient. The specimen was culture on HiChrom agar & incubated at 37°C and direct microscopy was done from uncentrifuged specimen and pus cells were 1-2/hpf, RBCs were 1-2/hpf. After 24 hours 20000 CFU/mL mucoid, oxidase positive, non-colored colonies obtained on HiChrom agar which were further subcultured on MacConkey agar and incubated at 37°C. Moist, big, oxidase positive, late lactose fermenting colonies were obtained next day and these colonies were then used for analysis on Vitek-2. The automated Vitek2 (bioMe'rieux) equipment was used to process the sample with GN ID/ N406 and next day it was identified as *B. pseudomallei* (with 95% probability) but AST was not given by Vitek2 due to AES data limitation on the system. (The 64-well plastic ID card for Gram-negative bacilli in the Vitek2 system has 47 fluorescent biochemical tests on it, including 18 enzymatic tests for aminopeptidases and oxidases.)



Figure 2: Culture Plate

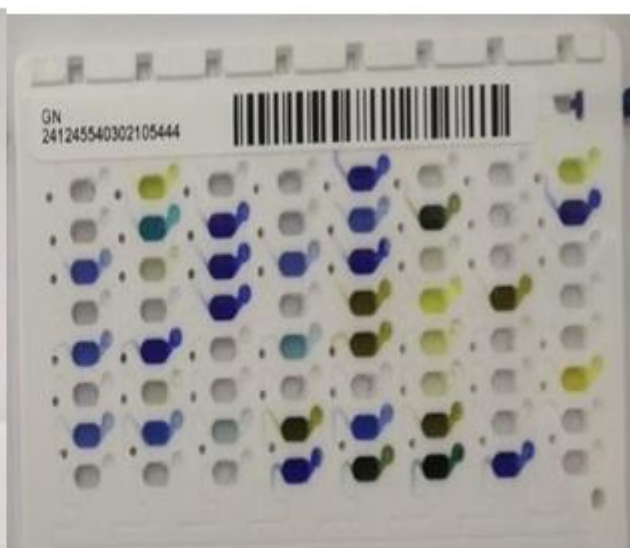


Figure 3: GN-ID



Figure 4: Moist, light pink colonies of *B.pseudomallei* on MacConkey Agar plate late lactose fermenting

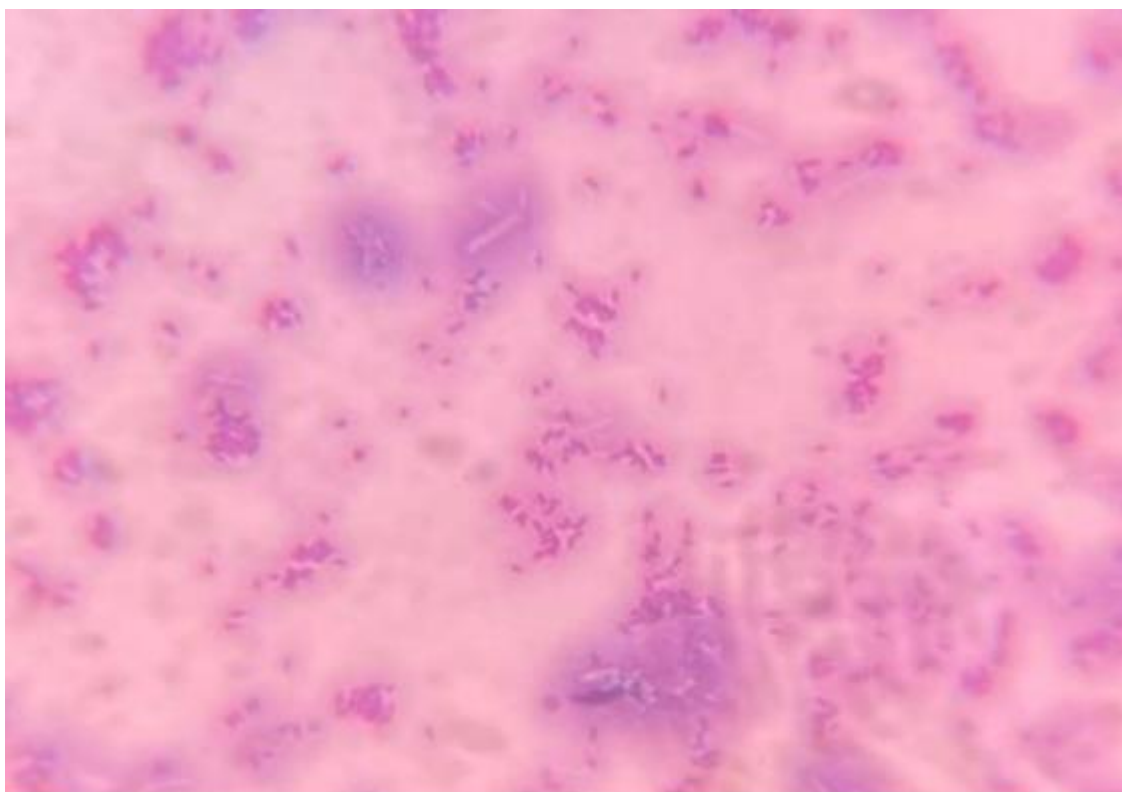


Figure 5: Gram negative bacilli with safety pin appearance on Gram stain



Figure 6: Inhibition zones of *B.pseudomallei*

<b><u>AUTOMATED (IRIS) URINALYSIS REPORT</u></b>			
<b>Chemistry (Automated)</b>			
<b>Method : Reflectance Photometry</b>			
Colour	Yellow	Pale Yellow	
Transparency	Clear		
Specific Gravity	1.028	1.003 - 1.035	
pH	5.5	4.7 - 7.5	
<b>Albumin</b>	<b>Trace</b>	< Trace	
<b>Glucose</b>	<b>++</b>	< Trace	
Bilirubin	Negative	< Trace	
Urine Ketone Bodies / Acetone	Negative	< Trace	
Leucocyte Esterase	Negative	< Trace	
Nitrite	Negative	< Trace	
Blood	Nil	< Trace	
Ascorbic Acid	Negative	Negative	
<b>Microscopy (Automated)</b>			
<b>Method : Flow Digital Imaging / Morphology</b>			
Pus Cells	2-3	< 5 - 7	/HPF
Epithelial Cells	NIL	< 7 - 10	/HPF
RBC's	0-1	< 1 - 2	/HPF
Crystals	Not Detected		/HPF
Cast	Not Detected		/LPF
Bacteria	Not Present	Not Present	/HPF
Crenated R.B.C.	Not Detected		
Others	Not Detected		

Organism Quantity: 20000 cfu/mL		Selected Organism : <i>Burkholderia pseudomallei</i>		Collected: Feb 7, 2024													
Source: URINE C/S																	
Comments:	Members of Non-Entrobacteriaceae family are intrinsically resistant to penicillin (ie benzylpenicillin), cephalosporins I (cefazolin, cephalothin), cephalosporins II (cefuroxime), cephamycins (cefoxitin, cefotetan), clindamycin, daptomycin, fusidic acid, glycopeptides (vancomycin), linezolid, macrolides (erythromycin, azithromycin, clarithromycin), quinupristin-dalfopristin, and rifampin.																
Identification Information		Analysis Time: 5.18 hours		Status: Final													
Selected Organism		95% Probability		<i>Burkholderia pseudomallei</i>													
ID Analysis Messages		Bionumber:		1023453552551311													
Biochemical Details																	
2	APPA	+	3	ADO	-	4	PyrA	-	5	IARL	-	7	dCEL	-	9	BGAL	-
10	H2S	-	11	BNAG	+	12	AGLTp	-	13	dGLU	+	14	GGT	+	15	OFF	-
17	BGLU	-	18	dMAL	-	19	dMAN	+	20	dMNE	+	21	BXYL	-	22	BAlap	+
23	ProA	+	26	LIP	+	27	PLE	-	29	TyrA	+	31	URE	-	32	dSOR	+
33	SAC	+	34	dTAG	-	35	dTRE	+	36	CIT	-	37	MNT	+	39	SKG	-
40	ILATk	+	41	AGLU	-	42	SUCT	+	43	NAGA	+	44	AGAL	-	45	PHOS	+
46	GlyA	+	47	ODC	-	48	LDC	-	53	IHISa	+	56	CMT	+	57	BGUR	-
58	O129R	+	59	GGAA	-	61	IMLTa	-	62	ELLM	+	64	ILATa	-			

Reagents & equipment from bioMerieux were used to set up the Vitek2 GN cards in accordance with the manufacturer's instruments. In short, individual colonies were chosen from 24 Hrs culture on Macconkey agar & then placed in a 3 mL sterile saline (aqueous, 0.45% to 0.05% NaCl, pH 4.5-7.0) test tube made of polystyrene. After mixing the tubes to create a homogenous organism suspension, the density was adjusted with a calibrated Vitek2 Densicheck to correspond to a Mcfarland Number of 0.50 to 0.63. Within 30 minutes of inoculation, every inoculated card was inserted into the apparatus. Software version VT2 9.02.0 was used to analyse the data. The CLSI and NABL recommendations have been followed in the validation of two quality control strains (*Escherichia coli* ATCC 25922, *Pseudomonas aeruginosa* ATCC 27853) for GNB. Correct identification of all quality control strains was necessary to enable test strain identification. When *B. pseudomallei* was identified in this investigation, the system yielded a result with a 95% probability (Excellent Identification).

The primary characteristics that allowed for identification were as follows: arginine dihydrolase-positive; moist, big, and pink colonies (late) on MacConkey agar after prolonged inoculation; oxidative utilisation of glucose, lactose, and lysine decarboxylase-negative; resistance to gentamicin and polymyxin B; susceptibility to ceftazidime (resistant); trimethoprim- sulfamethoxazole, carbapenems, tetracycline, and amoxicillin-clavulanic acid; and intermediate to amikacin and chloramphenicol. *E. Coli* ATCC 25922 was used for MHA GNB AST quality control.

It is not easy to obtain other diagnostic techniques in India, such as molecular biology testing and the latex agglutination test. A non-bacteremic form of severe dysuria was exhibited by the patient in the case study with pulmonary compromise.

Non-bacteremic melioidosis was present in the patient along with genitourinary symptoms with pain in lower abdomen & osteoarticular impairment, uncontrolled diabetic mellitus, and post- chemotherapy contributing as major risk factors for melioidosis. Multiple health issues plagued the patient, who resided in the humid and warm rural city of Agra (UP) in northern India. Serious forms of melioidosis can occur as a consequence of a

number of chronic conditions, including diabetes mellitus (DM), chronic renal failure (CRF), chronic obstructive pulmonary disease (COPD) & others (8).

## II. DISCUSSION

The common pathogen *B. pseudomallei* found in soil & water can cause the lethal sickness melioidosis. The contaminated environment, particularly soil & water serve as the primary reservoir for *B. pseudomallei* (9,10). Numerous animals have the potential to develop melioidosis & act as a reservoir for ongoing epizootic infection (11). Transmission from humans to animals & vice versa is thought to be incredibly infrequent. Though saprophytic by nature, *B. pseudomallei* exhibit remarkable survival qualities when interacting with the host immune system (12).

Health care professionals and the general public are unaware of the deadly virus known as melioidosis in non-endemic areas (13). Leading cases of melioidosis are still being reported from Southeast Asia and northern Australia, with Thailand reporting the largest number of cases annually at 2000–3000 (14). Among visitors, immigrants, and veterans returning from endemic regions, imported cases have been documented. Rarely does an infection spread from person to person; instead, infections are acquired by percutaneous, inhaled, and ingested contaminated water (15). Melioidosis cases are primarily found in the rainfall season and are usually associated with risk factors such as diabetes, alcoholism, and chronic renal diseases. However, 20–26% of cases were not associated with predisposing conditions (16).

## III. CONCLUSION

Melioidosis is a multi-symptom, potentially fatal condition that is more common in diabetics. This case emphasizes the need for tracking melioidosis cases in India. A wide range of challenges confront physicians, such as clinical symptoms that mimic other chronic illnesses like tuberculosis, test confirmation delays, misdiagnosis, low reporting, and a lack of suspicion.

The story also underlines how patient care management requires better microbiology services. On the basis of microbiological feedback, we were able to effectively handle the case by using the appropriate antimicrobials and timely referral of the patient to specialist physician.

## IV. ACKNOWLEDGEMENT

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# Role of Insecticides for Agricultural Development

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## ABSTRACT

Use of insecticide are very much essential and useful for good growth of crops and it should be applied at required quantity. There are large number of natural and synthetic insecticide, available and are applied as per their needs and requirements for good growth of crops and it should be applied whether it is natural or synthetic insecticide, if the amount given to the crops, vegetable, fruits or used for any other purposes are more than the required quantity for that purpose then it acts as a poison.

**KEYWORDS:** Insecticides, Agricultural Development

## I. INTRODUCTION

Insecticides are crucial in controlling insect-borne diseases and preserving crop health, and are essential in agricultural production. They control weeds and insects, leading to significant increases in agricultural products. Pesticides are crucial for producing one-third of agricultural products, reducing diseases and increasing crop yields. They have a long history and can be toxic to other organisms, air, water, soil, and crops. Contamination can lead to environmental pollution and human health issues. Climate change-related factors also impact pesticide application, resulting in increased usage and pollution. Scientific information should be provided for future pesticide application and management, addressing the historical perspective, types, and environmental impacts of pesticides. Pesticides, including insecticides, fungicides, herbicides, rodenticides, molluscicides, and nematocides, are crucial for agricultural development as they reduce product losses and improve food yield. Only 1% of pesticide is effectively used to control insect and pests, resulting in large amounts of pesticide contamination, environmental pollution, and negative health impacts. Agricultural development, pesticide usage, environmental impact, climate change-related factors, and adverse effects of pesticides, offering new insights for effective application and management of pesticides. However, pests, weeds, and diseases can significantly reduce crop yield, requiring pesticide usage. Hence, it is an requirements that public and the individual should look after the problems and diseases caused by pest [1]. Pesticides are used in agricultural production to control pests, diseases, and weeds, aiming to reduce yield losses and maintain product quality. However, concerns have been raised about health risks from occupational exposure and residues in food and drinking water. The risk assessment of pesticides impact on human health and the environment is challenging due to differences in exposure periods, pesticide types, and environmental characteristics. New tools and techniques are needed to predict potential hazards and reduce adverse effects on human health and the environment. Alternative cropping systems, new pesticides with improved safety

profiles, and improved formulations like microcapsule suspensions could help reduce the toxic effects of farming. Proper spraying equipment and precautions during pesticide handling can also minimize human exposure to pesticides and their environmental impacts[2].

Population growth necessitates increased global food production, requiring pesticides to control insect pests. Annually, 20-30% of agricultural produce is lost. However, injudiciously used pesticides can pose health hazards and contamination of food, feed, and environment [3].

Adverse health effects and abnormal behavior are found in animals, possibly due to pesticide-contaminated water. Therefore there is need for training on safe pesticide use and the potential for high exposure [4].

Insects pose a significant threat to crops, consuming foliage, roots, and stems, leading to crop losses. Large number of damage to the crops, fruits, flowers, vegetables and to the agriculture foods are caused due to insects, pests, rodents and microorganisms which results in the destructions of agricultural foods and eatables. Insecticides provide crop protection and have increased yield in agriculture. They are essential for commercial agriculture, including organic farming, as organic farmers increasingly use approved insecticides to protect their crops and prevent insect contamination. Biological controls, such as natural predators or parasites, are not enough to control these pests.

Synthetic insecticides are the most common type of insecticide, containing various types such as chlorinated hydrocarbons, organophosphates, and carbamates. These chemicals can be toxic to various insect species and have long-lasting effects. Chlorinated hydrocarbons contain carbon, chlorine, and hydrogen, while organophosphates inhibit insect nervous system function and are effective against sucking insects. Carbamates, derived from carbamic acid, eliminate insects but can be rapidly detoxified, making them less toxic to animals and humans. Insecticides are essential for controlling insect pests that damage crops, increasing yields, improving crop quality, providing quick pest control, and protecting against multiple pest species. They can be used alone or in combination to control multiple pest species, reducing the loss of income for farmers and resources. Insecticides also help prevent plant diseases spread by insects, ensuring pest-free fruits and vegetables. As pests evolve, research continues to improve insecticides, allowing them to be formulated quickly and provide protection sooner than other methods.

Insecticides are essential for controlling insect-borne diseases and maintaining crop health. Various types, including organophosphates, carbamates, pyrethroids, and neonicotinoids, have distinct modes of action and efficacy. However, they can have negative impacts on non-target species, the environment, and human health. Insecticides are toxic substances used to eradicate and control insect populations, including ovicides and larvicides for eggs and larvae. The earliest documented insecticide compounds were sulfur, heavy metals, salts, and plant extracts. The use of elemental and natural compounds for pest control began at the dawn of agriculture and has continued to this day. A variety of chemicals began to be used against crop infestations, such as borax. The first synthetic organic chemicals, benzene hexachloride (BHC) and dichlorodiphenyltrichloroethane (DDT), were synthesized in the 1800s and early 1900s, but their insecticidal properties were not fully discovered and utilized until later. These chemicals still impact the environment and human health due to their long residual effects [5].

Pesticides, including insecticides, have become essential in agriculture to ensure crop yields and minimize post-harvest losses. With a growing population and deteriorating environmental conditions, the challenge of sustainable development without causing environmental harm is greater. Agriculture is the primary cause of deforestation, occupying 70% of the world's grasslands and 45% of temperate forests. Vector control, such as insecticides, is crucial for preventing and controlling infectious diseases like malaria, dengue, and filariasis.

Despite the increasing demand for insecticides, their toxicology should be thoroughly studied to prevent environmental damage [5].

Insecticides pose a significant environmental threat, potentially harming other organisms and humans. Some are short-lived and decompose quickly, while others are persistent and can cause significant damage to ecosystems. They can also contaminate groundwater reserves and create resistance among insect populations. The nonspecific nature of current insecticides makes them more likely to have unintended effects on both harmful and beneficial insects [5].

Antibiotic insecticides, derived from bacteria or fungi, are effective against greenhouse pests like spider mites and leaf miners by blocking neurotransmitters at the neuromuscular junction [5].

Insecticides are substances used to control insects by disrupting their metabolisms. Examples include organosulfur compounds, dinitrophenols, organotins, pyrazoles, and pyridazinones. Plants like Rotenone and Neem contain compounds with medicinal properties used as insecticides. Fumigants release gas into the air, targeting pest metabolism and disrupting key pathways. Inorganic compounds can also be used as insecticides, with their mode of action varying depending on the type[5].

Biochemicals, classified as biorational compounds, are substances like hormones, enzymes, pheromones, growth regulators, and microbials that act as attractants, growth regulators, or endotoxins[5].

The main methods for controlling insects today are synthetic contact pesticides. In general, they easily penetrate inside the bodies of insects and are poisonous to a large number of species. The principal synthetic groups are carbamates, organic phosphates (organophosphates), and chlorinated hydrocarbons.

Synthetic pesticides were developed in the middle of the 20th century, and despite their negative effects on the environment, they are still crucial in modern agriculture for the effective control of insects and other arthropod pests. In some parts of the world between 1945 and 1965, modern pesticides enhanced crop yields by as much as 50% by reducing crop losses, improving product quality, and lowering farming costs. Additionally, they have been crucial in enhancing both human and domestic animal health; malaria, yellow fever, typhus, among other infectious diseases, have been greatly reduced in many areas of the world through their use.

However, the usage of insecticides has also led to a number of significant issues, primary among which are environmental contamination and the emergence of pest species that are resistant to their use. Insecticides may harm other organisms besides hazardous insects because they are poisonous substances.

Pesticides stop the spread of viruses and diseases that are carried by water. It increases groundwater and land contamination while protecting storage and conserving yield. Insecticides also affects the soil fertility with time. In fact, the buildup of particular insecticides in the environment can be a major concern to both humans and wildlife. Some pesticides are persistent and when used in large quantities they permeate the environment, whereas others are short-lived or are digested by the animals they are consumed by different organisms. When an insecticide is used, a lot of it gets into the soil, and runoff from treated areas or direct application might contaminate groundwater. The main soil contaminants are the chlorinated hydrocarbons such as DDT, aldrin, dieldrin, heptachlor, and BHC. Owing to repeated sprayings, these chemicals can accumulate in soils in surprisingly large amounts and their effect on wildlife is greatly increased as they become associated with food chains [6,7,8].

## II. METHODOLOGY

Based on the various harmful, hazardous and unwanted effects and trouble caused by various pest, insects, rodents and different microorganisms which are discussed in introduction part of this paper, the remedies for that harmful effects, the role of insecticides, pesticides, herbicides, germicides are discussed in result and discussion part of this paper.

## III.RESULT AND DISCUSSION:

### **Role of Insecticides in Crop Protection and Public Health:**

Insecticides have a crucial role. By safeguarding crops against pests, diseases, and weeds and increasing yield per hectare, they assist farmers in producing more food on less area.

Pesticides have played a significant role in the more than threefold increase in agricultural production since 1960.

For instance, production of rice, which feeds over half of the world's population, has increased by more than twofold. Wheat production has surged by about 160 percent. More than half of our crops would be lost to pests and diseases without insecticides.

Every farmer employs pesticides and insecticides. Insecticides are utilized by all farmers, whether they come from synthetic or natural sources. The distinction is that organic farmers are limited in using pesticides derived from natural sources. However, the toxicity of both artificial and natural insecticides varies. They also help farmers provide an abundance of nutritious, all-year-round foods, which are necessary for human health. Fruits and vegetables, which provide essential nutrients, are more abundant and affordable. Grains, milk and proteins, which are vital to childhood development, are more widely available because of lower costs to produce food and animal feed.

Pesticides and insecticides are substances that are used to prevent, eliminate, repel, or mitigate any pests, including weeds, animals, insects, and microorganisms. However, accidental exposure to pesticides can have a negative impact on human health. Despite the potential negative health effects, it has been argued that the use of pesticides, generally, has increased the quality and quantity of fruits and vegetables and, as a result, has improved public health. This makes determining the balance between benefit and harm from pesticide. We adopt a more nuanced approach, holding that effective use of a few selective pesticides should be taken into account following thorough scientific evaluation of health risk.

## IV. CONCLUSION

There is a long history of agricultural development in various parts of the world. Various classification concepts, including chemical classes, functional groups, modes of action, and toxicity, are used to categorise pesticides. Pesticide use has produced enormous benefits for a variety of fields, including agriculture and public health. In terms of public health, pesticides are regularly employed to eradicate pests from homes, workplaces, shopping centres, and streets (pest such as rats, mice, ticks, and mosquitoes).

Farmers have employed pesticides to manage weeds and insects in agricultural operations, and there have been reports of notable gains in agricultural output as a result of pesticide use. Pesticide behavior in the environment, such as transfer and degradation, should be taken into account when using pesticides to target plants. Pollution

of the environment, including soil, water, and air pollution as well as food poisoning, is caused by improper pesticide use, management, and behavior.

The incidence of insect, pests, weeds, and diseases linked to pesticide application are among the environmental and socioeconomic factors influenced by climate change factors. These changes also have an impact on the behavior of pesticides in the environment [1,9,10]. Climate change affects soil properties such as soil organic matter, soil's ability to store and cycle carbon, and the size and frequency of cracks in soils, which affects how pesticides are applied. Crop productivity is impacted by climate change, which also changes the geographic distribution of crops and increases temperature, precipitation, and carbon dioxide levels. Thus, the amount and type of pesticides may increase as a result of climate change [3,11,12].

Crop development, climatic factors, insect pest migration and distribution, pest abundance variations, pest outbreak frequency and vector dispersal, weed evolution, and disease stimulation are all impacted by climate change. This leads to a greater range of pesticides being used more frequently [4]. The behavior of pesticides in terms of volatilization, runoff, leaching, and pesticide degradation—which includes photolysis as well as chemical and microbiological breakdown—is also accelerated by climate change. Consequently, the increased usage of pesticides and insecticides as a result of climate change raises exposure to and dangers to human health from pesticide pollution.

Controlling pesticide contamination and its detrimental effects on the environment and other non-target creatures is therefore essential. To further our understanding of pesticide usage and management in the future, further research on occupational and environmental exposures, as well as the health risks associated with pesticide use, should be conducted. In order to mitigate the adverse effects of pesticide contamination on non-target organisms and the environment, it is recommended that new scientific methodologies and technologies be employed, along with practical measures like integrated pest management (IPM), laws prohibiting high-risk pesticides, and the creation of national implementation plans (NIPs). Additionally, in order to provide scientific training for pesticide use, it is imperative that the scientific results of exposure, occupational and environmental health risk assessments be communicated [13].

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# Neurodegenerative Diseases

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## ABSTRACT

Neurodegenerative diseases are one in which cells of CNS (central nervous system) dies or stop working. These diseases may be caused by tumour or stroke or by genetics itself, some food items having high saturated fat like butter, cheese, pastries, fast food are also responsible for neurodegenerative diseases. In Neurodegeneration slow and progressive loss of cell in specific region of the brain occurs. Alzhimers, Parkinson's disease etc. are examples of Neurodegenerative diseases.

**Key words:** Neurons, diseases, cells, Neurodegenerative.

## I. INTRODUCTION

### Types of Neurodegenerative diseases

- 1. Demyelinating Diseases:** In this type myelin sheath which is present on neurons( secreted by Shwan cells or oligodendrocyte ) is get damaged and in return it adversely affects the signal transferring in neurons. Neuromylitis optica spectrum disorder(NMOSD) and multiple sclerosis are the examples of demyelinating diseases. Tingling, Numbness paralysis, Coordination issues muscle spasms are the some symptoms in this type of Neurodegenerative disease.
- 2. Dementia types disease:** In this type neurons in some areas of brain dies due to progressive damage. In dementia type diseases symptoms are depends on the area affected. Alzheimer's disease , Limbic predominant age related TDP-43 encephalopathy (LATE) are the examples of dementia type neurodegenerative diseases ..Trouble in thinking, concentrating, memory loss and behavioural changes are the symptoms in this type of neurodegenerative diseases
- 3. Parkinsonism -type disease :** In this type neurons in brain which helps in managing coordination and control of muscles movement gets damage .Parkinson's disease is the best example of this type. Balance problem, shuffling steps, shaking, slowed movements are the examples of Parkinsonism type diseases.
- 4. Motor neurone diseases:** When neurons that control movement get damaged or dies of motor neuron diseases occurs. Amyotrophic lateral sclerosis(ALS ) also known as Lou Gehrig's disease and psp ( progressive supranuclear palsy) are the examples of motor neuron diseases . Loss of muscle control, weakness and paralysis are such common symptoms of this type.
- 5. Prion diseases:** This type of Neurodegenerative diseases happens due to protein miss folding. This causes serious brain damage in short time . Creutzfeldt-Jakob disease is the most common in this type.



### Some major factors which causes neurodegenerative diseases

1. **Age :** This is the most important factor in developing neurodegenerative diseases. Older you are more the chances of developing of these diseases.
2. **Genetics:** After the ageing factor genetic is most important. Specific mutation which is inheritable in nature that increases risk of development of Neurodegenerative diseases.
3. **Environment:** Exposure to pollution, toxins and chemicals or some mutagen which causes mutation all of this factors plays major role in developing neurodegenerative diseases

**Summary:** Neurodegenerative diseases are not so common. DNA damage , ageing, environmental factors are responsible for such diseases. No proper treatment is available for such type of diseases that why they are not completely curable but now a days medical field get advanced so we can just slow down the rate of neuron damage.

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# Indian Pollution Act's – An Analysis of Industrial Pollution in India

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## ABSTRACT

Barry Commoner, American biologist formerly said, “Environmental pollution is an incorrigible complaint. It can only be averted”. But rather of precluding we're exacerbating it. Around 7.4 Lacks people die in India annually because of abnormal temperatures due to climate change according to a recent Lancets study. 51 of air pollution in India is due to diligence. Indians are exposed to 25 micrograms per boxy metre above World Health Organisations limit of 10 micrograms per boxy metre of particulate matter. We know how important artificial pollution has been damaging our terrain, but do we have effective laws in order to cover citizens of India against environmental malefactors? Are being laws and legislation effective enough to discipline the malefactors and cover the victims? We do not have any methodical approach for making Artificial sector responsible and responsible towards proper operation of waste backwaters as it contributes around 50 of terrain pollution. diligence like leather, cement, plastic, garments, sugar, sword and petroleum are the major contaminating diligence. The ideal of this paper is to throw light on the important issue of mismanagement of our future and future of our generations so that some useful results can come out. Other ideal of this paper is to explore the impact of environmental profanations on people's lives and exploring laws that safeguards us and how important our laws and bills are guarding us from malefactors, also how much further is demanded in this regard

**Keywords---** Industrial Pollution, Environment, Legislations.

## I. INTRODUCTION

Constitution of India guarantees healthy terrain under Composition 21, Composition 47, Composition 51- A(g) and Composition 19(1) (g) as Fundamental Rights of every citizen. But 1.67 million deaths in 2019 in India were due to air pollution, USD 95 billion loss of Indian business to pollution with 48,000 green cases pending in courts of India. This can be considered as a agony for India, as our important fiscal capitals Kolkata, Mumbai and an important harbourage megacity Chennai along with a long bank of India will be three bases aquatic by century end according to recent IPCC report, can be considered as a advising bell

## II. BACKGROUND

Though India has per capita carbon emigrations at 2.98 tonnes of CO<sub>2</sub>, low but consequences are participated inversely with the world. As India is third largest emitter of carbon dioxide in the world banning European

Union in 2015. Our nonstop artificial expansion with enterprise like Make in India, a loaded responsibility lies in our hands that we cannot push forward more. India has set hothouse gas emigrations reduction targets for 2030 and 2070, which will take trillions of bones and technology according to some experts. Balance of carbon emigrations and growth of diligence with making India a global manufacturing unit have to go hand in hand as we have second largest population of the world calculating 17.7% of the world population, with so important to progress to achieve the 'New India' as promised by our Prime Minister Narendra Modi by 2022- 2023, the 75th year of India's Independence from eradication of poverty to getting a 5 trillion frugality (climatelinks.org, 2016). In India, with 2.2 billion tons of carbon dioxide emigration in which is 7% of the world in 2017 (CEEW, 2021), due to burning of bituminous coal in diligence that's extensively available in India, as it has high humidity and sulphur content responsible for carbon emigrations and due to colorful other factors responsible for this climate change. Impacts on India due to Industrial Pollution Impacts on India are grave with diligence being a major contributor roughly one-fourth of total India's Green House Gas emigrations, as millions of people in India gobble toxic air with a lot of particulate matter, carbon monoxide, sulphur dioxide, fluoride and hothouse feasts. As particulate matter goes deep into the lungs and other body organs starts gradationally demeaning body causing major habitual conditions like asthma, cancer, heart attack. diligence not only harm mortal body but also our ecosystem leading to declination.

### III. WATER AND AIR

India formerly a disaster-prone country with 9 littoral countries facing severe climate hazards thereby causing further peril due to increase in the intensity and frequency of these disasters as like world is facing due to climate change. According to a report by IPCC in 2021, India will face unrecoverable impacts of climate change. We know artificial growth is veritably important for a country's development but that shouldn't come in price of people's lives. Government of India wants to increase donation of manufacturing sector to gross domestic product by raising it to 25% share in GDP in decade end and this sector will give further 100 million jobs to jobs seeking population. Government of India should also consider pitfalls associated with it and should work towards taking every measure to combat pollution. The artificial sector of India contributed to emigrations totally with adding energy consumption, adding artificial process. These natural coffers had been stored in the earth for billions of times but their exploitation had been started only after artificial revolution in the 19th century within a couple of times at a veritably intimidating rate by throwing all the waste directly into the terrain making it as a scrap Gomorrah for diligence. Commercial sector of India should take the responsibility through institutionalisation the Commercial Social Responsibility as a obligatory provision irrespective their size or capital. (Vinjamuri, 2020) Protection of terrain in India is not new as it has been in practice since periods, as in ancient India, cleanliness of terrain and major environmental forces and nature has been considered as gods and 34 people took it as a duty and devotion towards God by guarding wildlife, foliage and fauna as they had faith in nature.

During British India, after destroying major timbers cover of South Africa, United States, Ireland, for boat structure assiduity, now was the focus on India. After a major destruction, now they allowed of guarding it by forming a Homeric timber department in 1864 with the experts from Germany which was headed by Dietrich Brandish for checking deforestation. programs in independent India, when Indian constitution was espoused in 1950, there were no terrain protection and conservation laws in India until correction in 1975. moment, there are remedies available under common law, legislative laws, Constitution of India, and other laws. As the

temperatures on the Tibetan table rises at a tremendous rate, this rise in temperature is causing melting of ice of Himalayan glaciers which is responsible for inflow rate of cataracts causing gutters in India like Ganges, Brahmaputra, Yamuna, Sutlej and other gutters. At a point of time for some times there will be cataracts in these gutters and it is indeed important to note that the major population of India lives on these gutters and after some times when the ice of Himalayas and glaciers will melt fully, also there will be no water left in these gutters as these gutters will come seasonal and there will be acute deficit of drinking water and husbandry of India will also suffer contemporaneously as we don't have well advanced irrigation system. We're heavily dependent on thunderstorm which is largely changeable. As it's veritably clear now that India is going to suffer from the impacts of climate change more constantly with more severe rainfall

Heat Swells more constantly, further volcanic conditioning with mores tress on ecosystem, more natural disasters in the coming decades. Temperature as per IPCC report 2021 on the impacts of global warming, says temperature of earth will rise above 1.5 °C above pre artificial situations. Temperatures above the land have risen by further than 1 °C pre artificial times. As per Indian assessment report, temperature above India has risen to 0.7 C since 1901. indigenous Provisions Constitution of India gives us a important- required protection and safeguards us from exploitation of any kind also from environmental malefactors. Both Directive principles of state policy and Fundamental Rights enunciate the commitment of the country to ameliorate and cover the terrain. Supreme Court of India established star that terrain free of pollution which is clean and is also a abecedarian right and mortal Right of every citizen of India under constitution. Supreme Court of India in case of Vellore Citizen's Forum. Union of India, AIR 1996 SC 2715 held that both Preventative star and Polluter Pays star is customary law. The word 'Environment' isn't included in the Constitution of India originally, it was only added after 42nd correction to the Constitution, which added Composition 48- A under chapter Directive Principles of State of Policy. It also added a new provision of Abecedarian Duty under Composition 51A. Through Article 48- A, it was asserted that the State shall strive and to cover and guard our timbers, wildlife, nature also the natural niche of creatures. Composition 51- A clause(g) says that 'It shall be the duty of every citizen to cover the natural terrain including timbers, gutters, lakes, foliage and fauna, and to have sympathy for living brutes. In case of pastoral Action and annuity Kendrav. State of UP (Rural action and annuity kendrav. state of UP and Others, 1985), the Supreme Court of India held that both citizens of India and State are responsible for the protection of terrain under Composition 48(A) and under Composition 51- A(g) of Constitution of India. Fundamental Duties firstly were not directly enforceable but with judicial activism a lot have been done to give them strength for achieving ideal behind their objectification in Constitution. In the case of L.K. Koolwalv. State of Rajasthan and others (L.K. Koolwalv. State of Rajasthan and others, 1986), court handed the compass of the Composition 51- A by stating that every citizen has the duty to cover the terrain under Composition 51- A(g) of Constitution and also laid down.

#### IV. ENVIRONMENTAL LAWS IN INDIA

##### **The Water (Prevention and Control of pollution) Act 1978**

has been formulated for the forestallment and control of water pollution and to guard the right of every citizen for safe and clean drinking water and to maintain the chastity of water in its real form. The Water Act made enactments of boards for the same purpose and also for the forestallment and controlling of water pollution in the developing country. This water pollution act restrains the discharge of adulterants by diligence, manufactories, homes etc beyond a certain limit or standard and also lays down some penalties for non-

compliance of the rules. At the central position, the water act has established a board of CPCB which functions for the forestallment and control of water pollution and it also lays down certain norms at the state position, water act has established SPCBs which acts under the control and instructions of CPCB and the state government. But according to a report of NITI Aayog in Composite Water Management Index of 2018, 2 Lacks people die annually due to water pollution despite water being the state subject. Around 37.7 million people get water born conditions annually in India. profitable burden of USD 600 million is also due to water pollution in a time in India.(indiawaterportal.org, 2021

### **The Air (Prevention and Control of pollution) Act 1981**

Shastri, Environmental Law, 2022), or the Air act, is the act for the forestallment and control of the pollution also for the establishment of Board for States, Centre for carrying out the functions laid down in the act. As the goods of climate change can be felt due to different kinds of reasons, to alleviate these dangerous goods India passed this law. However, may can also affect in imprisonment for 1 time and can be extended to 6 times, and there are debates going on for making this discipline more severe and also with a fine Adnan fresh forfeiture can also be laid down of Rs 5000 for malefactors, If anybody or organisation or assiduity fails to misbehave with the directions of Central Pollution Control Board or CPCB. Around 1.6 million people failed in India due impacts of air pollution in 2019 loftiest in the world. Air pollution in India costs 3 of GDP every time.

### **The Environment Protection Act 1986**

or the Environment Act, is an act for the safeguard and protection of the terrain, also for This act acts as marquee legislation for the planning and legislating of the frame for the protection of terrain and also for the speedy response of any situation which is dangerous and dangerous for the terrain. It can be said that this is a legislation which is designed to formulating a system for collaboration of both the central and state authorities which are established under the Water Act 1974. This Act does not cover all adulterants similar as radiation and noise. Decentralisation of powers is demanded as there's no power with state government Waste Management Regulations, In this hazardous waste which is chemically or can have physical reaction, inflammable, toxic which causes danger or can cause danger when escaped and/or exposed to natural surroundings. Around 55 lacks MT of hazardous waste remains exposed annually which causes pollution and threats to human life as its leads to radiations and contaminations of land and water. This act should make more severe penalties for industries which do not treat its hazardous waste.(indiatoday.in, 2019).

There are some enlightening examples also where people and communities with their administration are doing so well that can set a milestone in coming future for others also so that they are also encouraged to do something instead of saying.

- ❖ **Medha Patkar** is a well-known environmentalist in India especially for her role in Narmada Bachao Andolan in a peaceful manner against the construction of dam on Narmada River which would have displaced around 3,20,000 people. She formed NBA and is involved in that since 1989 and made a significant impact.
- ❖ **Jamuna Tudu** also known as 'Lady Tarzan'. This is a title recognised by various institutions including United Nations India. Also, the recipient of Padma Shri and Women Transforming India with other awards for her brave work in protecting timber from mafias by collecting other women also for illegally cutting down trees in Jharkhand.
- ❖ **Chandi Prasad Bhatt** is a social activist and a Gandhian philosophy environmentalist, who is India's first modern environmentalists. He also founded Dasholi Gram Swarajya Sangh in Gopeshwar in 1964, which after some time became parent organisation of Chipko Movement. He was also involved in Chipko

movement and was also awarded the distinguished Raman Magsaysay award in 1982 and Padma Bhushan in 2005 for his work in Subaltern ecology

- ❖ **Sunderlal Bahuguna** is a well-recognised name in India which does not need any introduction as he is one of the oldest environmentalists at the age of 92 in India. He became famous after Chipko Movement where he played a significant role and he is also the follower of Gandhian ideologies violence and Satyagraha. He is also the recipient of Padma Vibhushan in 2009. He fought for the preservation of Himalayas and forests around Himalayas in 1970s as he was the first member of Chipko movement and later this movement spread to Tehri Dam

## V. CONCLUSION

Enough has been said and enough has been suffered, now it's the time to act and create safer world for our future generations as it has been destroyed by us. Initiatives like Waste to Energy plants of Ghazipur and promoting use of Green Hydrogen are needed aggressively in order to protect Rights of people to get safer environment guaranteed under Article 21 of the Constitution of India. In India, it is the need of the hour as, we are increasing our CO<sub>2</sub> emissions in coming decades in order to pull out millions of people from poverty. There are more than enough legislations, laws, acts and regulations that deals with the hazards of environmental degradation impacts on human beings done by factories, industries, and individuals and institutions. As there are various legislations that leads to a lot of confusion, that should be simplified for the convenience of the people. The powers which are now vested on the Pollution Control board are not enough for controlling the pollution and also preventing from further damage to the environment. There is an urgent need of formulating stricter laws like Eco -Taxon activities and products which are harmful for environment on the violators of these laws with more simplified laws that common people can understand. Government of India should run awareness campaigns both at urban and rural levels with the help of Urban Local bodies at urban level and Rural Local bodies at rural level with the help of Gram Panchayats in villages. Green Energy should be promoted by making use of it at various levels like vehicles and appliances etc. NGOs should work for making people aware about protection of the environmental hazards and government can promote solar energy and gas stoves instead of use of forest wood for cooking in villages. Despite there are legislations of environmental policy and constitutional provisions of environmental protection, yet there is a major problem of Industrial waste disposal in our country that is day and night polluting out natural surroundings, rivers, ponds, lakes, soil, air, groundwater and much more to hazardous levels that in near future we will not have enough pure and clean water to drink left in our country.

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# Effect of Different Organic Sources On Growth and Yield of Sesame Under Rainfed Conditions of North Maharashtra

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## ABSTRACT

A field experiment was conducted at Oilseeds Research Station, MPKV, Jalgaon to assess the performance of different organic sources for sesame production and its effect on growth and yield of sesame during the kharif season of 2023. Application of FYM on N equivalent basis + foliar application of 3% Panchgavya at flowering and capsule formation stage + soil application of Pseudomonas and Azotobacter (2.5 lit /ha + 200 kg FYM) recorded higher seed yield (443 kg ha<sup>-1</sup>) over rest of the treatments, whereas higher net returns (35387 ha<sup>-1</sup>) and B: C ratio of 2.40 was obtained under application of RDF (50 % N as basal and remaining 50 % in 2 split doses) over rest of the organic sources.

**Keywords:** organic farming, sesame, farm yard manure, neem seed cake, panchagavya, productivity, economics

## I. INTRODUCTION

Sesame (*Sesamum indicum* L.) which is known variously as sesamum, *til*, *gingelly*, *simsim*, *gergelim* etc. is one of the most important oilseed crop grown extensively in India (Chaudhary et al., 2017). The crop is grown in various agroclimatic regions mostly grown semi-arid tropics under rainfed conditions by mostly by small and marginal farmers. India ranks first in the world in terms of sesame-growing area (23%) and second largest producer of sesame in the world after Myanmar. It is cultivated in an area of 19.47 lakh ha. with a production of 8.66 lakh tones. The average yield of sesame 413 kg/ha is lower than other sesame growing countries (535kg/ha). This probably indicates great opportunity for a higher increase in sesame productivity in India. Organic farming is gaining wide acceptance worldwide for agricultural production. Organic agriculture is one of the fastest growing sectors of agricultural production. The increasing trend in demand and export of sesame are continuously seen in international market (Gopinath et al., 2011). Nutrient management is one of the most critical management areas for organic growers. Hence, it is necessary to explore the possibility of enhancing the productivity and export of sesame through organic keeping this in view present investigation was carried out to assess the growth and yield of organic sesame.

## II. METHODS AND MATERIALS

A field experiment was conducted at Oilseeds Research Station, MPKV, Jalgaon to assess the performance of most suitable organic source for sesame production and its effect on growth and yield during the *kharif* season of 2023. Experiment was conducted in randomized block design (RBD) with comprising of 7 treatment combinations of different organic sources and bio fertilizers as well as bio pesticides compared with conventional chemical fertilizer treatment replicated thrice. The experiment conducted in vertisols which is low in nitrogen ( $225 \text{ Kg ha}^{-1}$ ), moderate in phosphorus ( $23 \text{ Kg ha}^{-1}$ ) and rich in potassium ( $832 \text{ Kg ha}^{-1}$ ) with slightly alkaline in nature (pH 7.92). A white seeded and bold sesame variety JLT-408 was sown at a distance of 45 cm in between rows and 10 cm as plant to plant spacing using  $2.5 \text{ kg/ha}$  seed rate sown in second week of July, with standard package of practices. The crop was harvested in the month of October, cut plants tied in bundles and kept 5-6 days for sun drying in upright position in the field. Harvesting was done at field maturity after the leaves turn yellow and start dropping while the capsules are still greenish-yellow to avoid shattering losses. Data on growth and yield attributing traits and seed yield were recorded. The economics of sesame cultivation was worked out with all the prevailing market prices of inputs used. On the basis of gross realization and cost of cultivation B: C ratio was calculated.

## III. RESULTS AND DISCUSSION

### Growth attributes

The results of experiment revealed that all the treatments of organic nutrient management produced at par effect on growth and seed yield during *kharif* season. Amongst different organic treatments Application of FYM on N equivalent basis + foliar application of 3% Panchgavya at flowering and capsule formation stage + soil application of *Pseudomonas* and *Azotobacter* ( $2.5 \text{ lit /ha} + 200 \text{ kg FYM}$ ) recorded maximum plant height (136.5 cm per plant), number of branches (4.93) and number of capsules per plant (47). However, application of RDF (50% N as basal and remaining 50% in 2 split doses) recorded significantly higher plant height (148.3 cm per plant), number of branches (5.73) and number of capsules per plant (59). This might be due to readily available soil applied nutrients to the plant for favorable growth and development of sesame plant.

### Seed yield and economics

Among different treatments of organic nutrient management application of FYM on N equivalent basis + foliar application of 3% Panchgavya at flowering and capsule formation stage + soil application of *Pseudomonas* and *Azotobacter* ( $2.5 \text{ lit /ha} + 200 \text{ kg FYM}$ ) recorded numerically higher seed yield ( $443 \text{ kg ha}^{-1}$ ) over rest of the organic treatments. Whereas, higher seed yield ( $506 \text{ kg ha}^{-1}$ ), net returns (₹ 35387  $\text{ha}^{-1}$ ) and B: C ratio of 2.40 was obtained under application of RDF (50% N as basal and remaining 50% in 2 split doses) over rest of the organic sources, which was mainly due to cost of organic inputs particularly cost of FYM and Neem Seed Cake was at higher side and it lowers net returns of organic sesame production. Lower seed yields in the plots under organic management may have been associated with the less readily available nutrients in the organic treatments as nutrient cycling processes in first-year organic systems change from inorganic N fertilization to organic amendments (Reider *et al.*, 2000) and slower release rates of organic materials (Liebhardt *et al.*, 1989; MacRae *et al.*, 1993).



**Table 1: Plant height , number of branches and number of capsules of sesamum as influenced by different treatments (*Kharif* 2023)**

Sr. No.	Treatments	Plant population at 20 DAS	Plant population at harvest	Plant height (cm)	Number of branches per plant	Number of capsules per plant
1	Application of FYM on N equivalent basis	211111	208025	127.5	4.20	40.93
2	Application of Neem cake on N equivalent basis	212654	209568	129.5	3.93	37.73
3	Application of FYM on N equivalent basis + foliar application of 3% Panchgavya at flowering and capsule formation stage	214198	211111	123.6	4.33	43.07
4	Application of Neem cake on N equivalent basis + foliar application of 3% Panchgavya at flowering and capsule formation stage	217593	214506	131.7	4.27	43.87
5	Application of FYM on N equivalent basis + foliar application of 3% Panchgavya at flowering and capsule formation stage + soil application of Pseudomonas and Azotobactor (2.5 lit /ha + 200 kg FYM)	213889	210802	125.5	4.67	45.20
6	Application of Neem cake on N equivalent basis + foliar application of 3% Panchgavya at flowering and capsule formation stage + Soil application of liquid biofertilizer (PSB and azospirillum 2.5 lit /ha + 200 kg FYM)	211420	208333	136.5	4.93	46.93
7	RDF ( 50 % N as basal and remaining 50 % in 2 split doses )	213889	210802	148.3	5.73	59.33
	SE $\pm$	2154	2208	2.8	0.23	1.12
	CD at (P=0.05)	NS	NS	8.7	NS	3.44
	CV %	1.75	1.82	3.69	8.85	4.26

Table 2: Seed yield (kg/ha) and economics of sesame as influenced by different treatments *Kharif 2023*)

Sr. No.	Treatments	Seed yield (kg/ha)	Gross returns (₹ /ha)	Cost of cultivation (₹ /ha)	Net Returns (₹ /ha)	B: C ratio
1	Application of FYM on N equivalent basis	388	49198	35425	13773	1.39
2	Application of Neem cake on N equivalent basis	377	45298	39675	5623	1.14
3	Application of FYM on N equivalent basis + foliar application of 3% Panchgavya at flowering and capsule formation stage	431	51748	37045	14703	1.40
4	Application of Neem cake on N equivalent basis + foliar application of 3% Panchgavya at flowering and capsule formation stage	411	49314	41295	8019	1.19
5	Application of FYM on N equivalent basis + foliar application of 3% Panchgavya at flowering and capsule formation stage + soil application of <i>Pseudomonas</i> and <i>Azotobactor</i> (2.5 lit /ha + 200 kg FYM)	457	54850	38695	16155	1.42
6	Application of Neem cake on N equivalent basis + foliar application of 3% Panchgavya at flowering and capsule formation stage + Soil application of liquid biofertilizer ( <i>PSB</i> and <i>azospirillum</i> 2.5 lit /ha + 200 kg FYM)	443	53181	38695	14486	1.37
7	RDF ( 50 % N as basal and remaining 50 % in 2 split doses )	506	60704	25317	35387	2.40
	SE <sub>±</sub>	18	2024			
	CD at (P=0.05)	55	6014			
	CV %	7.17	6.74			

#### IV. CONCLUSION

Application of FYM on N equivalent basis + foliar application of 3% Panchgavya at flowering and capsule formation stage + Foliar application of *Pseudomonas* and *Azotobactor* 2 lit /ha both + soil application of *Pseudomonas* and *Azotobactor* (2.5 lit /ha + 200 kg FYM) recorded higher seed yield over rest of the treatments, whereas higher net returns and B: C ratio was obtained under application of RDF ( 50 % N as basal and remaining 50 % in 2 split doses ) over rest of the organic sources. This might be due to higher cost of organic inputs used for sesame cultivation.

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# Biodeterioration of Green Gram (*Vigna Radiata* L.) By Seedborne Fungi

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## ABSTRACT

Green gram (*Vigna radiata* L.) is one of the most important pulse crop. The crop is grown in almost all parts of the country. The crop is also grown in some parts of South-East Asia, Africa, West Indies and America. In India, it is widely cultivated in Maharashtra, Uttar Pradesh, Gujarat, Tamilnadu, Andhra Pradesh and Bihar occupying an area about 2-4 million hectares with a production of 1 million tons of seeds. Green gram is attacked by a variety of pathogenic fungi of economic importance. Green gram seeds viz. BPMR-145 and S-8 were associated with nine fungi such as *Aspergillus flavus*, *Aspergillus niger*, *Alternaria tenuis*, *Fusarium oxysporum*, *Fusarium solani*, *Cladosporium herbarum*, *Drachslera longirostrata*, *Curvularia lunata* and *Penicillium citrinum*. The seed associated fungi are responsible for seed deterioration. The results regarding biodeterioration of green gram in artificially infested seeds that all fungi associated with the seeds invariably caused loss in dry weight, protein content, reducing sugar content and ash content.

**Keywords:** Green gram; physico-chemical properties; seed deterioration; seedborne fungi

## I. INTRODUCTION

In the Indian context, where legumes have been a part of daily diet, maximizing production and enriching nutrition through legumes is a better and acceptable alternative. The leguminous crops like groundnut (*Arachis hypogea* L.), Gram (*Cicer arietinum* L.), Red gram (*Cajanus cajan* L.), black gram (*Vigna mungo* L.) and green gram (*Vigna radiata* L.) are the important crops grown in Marathwada region of Maharashtra during both *kharif* and *rabi* season. The legumes are next in importance to cereals as a source of human food.

Mung bean contains about 24% protein, which is about two third of the protein content of soybean, twice that of wheat and thrice that of rice. Mung bean is grown mainly as a *Kharif* crop. However, its cultivation in *Rabi* is restricted to the eastern and southern parts of the country. The major mung bean growing states are Odisha, Maharashtra, Andhra Pradesh, Rajasthan, Karnataka and Gujarat. In India, the total production of mung bean is 15 lakh tonnes from an area of 34.40 lakh ha with a productivity of 406.98 kg ha<sup>-1</sup>, of which Karnataka occupies 5.28 lakh ha with a production of 1.08 lakh tonnes and average yield of 204.55 kg ha<sup>-1</sup> (Anonymous, 2011).

Seed constitutes an essential component of agriculture. About 90% of all food crops are propagated through seeds. They act as passive carriers of fungi, bacteria, viruses and nematodes. According to recent reports of the World Health Organization, 1-4% of the world's grain production is lost due to microbial spoilage. It is well

established fact that, the seeds of these crops are reported to carry many moulds both in field and storage. The association of moulds adversely affect the health of seed and seedling. The mycoflora has been studied by seed health testing methods such as standard blotter paper method (De Tempe 1953), agar plate method (Musket 1948) and seed washates method (ISTA 1966) for isolation and examination of seed borne pathogens.

Green gram is attacked by a variety of pathogenic fungi of economic importance. Several authors isolated the following fungi from greengram seed like *Aspergillus niger*, *Aspergillus flavus*, *Alternaria dianthicola*, *Curvularia lunata*, *Curvularia pellescens*, *Fusarium oxysporum*, *Fusarium equiseti*, *Macrophomina phaseolina*, *Rhizopus stolonifer*, *Penicillium digitatum* and *Penicillium chrysogenum* causes discoloration, rotting, shrinking, seed necrosis, loss in germination capacity and toxification to oilseeds (Dawar et al., 2007; Rao et al., 2015).

Several researchers investigated several seed health testing techniques for identifying pathogens that are transmitted *via* seeds. According to Mathur et al. (1975), the deep freezing approach proved preferable for identifying *Fusarium* spp. in sorghum seeds. According to Khan et al. (1988), the identification of *Fusarium* spp. in rice seeds may be accomplished using the blotter and agar plate techniques. Similar findings were made by Dawar (1994), who noted that compared to the agar plate and deep freezing procedures using sunflower seeds, the blotter approach produced significantly more fungus.

According to Malik and Jyoti (2013), seed degradation refers to deteriorative changes throughout time that make the seed more vulnerable to hazards beyond its control and make it less likely to survive. Deterioration was defined as a catabolic process by Manoharachary and Kunwar (2006) and Kapoor et al. (2010), which included cytological, physiological, biochemical, and physical alterations in seeds. According to Christensen (1969), losses brought on by microorganisms are known as "biodeterioration," and they cause degradation to happen more quickly in grains that are kept because of their invasion. According to Neergard (1977), fungus do more harm to the world's stored grain than other microbes.

The aim of the current research was to investigate the seed mycoflora and determine how the physical and chemical characteristics of green gram seeds such as their ash content, protein content, reducing sugar content and dry weight changed during fungal attack.

## II. MATERIALS AND METHODS

Two varieties of greengram seeds *viz.* BPMR-145 and S-8 were collected from market places of Latur district by using Neergaard's (1973) sample collection method. The collected seeds were properly stored in cloth bags at room temperature for the study of storage fungi and biochemical analysis. The isolation of seed mycoflora was done by using standards blotter paper method, Agar plate method and seed washates as recommended by International Seed Testing Association (1966), De Tempe (1953), Neergaard (1973) and Agrawal (1973). Observations were recorded in percent incidence of seed borne fungi associated with unsterilized seeds. The fungi which appeared on seed were isolated in pure culture for identification and for further study. Three different methods of isolation techniques for assessment of seed mycoflora were used.

Biochemical changes in the composition of green gram seeds, brought about by the seed moulds are found to be necessary to decide the degree of biodeterioration. Therefore, greengram seeds *viz.* BPMR-145 and S-8 were assessed for the deterioration by using physico-chemical analysis like Changes in dry weight of seeds, Changes in ash content of seeds, Changes in protein content of legume seeds (Lowry method, 1951.), Changes in

reducing sugar of legume seeds by 3, 5 dinitro salicylate method. The statistical analysis of the obtained data was carried out by using the methods given by Panse & Sukhatme (1961) and Mungikar (1997).

### III.RESULTS AND DISCUSSION

#### Fungi associated with seed of Green gram (*Vigna radiata* L.)

Table 01 indicate that Green gram seeds viz. BPMR-145 and S-8 were associated with nine fungi such as *Aspergillus flavus*, *Aspergillus niger*, *Alternaria tenuis*, *Fusarium oxysporum*, *Fusarium solani*, *Cladosporium herbarum*, *Drachslera longirostrata*, *Curvularia lunata* and *Penicillium citrinum*.

In case of standard blotter paper on S-8, the percent incidence of *Fusarium oxysporum* (52%) was highest followed by *Alternaria tenuis* (35%). *Aspergillus niger* (30%), *Aspergillus flavus* (25%), *Fusarium solani* (20%), *Drachslera longirostrata* (20%) and *Curvularia lunata* (15%) were found to be intermediate within the range of 15-30%. *Cladosporium herbarum* and *Penicillium citrinum* were found to be least.

In case of standard blotter paper on BPMR-145, *Fusarium oxysporum* (48%) gave highest percent incidence followed by *Alternaria tenuis* (30%). *Aspergillus niger* (29%), *Aspergillus flavus* (20%), *Fusarium solani* (15%), and *Drechslera longirostrata* (15%) were found to be intermediate within the range of 15-29%. *Curvularia lunata* and *Cladosporium herbarum* were found to be least. *Penicillium notatum* was not recorded.

In agar plate on S-8, *Fusarium oxysporum* (54%) gave highest percent incidence followed by *Aspergillus flavus* (45%). *Aspergillus niger* (35%), *Alternaria tenuis* (40%), *Fusarium solani* (25%), *Drachslera longirostrata* (23%) and *Curvularia lunata* (20%) were found to be intermediate within the range of 20-35%. *Cladosporium herbarum* and *Penicillium citrinum* were found to be least.

In agar plate on BPMR-145, *Fusarium oxysporum* (50%) gave highest percent incidence followed by *Alternaria tenuis* (40%). *Aspergillus niger* (34%), *Aspergillus flavus* (30%), *Drechslera longirostrata* (20%), *Fusarium solani* (22%) and *Curvularia lunata* (15%) were found to be intermediate within the range of 15-34%. *Cladosporium herbarum* and *Penicillium citrinum* were found to be least.

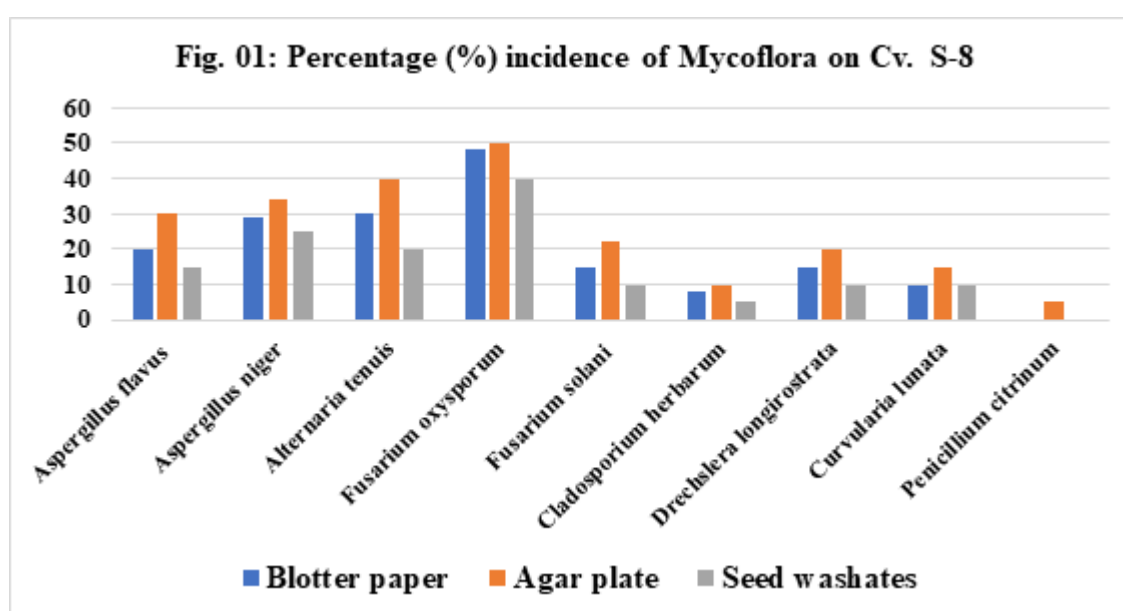
In case of seed washates on S-8, percent incidence of *Fusarium oxysporum* (40%) was highest followed by *Aspergillus niger* (27%). *Alternaria tenuis* (25%), *Aspergillus flavus* (20%), *Drachslera longirostrata* (18%) and *Fusarium solani* (15%) were found to be intermediate within the range of 15-27%. *Curvularia lunata* and *Cladosporium herbarum* were found to be least. *Penicillium citrinum* was not recorded.

In case of seed washates on BPMR-145, *Fusarium oxysporum* (40%) gave highest percent incidence followed by *Aspergillus niger* (25%). *Alternaria tenuis* (20%) and *Aspergillus flavus* (15%) were found to be intermediate within the range of 15-20%. *Drechslera longirostrata*, *Fusarium solani*, *Curvularia lunata* and *Cladosporium herbarum* were found to be least. *Penicillium citrinum* was not recorded.

**Table 01: Fungi associated with seeds of Green gram seeds (*Vigna radiata* L.) BPMR-145 and S-8**

Sr. No.	Name of Fungi	Percentage (%) incidence of Mycoflora on Cv. S-8			Percentage (%) incidence of Mycoflora on Cv. BPMR-145		
		Blotter paper	Agar plate	Seed washates	Blotter paper	Agar plate	Seed washates
1	<i>Aspergillus flavus</i>	25	45	20	20	30	15

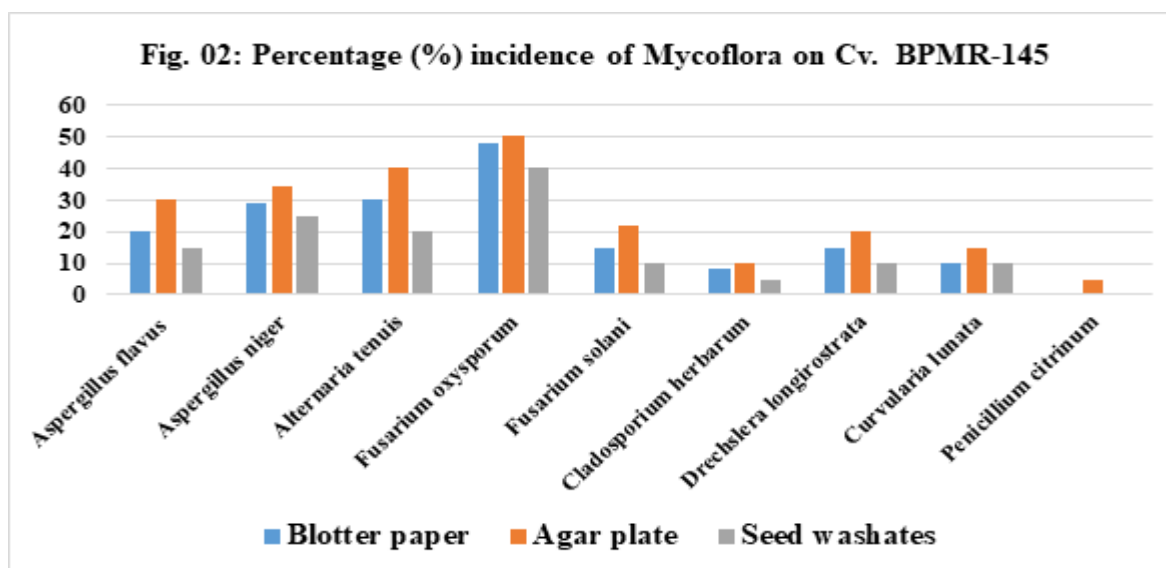
2	<i>Aspergillus niger</i>	30	35	27	29	34	25
3	<i>Alternaria tenuis</i>	35	40	25	30	40	20
4	<i>Fusarium oxysporum</i>	52	54	40	48	50	40
5	<i>Fusarium solani</i>	20	25	15	15	22	10
6	<i>Cladosporium herbarum</i>	10	15	8	8	10	5
7	<i>Drechslera longirostrata</i>	20	23	18	15	20	10
8	<i>Curvularia lunata</i>	15	20	10	10	15	10
9	<i>Penicillium citrinum</i>	5	10	0	0	5	0
S.E ±		4.45	4.61	3.71	4.52	4.56	3.80
C.D. at 5%		10.27	10.64	8.57	10.44	10.53	8.77



Similar types of observations have been made earlier by Jackson (1963); Gupta and Chouhan (1970); Chandra et al. (1981); Prahlad and Reddy (1981) in groundnut.

Various fungal flora were associated with the seeds of different cultivars indicating the presence of fungi on the healthy looking seeds. However, specifically high percent of *Aspergillus flavus*, *Fusarium oxysporum* and *Alternaria tenuis* were observed showing their dominance.

*Aspergillus flavus* and *Alternaria tenuis* cause seed rot while *Fusarium oxysporum* cause seedling blight and wilt of mature plants. The presence of *Aspergillus flavus*, *Fusarium* sp. and *Alternaria* sp. and their frequent association with legume seeds was reported by Austwick and Ayerst (1963); Gupta and Chouhan (1970); Shukla and Bhargava (1977); Lokesh et al. (1987); Bhikane (1988); Reddy (1988); Muley (1990); Dwivedi and Shukla (1990); Reddy et al. (1991); Kareppa (1998); Shamsur Rahman (1999) and Shahnaj Dawar et al.(2007).



### Effect of seed infestation with moulds on physico-chemical properties in Green gram.

The susceptible cultivars of green gram seeds like Cv. BPMR-145 & S-8 were artificially infested with dominant fungi to analyze the bio-deterioration of seeds by storage fungi.

It is clear from the results summarized in Table 02 & 03 that, all the five fungi caused significant loss in dry weight, ash content and protein content of seed.

It is clear from the results summarized in Table 2 & 3, that all the five fungi caused significant loss in dry weight and ash content of seeds. Maximum loss in dry weight was done by *A. flavus* followed by *A. tenuis*, *F. oxysporum* and *A. niger*.

Reduction in ash content was done by *A. tenuis* followed by *A. niger*, *A. flavus* and *C. lunata*. In case of protein followed by *A. tenuis*, *F. oxysporum* and *A. niger*. There was decrease in reducing sugar content of seeds by *A. flavus*, *F. oxysporum*, *A. tenuis* and *A. niger*.

Similar observations were made by Sethumadhava et al., (2014) in stored vegetable seeds and Ram Babu, (1994) in stored red and black gram seeds. Singh and Prasad, (1977) stated that the proteins break down into amino acids due to the action of fungi.

**Table 02: Effect of seed infestation with moulds on Physico-chemical properties of green gram in Cv. S-8**

Characteristics	Control	<i>A. flavus</i>	<i>A. niger</i>	<i>A. tenuis</i>	<i>F. oxysporum</i>	<i>C. lunata</i>
Dry weight	24.7	-18.06	-12.13	-15.93	-16.11	-13.95
Ash content	2.8	-1.8	-1.38	-2.13	-1.72	-1.86
Protein	21.42	-14.13	-13.7	--11.87	-11.9	-10.3
Reducing sugar	5.4	-4.5	-1.7	-1.4	-1.17	-1.92

**Table 03: Effect of seed infestation with moulds on Physico-chemical characters in Green gram Cv. BPMR – 145**

Characteristics	Control	<i>A. flavus</i>	<i>A. niger</i>	<i>A. tenuis</i>	<i>F. oxysporum</i>	<i>C. lunata</i>
Dry weight	24.2	-19.4	-17.1	-19.0	-18.2	-15.4
Ash content	2.9	-1.8	-2.1	-2.4	-0.8	-1.0
Protein	21.2	-14.0	-14.9	-16.0	-15.5	-12.4
Reducing sugar	5.5	-4.6	-3.1	-3.6	-4.0	-2.2



Similar findings were obtained by Mc Cready et al. (1950); Christenson and Kaufman (1965); Cherry et al. (1972); Bilgrami et al. (1976) and Jamaluddin et al. (1977).

#### IV. CONCLUSION

In green gram seeds, maximum loss in protein content was done by *A. tenuis*, *F. oxysporum* and *A. niger*. The sugar content was decreased by *A. flavus* and *F. oxysporum*. These fungi degrade the chemicals present in the seed, which are rich in protein, carbohydrate and fats by producing enzymes and toxins.

The seed associated fungi are responsible for seed deterioration. Similarly they are known to inhibit seed germination. These fungi have been found to cause quantitative and qualitative changes in chemical composition of the seeds. This is called Biodeterioration of seeds.

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# Survey of Haemoglobin Level in The Different Age Groups of Male and Female Human Beings from Shardchandra Arts, Commerce and Science College Naigaon Dist. Nanded

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## ABSTRACT

Deficiency of hemoglobin in red blood cells causes Anemia which is one of the most common health issues of the planet. Most common class of anemia is Iron Deficiency Anemia in which the iron content is fewer. Anemia occurs in male and female. Taking this in to consideration estimation of hemoglobin level among different age groups of students from Shardchandra Arts, Commerce and Science college Naigaon Dist. Nanded. Blood samples from 220 of different age groups (17-22 years) were collected and analyzed using AccuSure Hb Haemoglobin Test System, To see the impact of nutrition on hemoglobin, information from students were gathered through a Questionnaire. The results revealed that 0.56% had severe anemia while 12.88% had moderate and 42.66% had mild anemia. The remaining had normal values of hemoglobin. Fewer intakes of fruits, vegetables and meats are the main cause of anemia.

**KEYWORDS:** Iron Deficiency Anemia AccuSure Hb Haemoglobin Test System.

## I. INTRODUCTION

Hemoglobin (Hb) is a complex protein that consists of heme group (iron) and globulin protein. Function of hemoglobin is to move oxygen to the body with the help of blood. It also carries carbon dioxide to the lungs from different parts of the body.

There are three main types of anemia Blood Loss Anemia. The second type of anemia occurs when the erythrocytes get demolish, it is known as Hemolytic Anemia. The third and the most common of anemia is Iron Deficiency Anemia [1]. About 50% of people in the world contain insufficient iron in their body due to which they are anemic and the main root of anemia is lack of nutrition [2]. Insufficiency of folic acid or vitamin B12 is also creating Iron Deficiency Anemia [3]Iron plays an important role because many enzymes in hemoglobin [4]. The reason of Iron deficiency (IDA) is fewer intakes of iron, poor digestion and nutritional problems [5]. IDA is most common in females, of folic acid. When the level of hemoglobin is low it results in many symptoms like fatigue, weakness and poor defense system [6] Nutritional deficiency of iron, not only produce anemia but also cause immunological disorders, dysfunction of neurons and also demolish work capacity. Insufficient intake of iron also generates some severe metabolic disorders and brings changes in behavior. Anemia is more commonly found in underdeveloped and developing countries like India [7]

Reported that under nutrition, low standard of living and age are main causes of anemia in male and female. As compared to males, females are more vulnerable to cause anemia. Aim of this study is to evaluate the hemoglobin level in male and female students Shardchandra Arts, commerce and Science College, Naigaon Dist. Nanded and determine the different aspects by which anemia occurs.

The male and female students have less awareness about anemia and their Hemoglobin level, so this study offered an opportunity to the male and female students to get their hemoglobin checked and to know about hemoglobin deficiency and get awareness about the balanced diet.

## II. METIRIALS AND METHODS

**Study Subjects:** In this study 220 blood samples were collected from the male and female students Shardchandra Arts, commerce and Science College, Naigaon Dist. Nanded Students U.G. of different age groups ranged from 17-22 years donated their blood for this study voluntarily.

**Sample & Data Collection:** Two drop of blood sample was drawn and quickly transferred into AccuSure Hb Haemoglobin Test System Data regarding eating habits was collected from the donors through a questionnaire.

## III.DISCUSSION

The hemoglobin level of male and female U.G. students in different age groups ranged from 17-22 years were found between 7.00 to 16.0 g/dl, as shown in Figure

Fig. 1: Hemoglobin level among different age groups Students U.G. Ranged from 17-22 years

**Table 1: Haemoglobin Frequencies**

Low Hb Level	N	Percentage
7 .00 To 8.00	8	13.57%
8 .00 To 9.00	10	17.35%
9 .00 To 10.00	27	33.26%
10.00 To 11.00	46	54 .64%
11.00 To 12.00	49	59.11%
Total	140	

Normal Hb Level	N	Percentage
12.00 To 13.00	33	16.56%
13.00 To 14.00	37	17.45%
14 .00 To 15.00	12	5.66%
15 .00 To 16.00	01	0.47%
Total	80	

## IV.RECOMMENDATION

Seminars or health check-up care camp awareness about Hemoglobin should be arranged at college levels to give knowledge about the foods that are required to make Hemoglobin in the body. It is important to give awareness about daily requirement of iron supplements to increase Hb level.

Iron ability is affected by some important factors known as iron blockers which are calcium, teas, colas and coffee, so further study should also be carried on to find out those iron blockers which commonly more effected iron ability due to which Hb level gets low.

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# Effect of La Doping on Optical and DC Electrical Properties of Spray Deposited ZnO Thin Films

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## ABSTRACT

Zinc Oxide (ZnO) thin films were deposited five different doping atomic % of transition rare earth metal such as La (1%, 2%, 3%, 4% and 5%) using simple chemical spray deposition method to study the effect of La atomic % on optical properties and DC electrical resistivity. Characteristics of ZnO thin films were considerably changed with La doping. The XRD pattern exhibit polycrystalline hexagonal wurtzite crystal structure of ZnO which was confirmed by JCPDS card no. 75-1526. The optical properties were recorded by using Systronic Double Beam Spectrophotometer (2201). The absorption was higher in the 190-390nm range. The optical transmittance was significantly decreased as compared to transmittance of pure ZnO film. The band gap of 1 to 5% La doped ZnO was decreased from 3.25 to 3.20 eV. The resistivity of ZnO thin films was considerably decreased by addition of low content of La. Thermal activation energy was increased in the range of 0.0275-0.056 eV.

**Keywords:** ZnO thin films, chemical spray deposition, band gap, thermal activation energy.

## I. INTRODUCTION

Zinc oxide (ZnO) is an important wide band gap II–VI semiconductor material and natural n-type electrical conductor. ZnO thin films are used in various applications such as window materials in solar cell applications because of their high optical transmittance in the visible region. Zinc oxide (ZnO) is a wide band gap (3.37 eV) semiconductor. It exhibits good piezoelectric, photoelectric and optical properties. Hence, it has so many applications such as optical devices, light emitting diodes, transparent conductive films, solar cells, sensors and surface acoustic wave devices [1-3]. ZnO thin films and nanostructures have been produced by a wide range of growth techniques, including chemical vapor deposition (CVD) [4], magnetron sputtering [5], laser molecular beam epitaxy [6], sol-gel [7] and spray pyrolysis [8–11] Among these methods, spray pyrolysis is appropriate for large area thin film formation and easy doping.

Now days transition metal doped ZnO semiconductor material has received much attention as such doping can modify and improve electrical and optical properties by large amount [12-17]. The transition rare earth metal doping was possible to increase or decrease the band gap but electrical conductivity was certainly increased. The effect of dopant element completely depends on its difference between ionic radius of Zinc and the dopant material [18-19]. Lanthanum has excellent electrical, optical and chemical properties thus many researchers came to the result that addition of Lanthanum decreases the energy band gap of pure ZnO semiconductor.

Therefore, in present article ZnO thin films have been prepared by doping rare earth transition metal such as Lanthanum.

This article deals with the preparation of La doped ZnO thin films on commercial glass substrate by using simple chemical spray deposition method using locally available perfume atomizer.

## II. RESEARCH METHOD

- 1] The La doped ZnO thin films were prepared by using simple spray deposition technique using locally available perfume atomizer. The La doped ZnO thin films were prepared by mixing two solutions.
- 2] First solution was prepared by dissolving analytical reagent grade 0.15M Zinc Chloride hydrated in distilled water/methanol (70:30) proportion. Few drops of acetic acid were added These solutions were individually stirred for two hours using magnetic stirrer.
- 3] Second solution was prepared by dissolving 0.15 M Lanthanum Chloride in distilled water.
- 4] In this technique, five precursors of Zinc Chloride were prepared. In first Zinc Chloride solution 1 atomic % of La was added. In second Zinc Chloride solution 2 atomic % of La was added. In this way 3 through 5 atomic % of La was added in remaining three Zinc Chloride solutions.
- 5] These solutions were stirred individually by using magnetic stirrer for two hours till the clear precursors were obtained. The clear precursors have been sprayed on the pre-heated glass substrate at desired optimized temperature (3000C).
- 6] The deposited substrates were allowed to cool at room temperature and then annealed at 4000 C for two hours in muffle furnace to obtain highly compact films.

The two-point probe method is simple and easy to use and useful for high resistive thin films. Two probes, electrical conductivity equipment was used for measurement of high temperature DC electrical conductivity. For uniform sample the resistivity is given by the relation [20] (1). to avoid formation of Zinc hydroxide.

**A**

$$\rho = (l) \times (V) = (L 1) \text{-----} 1$$

**$\sigma$**

Where,  $\sigma$  is the electrical conductivity of the film sample.

In case of semiconducting thin films, resistivity decreases with increase in temperature. The thermal activation energy 'Ea' is calculated by using resistivity equation [21-22] (2).

$$\rho = \rho_0 \exp(-E_a/kT) \text{-----} 2$$

The slope of  $\log \rho$  versus  $(1000/T)$  is used for estimation of activation energy. The resistivity measurement of material discloses information of room temperature resistivity and activation energy.

## III.RESULT AND DISCUSSION

The La doped ZnO thin films were characterized by using different techniques. In the present article optical and DC electrical properties of La doped ZnO thin films were studied.

### 3.1. Effect of La Doping on UV-Visible Spectra:

Optical absorbance data of La doped thin films was recorded by using UV-Visible spectrophotometer (Systronic Double Beam 2201). Figure 1 shows the percentage absorption versus wavelength. Entire film samples show



that optical absorbance decreased considerably with increased in wavelength. The absorption was higher in the 190 nm to 390 nm range. The percentage absorption was observed decreased considerably with increased in La atomic percentage. The absorption edge was significantly red shifted as La doping % was increased. Similar results were reported for the La doping was higher than 1 atomic % in earlier literature [23].

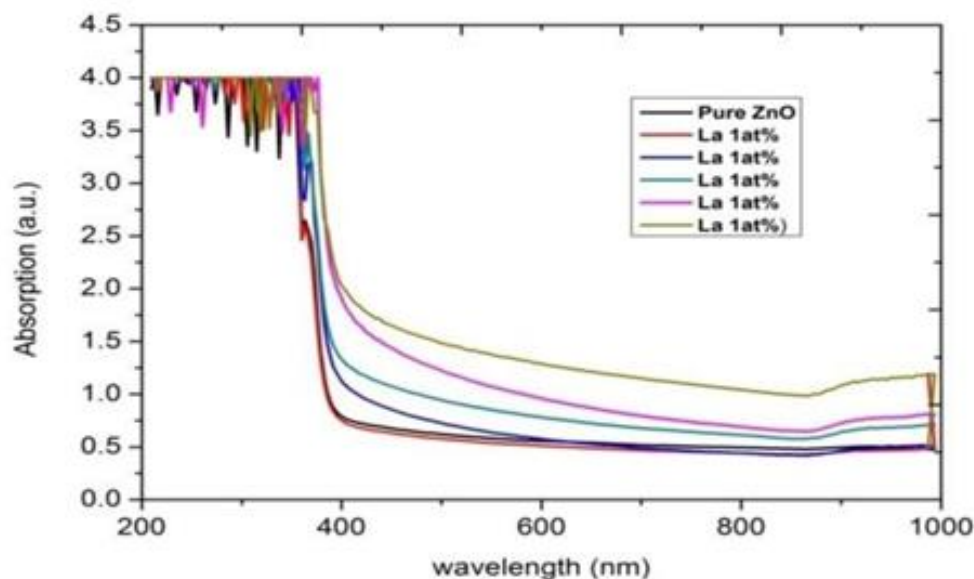


Figure 1 UV-Visible Spectra of Pure and La doped ZnO thin films

Figure 2 shows plot of percentage transmittance versus wavelengths in nm. The optical transmittance was higher in the visible region in the range 300-1000 nm. The maximum transmittance for pure ZnO was 68%. The small amount of La doping show significant decrease in transmittance. The 1 atomic % La doping sample exhibits maximum 38% transmittance. The transmittance was further decreased with increase in La doping percentage.

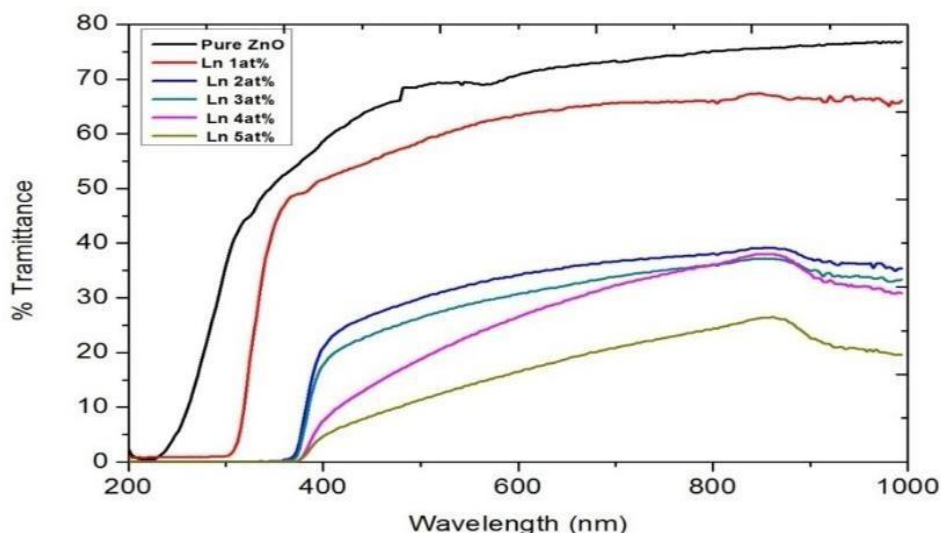


Figure 2 UV-Vis Transmission Spectra of Pure and La doped ZnO thin films.

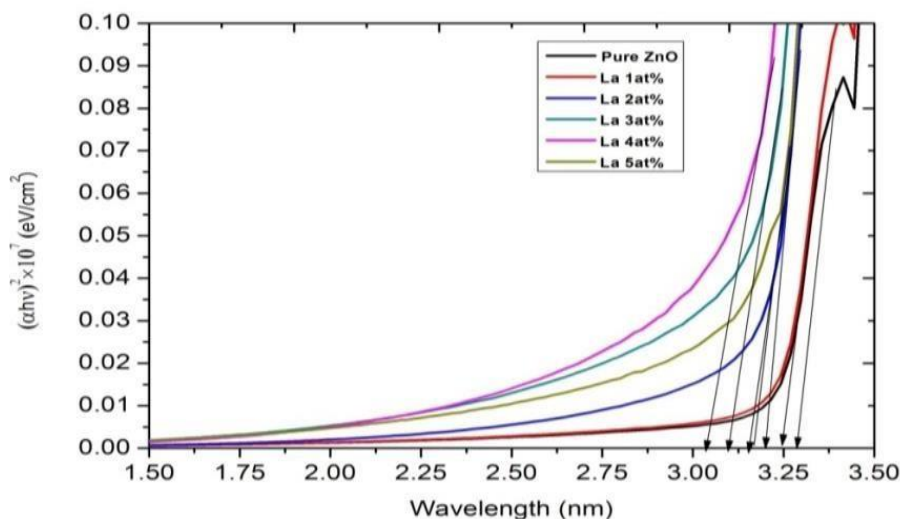


Figure 3 Tauc's plot for calculation of band gaps

Figure 3 shows Tauc's plot for calculation of band gap. The band gap estimated for samples prepared for La atomic % which was decreased with increase in La atomic % (1 to 5 %) from 3.25 to 3.20 eV which was smaller than pure ZnO thin film (3.33 eV). Result clearly showed that the band gap decreased with increase in La doping.

Figure 4 shows plot of band gap versus La atomic percentage. Band gap energy of pure ZnO obtained is 3.33 eV which decreased to 3.25 eV for 1% La doping content and remained near about constant for 2% and 3% La content. It again decreased to 3.22 eV and 3.20 eV for 4% and 5% La content as shown in Figure 4.

### 3.2. Effect of La doping on Resistivity:

The study shows that ZnO thin films are high resistive in nature which is in the order of to 10<sup>6</sup> and 10<sup>4</sup> Ω –cm for pure and doped ZnO thin films respectively. The variation of Resistivity with Temperature in 0C is shown in figure 5. It was found that resistivity decreased with temperature as well as doping % of La content. The decrease in resistivity with increase in temperature is the characteristic property of semiconducting materials. It was found that resistivity at room temperature decreased with increase in La atomic % which was illustrated from figure 6. The similar results were reported in earlier literature [24].

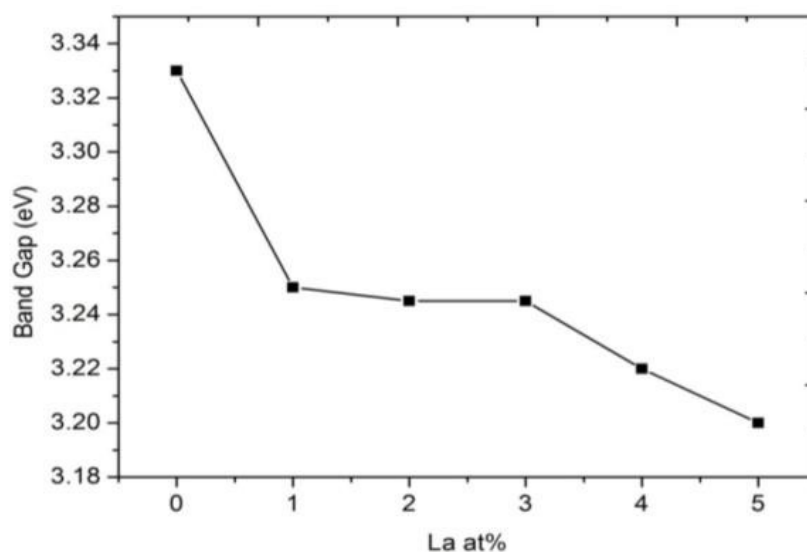


Figure 4 Plot of band gap energy versus La atomic %

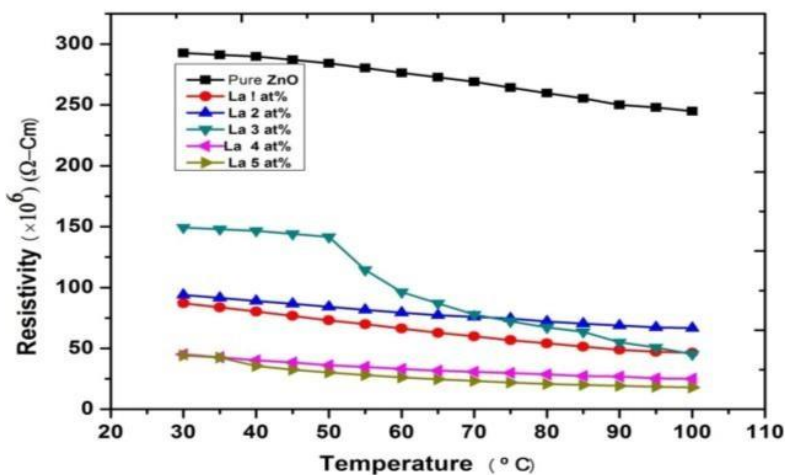


Figure 5 Plot of Resistivity versus Temperature

Log ( $\rho$ ) versus  $1000/T$  ok-1 plot was shown in figure 5. The thermal activation energy for pure and La doped samples was estimated from the slopes of Log ( $\rho$ ) versus  $1000/T$  ok-1 curves and plotted versus La atomic % as shown in figure 7. Thermal activation energy was in the range of 0.056 -0.0275 eV and generally increased as the La atomic % was increased. However, it was lower than activation energy (0.56 eV) of pure ZnO. The increase in activation may be related to decrease in band gap and creating oxygen vacancies due to higher ionic radia of La ion as compared to Zn ion. However, activation energy of doped ZnO thin films was lower as compared to activation energy of pure ZnO thin film.

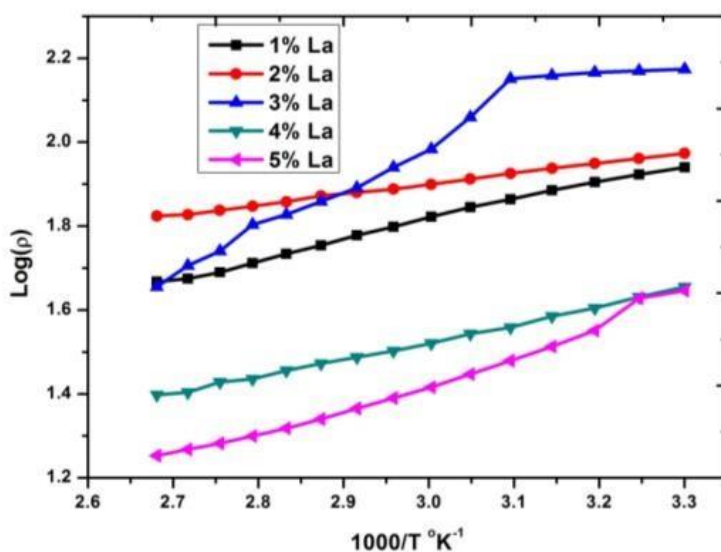


Figure 6 Log( $\rho$ ) plotted versus  $1000/T$  oK-1 for La doped ZnO thin film

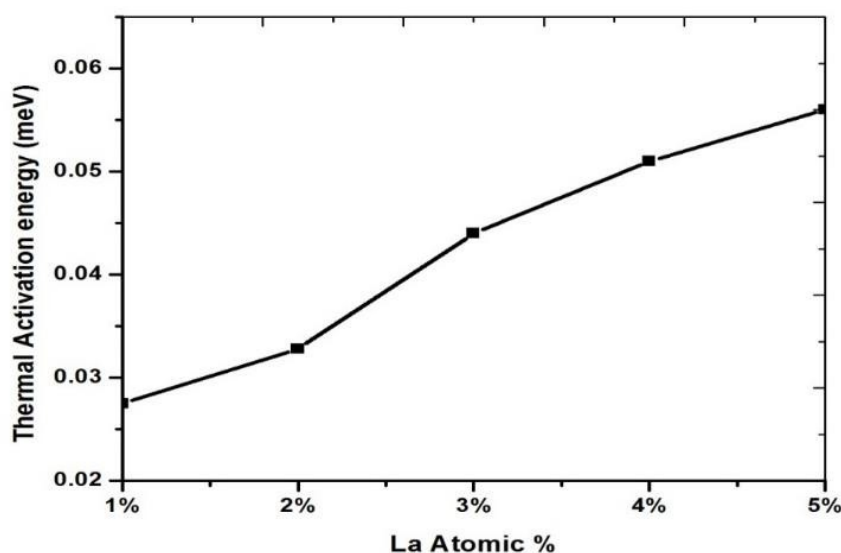


Figure 7 Activation Energy verses La atomic %

#### IV. CONCLUSION

The Systronic Double Beam 2201 spectrometer was used to record absorbance data of La doped thin films. The results were concluded that absorbance of all the La doped film samples decreased considerably as compared to absorption of pure ZnO film. It was concluded that the absorption was higher in the 190 to 990 nm range. The optical transmittance was significantly decreased as compared to transmittance of pure ZnO film. The low content La doping significantly decreased the absorption that concluded formation of La-ZnO matrix. The optical band gap of La doped ZnO thin films were decreased as La atomic % was increased. The band gap for 1 to 5 % La content was decreased from 3.25 to 3.20 eV. The DC electrical transport properties of pure ZnO and La doped ZnO thin films concluded that the deposited thin films are semiconducting in nature. The dark resistivity measurement clearly shows that the resistivity at room temperature of the pure ZnO thin films was greater than the resistivity of La-ZnO thin films. The resistivity of ZnO thin films was found to be of the order of 103  $\Omega$ -cm. The resistivity was considerably decreased by addition of low content of La into pure ZnO thin films. Thermal activation energy was 0.056 -0.275 eV in the range and generally increased as the La atomic % was increased. However, it was lower than activation energy (0.56 eV) of pure ZnO.

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# Genetic Diversity Studies in Niger (*Guizotia abyssinica* (L.f) Cass.)

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## ABSTRACT

The present study was conducted at the College of Agriculture, Pune; Maharashtra using 28 genotypes along with two checks received from ZARS, Igatpuri, during Kharif-2022. The analysis of variance revealed considerable variation among the genotypes for all the traits under study. Mahalanobis D<sub>2</sub>-statistics was used in the multivariate analysis, which revealed greater variability in the Niger genotypes. Total of six clusters were formed among which cluster III is the largest comprising eleven genotypes, clusters I and II comprised nine and seven genotypes, respectively. While clusters IV, V, and VI were monogenotypic. Cluster IV and Cluster VI had the greatest intercluster distance (D<sub>2</sub>=45.74), followed by Cluster IV and Cluster V (D<sub>2</sub>=41.57), Cluster I and Cluster II (D<sub>2</sub>=38.78), Cluster I and Cluster V (D<sub>2</sub>=33.5), and Cluster II and Cluster VI (D<sub>2</sub>=33.37). The lowest intracluster distance was found in cluster I (D<sub>2</sub>=13.07), while cluster III had the highest intra cluster distance (D<sub>2</sub>=18.94). Oil content had the highest variance for cluster means (55.66%), followed by plant height (34.02%), while the number of branches per plant (4.14%), seed yield per plant (2.53%), number of capitula per plant (1.84%), number of seeds per capitula (0.92%), days to 50% flowering (0.46%), capsule diameter (0.23%), and days to maturity, as well as test weight, contributed zero to the divergence. The genotypes IGPN-18-07, IGPN-20-7, and IGPN-19-7 will be used in future breeding programmes.

**Keywords:** Cluster, Genetic diversity, Niger, Seed yield per plant

## I. INTRODUCTION

Niger, (*Guizotia abyssinica* (L.f.) Cass) is classified as a minor oil seed crop in India. It is originated from Ethiopia. In India, Niger oil and seed are the key reasons for cultivation. However, in Maharashtra, it is considered as a poor man's crop as restricted to hilly area by tribal people. The Ethiopian Niger seed has 35 to 40 percent oil, with the fatty acid composition being 75–80% linoleic acid, 7-8% palmitic and stearic acids, and 5-8% oleic acid. (Getinet and Teklewold, 1995). However, Indian Niger varieties contain 25% oleic and 55% linoleic acids.

Identification and understanding of genetic differences are essential for any breeding programme to be effective in order to choose the best resources that are adapted to a given environment. This vital information was discovered through an analysis of the available genotypes. However, due to the scarcity of data on this

topic, the genotypic characteristics of Niger seed are still poorly understood. As a result, identification of the numerous genotypes and crop development have become exceedingly challenging.

Genetic diversity is of utmost importance in breeding and is a key requirement for any successful breeding programme. A cross between genetically varied parents is likely to provide more diversity in segregating generations, which can be employed for the intended improvement. Genetic divergence among the parents is therefore essential for cultivar development. Plant breeders typically prioritise phenotypic diversity when choosing parents. Therefore, understanding the range of parental variation for the traits you want to enhance is crucial. With these considerations in mind, the current study attempted to assess a collection of Niger genotypes in an effort to investigate the character and extent of divergence.

## II. METHODS AND MATERIAL

The study was conducted at the research farm of the College of Agriculture, Pune, during the *Kharif* season 2022; Experimental material consisting of thirty Niger genotypes was evaluated using a Randomized Block Design with two replications. Each entry was represented by two rows, each measuring 3.0 meters in length, with a 30 cm gap between rows and 10 cm between plants. Ten quantitative characters, including days to 50% flowering, days to maturity, plant height (cm), number of branches per plant, number of capitulum per plant, capsule diameter (cm), number of seeds per capitulum, seed yield per plant (g), test weight (1000 seed weight), and oil content, were recorded on five competitive, randomly selected plants of each genotype from each replication. The efficient "Mahalanobis  $D^2$  statistics" or "D<sup>2</sup> technique" method proposed by Mahalanobis (1936)<sup>[6]</sup> is commonly utilized to understand genetic diversity in the germplasm. It was employed to calculate the intra- and inter-cluster distances as well as to logically classify the genotypes into different clusters in accordance with Tocher's approach (Rao, 1952). Fig. 1

## III. RESULT AND DISCUSSIONS

The analysis of variance demonstrated statistically significant variations among the genotypes for all the observed characteristics. Based on the  $D^2$  statistics, a total of thirty genotypes were assessed for ten distinct characteristics. These genotypes were then classified into six clusters using Tocher's technique, as first outlined by Rao in 1952. Cluster III was the largest with 11 genotypes, followed by clusters I and II (9 genotypes in cluster I) and cluster II (7 genotypes), while cluster IV, V and VI were mono genotypic. In the current study, the categorization of genotypes into six clusters (Table 3) indicates the existence of a significant level of genetic variety within the examined material. Similar results were depicted by Pulate *et al.* (2013), Khunthey and Kumar (2015), Bisen *et al.*, (2016), Goyal and Bisen (2017), Surayanarayana *et al.* (2018), Patil *et al.*, (2019) and Bhoite *et al.*, (2021) while evaluating Niger genotypes.

The maximum intra-cluster distance was observed for cluster III ( $D^2=18.94$ ) followed by cluster II ( $D^2=14.74$ ) suggesting that genotypes present in these clusters might have different genetic architecture (Table 2). However, the lowest intra-cluster distance was observed in cluster I ( $D^2=13.07$ ) indicating that genotypes present in these cluster might have genetical similarities with one another and appear to have evolved from a common gene pool. Clusters IV, V, and VI showed no intra-cluster distance due to their mono-genotypic nature. Maximum intercluster distance was observed between clusters IV and VI ( $D^2=45.74$ ) followed by clusters IV and V ( $D^2=41.57$ ), clusters I and II ( $D^2= 38.78$ ), cluster I and IV ( $D^2=36.6$ ) indicating wide divergence among

these clusters. These also suggest that genotypes present in one cluster differ entirely from those present in other clusters. The minimum inter cluster distance was found between clusters V and VI ( $D^2=18.12$ ). The smaller inter-cluster distance observed among these clusters indicates a higher degree of genetic similarity among the genotypes. Based on the mean performance of clusters for 10 characters (Table 3), it was observed that cluster VI exhibited the highest number of plant heights, number of capitulum per plant, and test weight. All these characters appeared to have played an important role in determining seed yield per plant in this cluster. Cluster II was characterized by less oil content, whereas cluster I was observed to have the highest oil content. Cluster V was characterized by the highest number of branches per plant, diameter of the capsule and number of seeds per capsule. Clusters IV, V and VI performed exceptionally well on the majority of measures when compared to the other clusters' mean performance.

The variance of cluster mean provides information on relative importance of different characters towards seed yield per plant. The present study revealed that oil content (55.66%) contributed more to genetic diversity than plant height (34.0%). However, number of branches per plant (4.14 percent), seed yield per plant (2.53 percent), number of capitulum per plant (1.84 percent), number of seeds per capitulum (0.92 percent), days to 50% flowering (0.46 percent), and capsule diameter (0.23 percent) contributed least to the divergence, and days to maturity and test weight contributed zero percent to diversity. These results were similar to those reported by Ravanappa and Sheriff (1994) for the number of capitula per plant, oil content and seed yield per plant. Patil *et al.* (2019) for seed yield per plant and diameter of capitulum. Bhoite *et al.* (2021)<sup>[1]</sup> for days to 50% flowering and number of capitula per plant, and Yadav *et al.* (2020) for characters like plant height and number of seeds per capitulum. The zero contribution of days to maturity to divergence was similar to the studies of Suryanarayana *et al.* (2019).

Based on the analysis of inter-cluster distances, cluster means, and observed performance in the current study, it was determined that the genotypes IGPN-18-07, IGPN-20-7, and IGPN-19-7 exhibited superior characteristics. These genotypes have the potential to be utilized in future hybridization programme aimed at enhancing crop quality and productivity.

**Table 1 Distribution of 30 Niger genotypes into different clusters**

Cluster no.	Number of genotypes Included	Genotypes
I	9	IGPN-20-8, IGPN-20-01, IGPN-19-2, IGPN-19-10, IGPN-19-8, IGPN-18-32, IGPN-18-08, Phule Vaitarna, IGPN-19-5
II	7	IGPN-18-26, IGPN-18-33, IGPN-18-29, IGPN-20-4, IGPN-19-06, IGPN-20-3, IGPN-20-5
III	11	IGPN-19-47, IGPN-20-2, IGPN-19-9, IGPN-18-03, IGPN-20-06, IGPN-19-3, IGPN-19-1, IGPN-19-4, IGPN-20-9, Phule Karla, IGPN-17-03
IV	1	IGPN-18-07
V	1	IGPN-20-7
VI	1	IGPN-19-7



Table 2 Average intra and inter cluster  $D^2$  values of 6 clusters formed from 30 genotypes.

Clusters	I	II	III	IV	V	VI
I	<b>13.07</b>	38.78	22.52	36.6	33.5	26.3
II	38.78	<b>14.74</b>	30.31	28.15	23.08	33.37
III	22.52	30.31	<b>18.94</b>	23.57	33.05	32.76
IV	36.6	28.15	23.57	<b>0</b>	41.57	45.74
V	33.5	23.08	33.05	41.57	<b>0</b>	18.12
VI	26.3	33.37	32.76	45.74	18.12	<b>0</b>

Table 3 Mean performance of different clusters in Niger

Cluster	Daysto50% Flowering (no.)	Days to maturity (no.)	Plant Height (cm)	Numberof branches per plant (no.)	Number of capitula per plant (no.)	Diameter of capitulum (cm)	Number of seeds per capitula (no.)	Seed yield per plant (g)	Test weight (g)	Oil content %
I	65.11	108.61	154.31	8.43	59.94	0.63	17.41	6.23	3.16	35.71
II	63	105.79	149.69	7.41	54.57	0.6	22.65	7.24	3.53	28.23
III	64.64	108.45	144.25	9.12	61.5	0.6	16.8	7.56	3.33	34.34
IV	67.5	111	130.2	7.3	50.5	0.67	15.7	7.75	3.15	33.5
V	57	100.5	164.05	10.2	52.5	0.75	26.3	8.7	3.1	28.7
VI	57	100.5	169.75	8.2	88	0.73	21.9	15.95	4.45	30.3

Table 4 Percent contribution of 10 characters for divergence in Niger

Sr.No.	Characters	Timesranked1*	Contribution%
1.	Daysto 50 %flowering	2	0.46 %
2.	Daysto maturity	0	0.00 %
3.	Plantheight	148	34.02 %
4.	Numberofbranches/plant	18	4.14 %
5.	Numberofcapitula/plant	8	1.84 %
6.	Diameterofcapitulum	1	0.23 %
7.	Numberofseeds/capitula	4	0.92 %
8.	Seedyield/plant	11	2.53 %
9.	Testweight	0	0.00%
10.	Oilcontent	243	55.86%
	<b>Total</b>		<b>100</b>

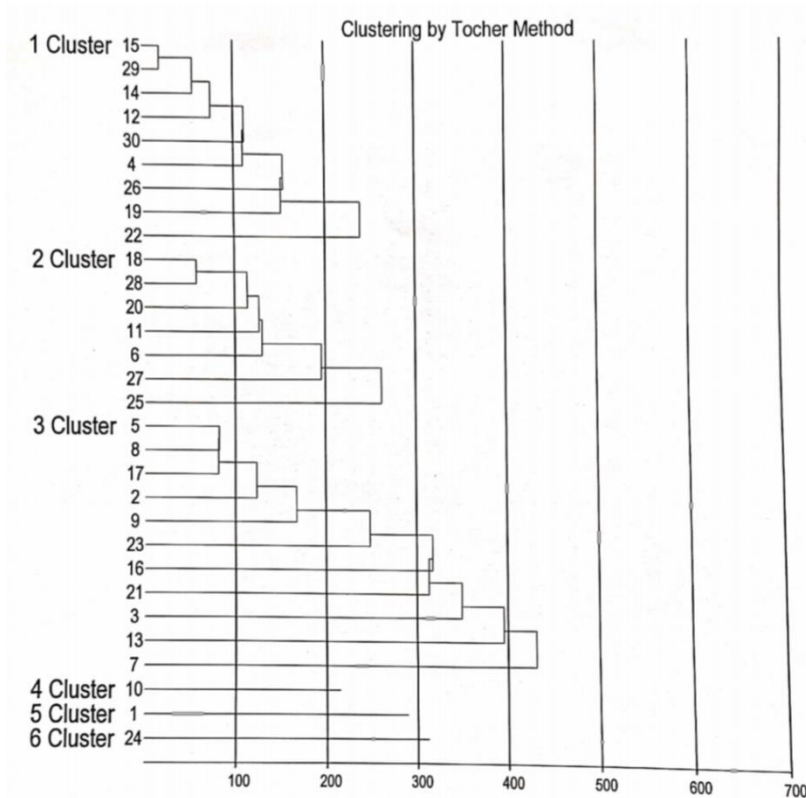


Fig. 1. Dendrogram: Cluster formation of genotypes

#### IV. CONCLUSION

Mahalanobis  $D^2$ -statistics was used in the multivariate analysis, which revealed greater variability in the Niger genotypes. The genotypes IGPN-18-07, IGPN-20-7, and IGPN-19-7 are recommended to use in future breeding programmes

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# Pedagogical Teaching Approach in Mathematics (Special Reference to Junior College Teacher in Latur District)

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## ABSTRACT

This study discusses several Aspects, Issues and challenges for pedagogical teaching approach in Mathematics which are being faced by junior college teacher in Latur district. To play an integral role in student's educational growth and educational development now like all other teachers. Because Mathematics is an important part of the education system it provides ample opportunities for students to learn about calculations and measurement activity. That's why Researcher conducts a study to investigate advantages and disadvantages of online teaching in physical education. This is in the title of pedagogical teaching Issues and Challenges in Mathematics (Special reference to junior college teacher in Latur district)

**Key words-** pedagogical teaching in Mathematics, teaching approach in Mathematics

## I. INTRODUCTION

This study examined the Aspects, Issues and challenges for pedagogical teaching approach in Mathematics which is being faced by junior college teacher in Latur district. With difficulties of running Mathematics classes to develop an effective operation plan to address these difficulties. The present study focused on the major practices of the Pedagogical Approaches in Mathematics teaching in Latur district. The present research paper explores the responsibility of Mathematics Teachers & finds out the problems and challenges to integration Mathematics and Pedagogical knowledge. The researcher finds out the pedagogical outcomes in mathematics classrooms at junior college level. This study specially presents the Pedagogical Approaches in the teaching of mathematics junior college class.

### Objectives of research

1. To overview on teaching issues in Mathematics.
2. To study of challenges in pedagogical teaching approach
3. To investigate Issues and challenges for pedagogical teaching approach in Mathematics

## II. RESEARCH METHODOLOGY

While studying any subject or event, it is necessary to do it in a scientific manner. One of the most important tasks in research methodology is data collection. In the present research the facts have been collected through primary and secondary sources. Along with secondary data collection, more emphasis is given especially on primary data collection and observation method. For the study of the subject of the present research paper, an attempt has been made to obtain information from the junior college students of Latur district by conducting a survey through interview schedule. An attempt has been made to arrive at a definite conclusion based on the information obtained. For the purpose of this study also used scientific research methodology to study the research topic. In this method used secondary data tools. In this secondary data tool used reference books. Research articles, newspapers, journals, published and unpublished materials and also taken help of internet facilities.

### Data Collection

The collected data included material directly produced by the exploration actors and students of mathematics classes. To investigate the Aspects, Issues and challenges for pedagogical teaching approach in Mathematics classes. In-depth individual interviews were conducted to examine experiences emerging in the participants.

### Simpleing method

For the study of the topic of the present research paper, a survey has been conducted among the college students of Latur district. For this, 20 junior college students from Latur district have been selected for interview in a random manner. An attempt has been made to obtain information from them through interview schedule.

### Investigation through interview schedule

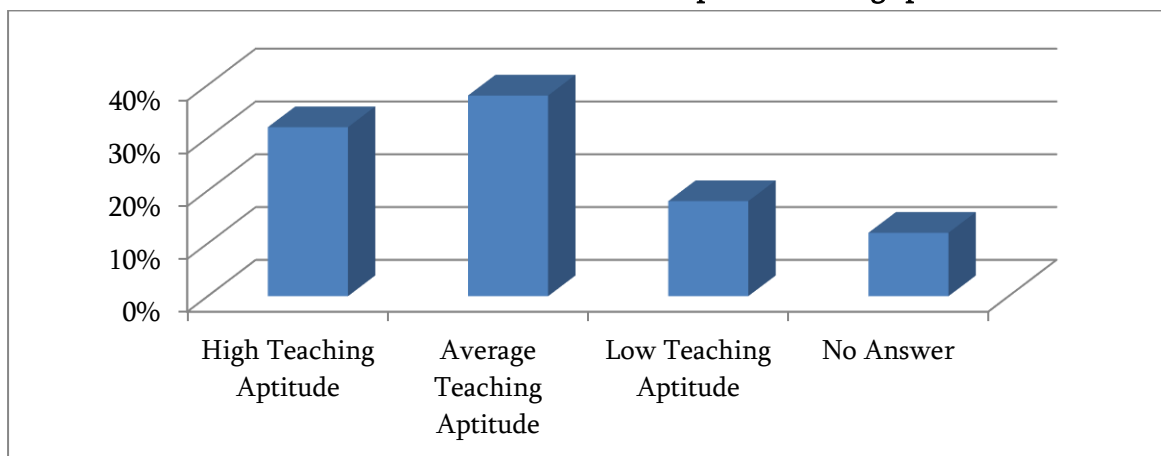
**Table no 1.1 Classification of the total sample on teaching aptitude**

Sr.No.	Options	No of Students	Percentage
1	High Teaching Aptitude	16	32 %
2	Average Teaching Aptitude	19	38 %
3	Low Teaching Aptitude	9	18 %
4	No Answer	6	12 %
	<b>Total</b>	<b>50</b>	<b>100 %</b>

**Source-** Survey of students

It is clearly seen from the above table that when the junior college students of Latur district were surveyed regarding teaching aptitude in mathematics, the highest percentage of students who answered that it is Average Teaching Aptitude in teachers possess mathematics which is 38 percent. Below that, the proportion of students who answered that High Teaching Aptitude in teachers possesses mathematics is 32 percent. It was found that the percentage of students who responded that they were realizing Low Teaching Aptitude in mathematics it was 18 percent. The proportion of students who do not give any answer regarding Teaching Aptitude in teachers possesses mathematics was the lowest and it is 12 percent.

**Graf No.1.1 Classification of the total sample on teaching aptitude**



Source- Survey of students

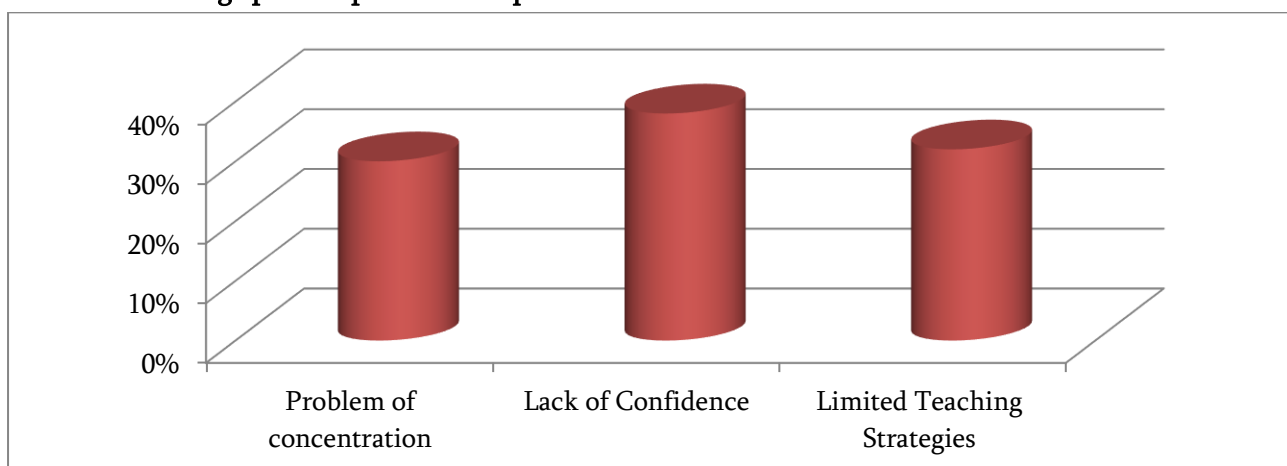
**Table no 1.2 Teaching aptitude-professional qualifications**

Sr.No.	Options	No of Students	Percentage
1	Sufficient professional qualifications	18	36 %
2	Insufficient professional qualifications	25	50 %
3	No Answer	7	14 %
	<b>Total</b>	<b>50</b>	<b>100 %</b>

Source- Survey of students

It is clearly seen from the above table that when the junior college students of Latur district were surveyed regarding teaching aptitude in mathematics, the highest percentage of students who answered that it is Insufficient professional qualifications in teachers possess mathematics which is 50 percent. Below that, the proportion of students who answered that sufficient professional qualifications in teachers possess mathematics is 36 percent. The proportion of students who do not give any answer regarding Teaching Aptitude professional qualifications in teachers possess mathematics was the lowest and it is 14 percent.

**Graf No.1.2 Teaching aptitude-professional qualifications**



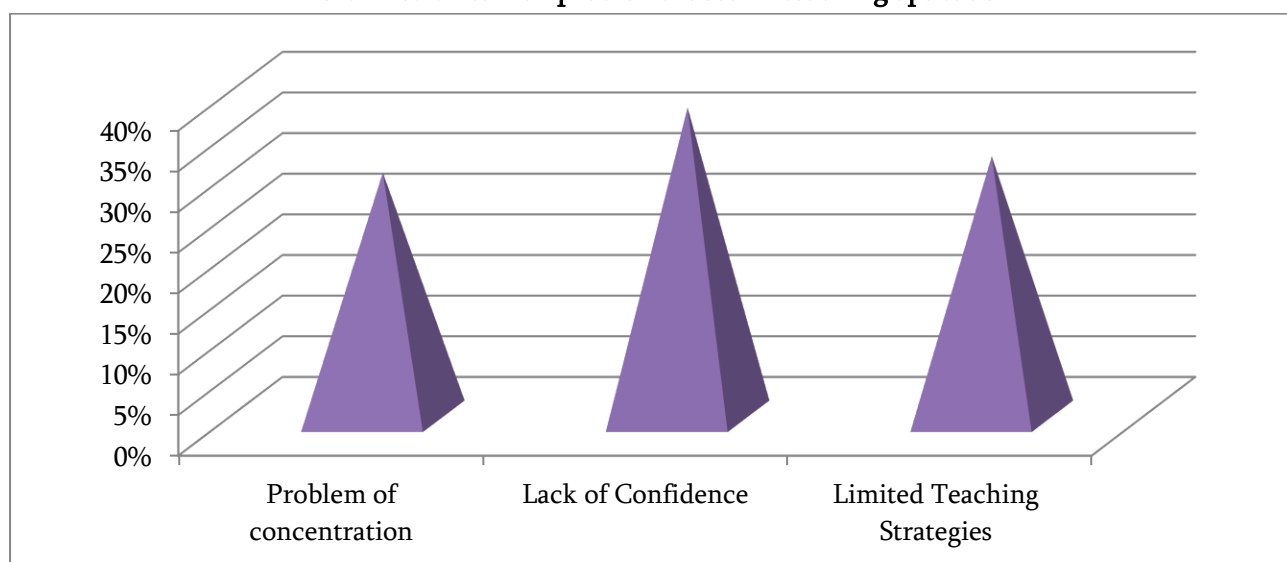
Source- Survey of students

**Table No 1.3 Which problems faced in teaching aptitude**

Sr.No.	Options	No of Students	Percentage
1	Problem of concentration	15	30 %
2	Lack of Confidence	19	38 %
3	Limited Teaching Strategies	16	32 %
	<b>Total</b>	<b>50</b>	<b>100 %</b>

**Source-** Survey of students

It is clearly seen from the above table that when the junior college students of Latur district were surveyed regarding teaching aptitude in mathematics, the highest percentage of students who answered that it is Lack of Confidence in teaching method in mathematics which is 38 percent. Below that, the proportion of students who answered that Limited Teaching Strategies in teaching method in mathematics is 32 percent. The proportion of students who faced Problem of concentration in teaching method in mathematics was the lowest and it is 30 percent.

**Graf No.1.2 Which problems faced in teaching aptitude**

**Source-** Survey of students

### III.CONCLUSION

This study shows that station towards mathematics practice in the inferior council classroom. The same number of others will authenticate, upholding for comprehensive instruction can be worrisome. Average tutoring Aptitude in preceptors retain mathematics inferior council schoolteacher of Latur quarter. In Latur quarter inferior council preceptors must have engage scholars through rich and grueling tasks that allow scholars time and openings to make opinions, and which use a variety of forms of representation. In Latur quarter inferior council preceptors interact with scholars while they engage in the gests , encourage scholars to interact with each other and plan to support and challenge scholars meetly. In Latur quarter inferior council preceptors must have identify crucial ideas from generalities to be tutored and communicate with scholars that these are the pretensions of tutoring and preceptors explain to scholars how they will learn to reach the thing.

#### IV. THE SILENT COMPLIANCES

Of course In Latur quarter inferior council preceptors interact with scholars preceptors borrow pedagogies that foster communication and both individual and group liabilities with schoolteacher summaries of crucial fine ideas. A pupil can fluently get the information related to his studies at a regard. still, some compliances have been reported from the study. They're as follows.

- Positive station in mathematics education has made learning more pleasurable and easier.
- Through mathematics education we can do numerous effects fluently.
- Scholars shouldn't fully depend on this medium of education. Scholars should also read published books and be open to online reading accoutrements.
- Endured preceptors who educate in an intriguing manner should be encouraged in mathematics education.
- 21 century is the age of wisdom and technology, in the twenty-first age man has succeeded in making amazing inventions.

#### V. RESULTS AND DISCUSSION

Some Results have been drawn from the below analysis. They're as follows.

- The inferior council scholars of Latur quarter were surveyed regarding tutoring aptitude in mathematics also the loftiest chance of scholars who answered that it's Average tutoring Aptitude in preceptors retain mathematics.
- The inferior council scholars of Latur quarter were surveyed regarding tutoring aptitude in mathematics, the loftiest chance of scholars who answered that it's inadequate professional qualifications in preceptors retain mathematics.

The inferior council scholars of Latur quarter were surveyed regarding tutoring aptitude in mathematics, the loftiest chance of scholars who answered that it's Lack of Confidence in tutoring system in mathematics

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# Effect of Physical and Chemical Mutagenesis on Seed Germination in Soybean

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## ABSTRACT

Soybean botanically described as *Glycine max* (L.) Merrill. It is considered as one of the most important leading legume crops worldwide due to its high protein and oil content. In present investigation healthy and dried seeds are mutagenized with various doses of physical mutagen gamma rays and various concentrations of chemical mutagen EMS and SA studying seed germination percentage. The inhibition in germination percentage was observed as compared to control. As the doses and concentration of mutagens increased the decrease in germination was recorded.

**Keywords:** Soybean, Gamma rays, SA, EMS, Mutagenesis, germination percentage.

## I. INTRODUCTION

Soybean is botanically described as *Glycine max* (L.) Merrill. It belongs to family fabaceae. It is a Soybean is a major crop in many countries. It can be used in various ways as food, feed, functional food and industrial products. It is known for protein and oil content. Increasing interest in functional food and various soybeans by- product is the reason for high demand of soybean (Kumawat *et. al.*, 2016).

Soybeans are mostly grown in India as a *kharif* crop under rain-fed conditions. It makes up almost 25% of India's domestic edible oil pool, and the export of soy meal brings in a sizable amount of foreign exchange roughly Rs. 3731 crores (Manjaya, 2020). Narrow genetic diversity is a main problem restricting the progress of soybean breeding. However, genetic improvement depends on the amount of genetic diversity present in the population, though the natural diversity can be improved through induced mutation (Herwibawa *et. al.*, 2014). The induced mutations are used to improve various crop plants.

Induced mutation combined with selective breeding, is highly efficient in order to screen for new traits (Chen *et. al.*, 2016). Present investigations were started with an objective to induce the genetic variability in soybean. The effect of various doses and concentrations of physical mutagen gamma rays and chemical mutagen Sodium azide and Ethyl methanesulphonate was assessed by studying seed germination percentage.

## II. MATERIALS AND METHODS

The seeds of soybean variety DS-228 were procured from Agricultural Research Station, Kasbe Digraj, District Sangali, Maharashtra State – India. Healthy and dried seeds were selected for physical and chemical

mutagenesis. Initially the pilot experiments were carried out to and LD50 doses were determined for all the mutagens. Physical mutagen gamma rays and chemical mutagens Sodium azide and Ethyl methanesulphonate were used for mutagenesis. For physical mutagenesis healthy and well dried seeds were packed in zip lock bags and sent to Rashtrasant Tukdoji Maharaj University- Nagpur. The doses 200, 400 and 600 Gy were given for physical mutagenesis. Chemical mutagenesis was carried out in Molecular Biology and Biotechnology laboratory of Department of Botany, Govt. Vidarbha Institute of Science and Humanities, Amravati, Maharashtra State – India. For chemical mutagenesis the mutagenic solutions were prepared at room temperature. The dry seeds were immersed in mutagenic solutions and kept for 18hrs with intermittent shaking. The concentrations used for SA were 0.001%, 0.003% and 0.005% and for EMS 0.02%, 0.04% and 0.06%. After mutagenic treatment seeds were thoroughly washed under tap water and residues of chemical mutagens were removed. Then mutagenized seeds were post soaked in distilled water for 1 hour. Then the seeds were kept for germination in moist petri plates in three replications each along with control. Germination percentage was calculated after three days by counting the germinated seeds and total number of seeds kept for germination.

### III.RESULTS AND DISCUSSION

Results of seed germination indicated that, all the mutagens showed the inhibitory effect on seed germination percentage except 200 Gy dose of gamma rays where a slight increase in germination was recorded. In all mutagenic treatment the decreasing trend of seed germination with increasing mutagenic doses or concentrations was observed. Maximum inhibition was observed in EMS concentrations as compared to gamma rays and SA. In control 96.66% seed germination was recorded. The germination percentage 96.96%, 94.11% and 92.85% was recorded in 200, 400 and 600 Gy doses of gamma rays respectively. The lowest germination was observed in 0.06% of EMS.

Reduction in seed germination percentage after mutagenic treatment was also reported in other crops by Kulkarni (2011) in horsegram, Acquaaah and Klu (1983) in winged bean, Singh *et al.*, (1997); Na Lampang *et al.*, (1982) and Thilagavathi and Mullainathan (2011) in mungbean, Sangle *et al.*, (2011) in pigeonpea, Toker and Cagirgan (2004) and Kulthe (2009) in chickpea, and Gaikwad (2002) in lentil.

The decrease in germination due to mutagenic action may be correlated to disturbances at cellular level and due to chromosomal damages. Disturbance in the formation of enzymes involved in the germination process may be one of the physiological effects caused by mutagenic treatments particularly chemical mutagens like EMS and SA leading to decrease in germination.

Lawley (1974) and Sun and Singer (1975) have attributed the decrease in germination percentage to lethality generated in seeds which possibly develops due to physiological injuries, chromosomal aberrations and the hydrolytic products of mutagens. The reduction in germination following irradiation may be due to the disturbance of balance of inhibitory substance or due to destruction of all germination regulators present in seeds.

### IV.CONCLUSION

All the mutagens showed the inhibitory action on seed germination. The changes caused by mutagens may leads to induction of variability in soybean variety DS- 228.

Table 1: Effect of mutagens on seed germination percentage in soybean variety DS-228.

Mutagen	Dose / Concentration	Germination Percentage (%)
	Control	96.66
Gamma Rays	200 Gy	96.96
	400 Gy	94.11
	600 Gy	92.85
SA	0.001%	86.66
	0.003%	83.33
	0.005%	76.66
EMS	0.02%	76.66
	0.04%	63.33
	0.06%	60.00

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# Taxonomy and diversity of *Trametes* from the Kinwat (Nanded)

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## ABSTRACT

*Trametes* is the genus under order Aphyllophorales with about 45 species throughout the globe where as India represent 10 species under the genus. Present study reports 3 species from Kinwat Nanded District, Marathwada region of Maharashtra. The details of each species are described & the microstructure is illustrated.

Keywords - Aphyllophorales , Polyporaceae, Marathwada- Maharashtra

## I. INTRODUCTION

*Trametes* is considered one of the largest genera in family Polyporaceae with about 45 species worldwide.

1. Responsible for the brown rot of the hard deciduous & coniferous trees. In the air 1972 Ryvarden who established many present days standing genera erected this genus with type species *Polyporus Dochmius* to accommodate those species similar with fomes in consistency but contains regular pores and sessile or effused reflexed basidiocarps.

Different taxonomic characters were used for identification purpose of the genus *Trametes* time to time various workers. Some of them are who worked extensively on this genus after examining the specimen nearly from each continent of the world. Ryvarden erected many new species by transferring many names to this genus and also rejected several synonyms. His view of judging species under this genus includes 2. following macro & microscopic parameters.

a. size and shape of the basidiocarps of collection should be examined.

b. colour of pileus changes with age & should be carefully observed. c. pore size is a valuable taxonomic character as it is constant.

d. colour of pore surface & context changes overtime specimen of different age should be examined.

e. hyphal system is trimitic in measure of the species. That why width and colours should be carefully observed.

f. basidiocarps may vary in size and shape & hence should be carefully observed .

Gilbertson and Ryvarden concluded that 1-3 collection are insufficient to describe a species hence as many specimens are possible to be examined should be examined and wide range of characters will narrow the errors while delimiting a species.

In India Bakshi, Bose & Banerjee contributed to the study of this genus.

## Material and Methods.

Collection of the samples was collect from various Location Marathwada & surroundin location like Nanded & Kinwat Nanded District. morphological details, thin hard sections were taken from cutis, context & from the tube layer of each sample respectively. Spores were isolated from a black of tube layer Technical describe by Steyert ( 1972) to loosen the hyphae, the sectioned material was treated with 10% KOH, washed with water & stained with 1% Phloxine. These sections were again washed with water & finally stained with cotton blue lactoglycerine (50%) was used as mounting media. All the preparation were semipermanent. The slides were observed under compound microscope having a combination of 10X eyepiece & 10X, 45X, & oil immersion i.e.=100X

## Objectives

The spores were observed under water Olympus BX 40 at 100X objective with phase contrast & dermis sections at 40X objective of the same. Photography were taken using Olympus BX-40 attached with photomicrography unit.

Result :- An artificial key where prepared to differentiate the collected species, key of different authors viz, Bakshi, (6), Ryvardeen & Johansen (10) Gilbertson & Ryverden (5), & Ryverden (11) where also followed under stand there views to seprate the species within genus.

## Key to the species of Fomitopsis –

1. Pore surface, context & tubes rose pink to pinkish brown
2. Pore surface , context and tubes white to yellowish brown not rose pink
3. Tropical species, known only on hard wood T.Jibbosa
4. Basidiocarp usually up to 2.5 cm long & wide, Pilear surface, white , becoming. black with age T. lactinea.
5. Crust not radially cracked T. cubensis.

## Species Description-

*Trametes Jibbosa* .: (Pers.) Ryv.

Basodopcarps :- Annual, to perennial, sessile , solitary or imbricate cluster, dimidiate , upto 15 cm broad & 10 cm wide & 1-2 cm thick Hyphal System- Trimitic, contextual generative hyphae thin walled, with clamps, hyaline 2.5-3.5µm wide, difficult to find in mature specimen, skeletal hyphae thick walled , hyline to pale brownish, non septate, with rare branching, 2-4 µm wide. Binding

hypohae- Thick walled, non septate, hyaline, branched, 1.5-3 µm wide , cystidia or other sterile elements absent, Basidia – clavate , narrowed at the base, 4-sterigmate, 15-20 x 5-7.5 µm , with a basal clam. Basidio spores- short cylindrical, to oblong, hyaline, smooth, 5-6.5 µm

Specimens examined:- (mu-108) E. Citriodora (mu-13). Tamarindum indica.

Geographical distribution-

Philippines, India, Ceylon, Austrelia, New zeland, Cuba, Brazil, Java, Jamaica, Costarica, Islands, Colombia, Canada, & India

*Trametes lactinea*:(schum.Fr.) Pil.

Basidiocarps:- Annual to biennial small solitary or fused into horizontal rows, up to 10 cm long semipileate, effused- reflexed to distinctly pileate individual fruit bodies brodly to narrowly attached 5 to 2 cm long , broad, up to 1 cm thick near the base, but usually smaller, consistency corky to woody hard when dry, pileus. Dimidiate to scutellate, or unguulate, upper surface first fawn coloured & finely tomentose becoming chestnut to

black & glabrous, concentrically sulcate & wrinkled in zones about 2 mm wide, partly radiately rugulose, with black crust

Margin: Round often lighter than the rest of the pileus, entire or slightly lobed,

Pore Surface: Becoming grey, woody coloured.

Pores: Small, 4-5 per mm, dissepiments thick & entire, velutinate to farinose,

Hyphal System :- Trimitic, generative hyphae clamped, hyaline & thick walled, sometimes more yellow & thick walled 2-4  $\mu\text{m}$  wide. Skeletal hyphae yellow to bay, thick walled to solid 3-4  $\mu\text{m}$  wide binding hyphae very much like skeletal, but slightly thicker and moderately branched, Cystidia – none Basidia – clavate, 4-sterigmate, 15- 22x 4-5.5  $\mu\text{m}$  with basal clamp, Basidiospores – cylindrical, hyaline smooth & thin walled, 7.5-9.5 x 3-3.5  $\mu\text{m}$  Specimens examined- Growing on hard woods & boswelia serata (mu-69)

Geographical distribution- Cuba, East Indies, Phillippines, Austrelia, Cellon, North America, Brazil, Africa & India, China, Japan, Mexico, Brazil, Java, Cuba, U.K., USSR, Europe.

Trametes cubensis -(Mont.) David Basidiocarps- Annual, Pilleate, broadly to narrow attached, often fused into lateral rows or imbricate up to 6 m broad, 3 cm wide and 1 cm thick near the base, thinning out towards the margin, consistency coriaceous to hard when dry; pileus dimidiate to flabelliform or semicircular, attached with a disc or completely sessile, with or without slightly decurrent pore layer, surface first white to pale ochraceous buff with a pink tint, finely adpressed tomentose to velutinate & concentrically faintly zoned, with age becoming glabrous; margin acute, even or lobed; pore surface cork, wood coloured to buff, very variable, first poroid with few split pores to sinuate; context ochraceous with the piles or paler, upto 3mm thick, near the attachment.

Hyphal System- trimitic, generative hyphae hyaline, clamped, thin to thick walled, strongly branched, near the hymenium, 2-3  $\mu\text{m}$  wide, skeletal hyphae thick walled to solid, hyaline, 3-6  $\mu\text{m}$  wide, binding hyphae moderately branched, hyaline, upto 5 mm wide, Tapering towards the ends; cystidia proper none, but both binding hyphae & predominantly the skeletal hyphae project into the hymenium as cystidial organs, smooth to finely encrusted, most conspicuous in hymenia, basidia clavate, 4-sterigmate, 15-30\*4.5  $\mu\text{m}$  with 2 basal clamp at base; basidiospores broadly ellipsoid,

4.5-6\*2-2.5  $\mu\text{m}$

Specimen Examined- on dead woods of albizia lebbek (mu-70).

Geographical Distribution- Wide spread in southern Asia, East Africa, Thailand, Indonesia, New-guinea, Japan Phillippines, India.

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# Production Potential, Economics and Sustainability of High Yielding Genotypes of Roselle (*Hibiscus Sabdariffa* L.)

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## ABSTRACT

The field experiment was conducted during kharif 2019 at Farm of Jute and Allied Fibre crops at Rahuri, Maharashtra on medium black soil to evaluate the yield potential and economics of newly released genotypes of roselle (*Hibiscus sabdariffa* L.). The experiment was laid out in Factorial Randomized Block Design during kharif season in four replications. The factor A consist of three varieties viz., V1- AHS 286, V2- AMV-5 and V3- HS-4288 and factor B consist of four fertilizer levels viz., F0 – Control, F1- 40:20:20, F2- 60:30:30 and F3- 80:40:40; N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O; kg ha<sup>-1</sup>. This semi-arid tract with an annual rainfall received 693.8 mm and 43 rainy days during period experiment. The altitude varies from 495 to 569 m above mean sea-level. The results stated that, the variety AHS-286 recorded significantly higher growth and yield attributes viz., Plant height, number of functional leaves, fibre yield per plant than the variety AMV-5 and HS-4288. The variety AHS-286 recorded significantly higher green biomass and fibre yield (59.68 t/ ha, 23.79 q/ ha) than the variety HS-4288 (56.42 t/ha, 20.73 q/ha) and AMV-5 (51.15 t/ha, 20.01q/ha). Similarly, the variety AHS-286 recorded maximum gross (Rs.93962/ha), net (Rs.55921/ha) monetary returns and B:C ratio (2.45) than rest of all varieties. The application of fertilizer levels (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O) of 80:40:40 to the roselle crop recorded significantly higher green stalk and fibre yield (64.53 t/ha and 27.07 q/ ha ) than fertilizer levels of control and 40:20:20 kg/ha but it was at par with fertilizer levels (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O) of 60:30: 30 kg/ ha (63.29 t/ha and 26.03 q/ha). So, Its beneficial effects recorded to increase economic indices viz., net returns (Rs.66185/ha ) and per rupee returns(2.64) of application of fertilizer levels (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O) of 60:30: 30 kg/ ha than rest of all treatments. It is concluded that, performance of newly released genotype of AHS-286 with fertilizer level of 60:30:30 (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O) kg/ha is beneficial for higher fibre yield and economic returns of roselle (*H. sabdariffa*) in kharif season.

**Key words:** Growth attributes, Fertilizer levels, Fibre yield, Productivity and Sustainability

## I. INTRODUCTION

In twenty-first century, jute and allied fibers, once known as The Golden Fiber of India is becoming increasingly valuable not only as a natural alternative to petrochemical derived synthetic fibers, but also as a component of automobile interiors, fiber composites and other diversified products. In comparison to major crops like rice and wheat, jute is more energy efficient, producing more biomass and fixing higher carbon



dioxide (Pacharne *et al.*, 2021). Surely, demand for jute will increase in near future. Globally, India is the largest producer of both raw jute (jute and Mesta) and jute products with shares of 53 per cent and 62 per cent respectively, in global production. Jute fiber contributes nearly 7000 core (0.4 per cent) to India's value of output from agriculture. India is the largest producer of jute and allied fibre (40 % of world production) and jute and allied fibre goods (60 % of global production) in the world with an average productivity of both Bangladesh and India (Pandey *et al.* 2020). China has also a dominating place in its cultivation. On small scale, Thailand, Myanmar, Pakistan, Nepal and Bhutan are also cultivating these crop. In India area under jute and mesta was 0.742 million ha and production 10.03 million Bales with productivity 2435 kg ha<sup>-1</sup> during 2017-18 (Anonymous, 2018). Two botanical types of roselle, namely *H. sabdariffavar. altissima* and *H. sabdariffavar. sabdariffa*. The first grown for its phloem fibre and the second for its fleshy, shiny-red calyxes which are usually extracted in hot or cold water and consumed as a beverage. Area under cultivation of roselle in Maharashtra especially very low, but this crop is newly emerging and grown for seed production in Andhra Pradesh and Karnataka.

Roselle is highly responsive to chemical fertilizer and organic manures. The full expression of genetic potential of a crop could be attained with proper management practices including appropriate fertilizer management (Alam *et al.*, 2002). Use of chemical fertilizers has positive effect on growth and yield of roselle, but imbalanced use of chemical fertilizers not only lowers productivity but also adversely affects soil health by decreasing soil organic carbon, microbial flora and hardening of soil. The newly released genotypes with improved agro-techniques play crucial role to increase the production and productivity of fibre crops (Singh *et al.*, 2015).

For this present study was undertaken for evaluation of newly released genotypes and fertilizer levels on growth, fibre yield and economics of roselle (*Hibiscus sabdariffa* L.).

## II. METHODS AND MATERIAL

The experiment was conducted during *kharif* 2019 on Farm of Jute and Allied Fibre crops, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra (situated at lies between 19° 48' N and 19° 57' N latitude and 74° 32' E and 74° 19' E longitude). The altitude varies from 495 to 569 meter above mean sea level. The soil of the experimental site is clay loam in texture (Clay- 53.18%, Silt-18.04 % and Sand- 28.78%) with having pH 8.2 and EC 0.28dS/m and organic carbon 0.46 % in top of 15 cm soil. The soil available nitrogen, phosphorus and potassium were 279.88, 15.56, 313.78kg/ ha. The field capacity, bulk density and permanent wilting point of the surface (0-15 cm) soil were 31.20% on volume basis, 1.17 Mg<sup>-3</sup> and 16.42 %, respectively. The average annual rainfall at Rahuri is 520 mm. The rainfall received from south-west monsoon from May to November was 693.8 mm and 43 rainy days during 2019, which is beneficial for crop growth and seed development. The average mean annual maximum and minimum temperature ranges from 33° to 43°C and 6° to 18°C, respectively. The average relative humidity during morning and evening hours are 59 and 35 per cent, respectively. The experiment was laid out in Factorial Randomized Block Design during *kharif* season in four replications. The factor A consist of three varieties *viz.*, V<sub>1</sub>- AHS 286, V<sub>2</sub>- AMV-5 and V<sub>3</sub>- HS-4288 and factor B consist of four fertilizer levels *viz.*, F<sub>0</sub>- Control, F<sub>1</sub>- 40:20:20, F<sub>2</sub>- 60:30:30 and F<sub>3</sub>- 80:40:40; N:P<sub>2</sub>O<sub>5</sub> :K<sub>2</sub>O; kg ha<sup>-1</sup>. Fertilizer doses of N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O were applied as per treatment wise fully of P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O at the time of sowing and N was given in split application of 30 % at sowing, 35 % at 30 days after sowing and 35 % at 65 days after sowing, respectively.

In experimental plot, 5 plants were selected randomly from the second row of each plot for measurement of growth and yield attributes. The crop was harvested at 50% flowering as per treatment wise and take weight of green biomass bundles and dipped in rating tank as per treatment-wise for 21 days and after washed in freely moveable water, dried and recorded yield of fibre from net plot and converted into t/ha. The gross returns were calculated by multiplying the prevalent market price of fibre with their respective yields, and net returns were calculated by subtracting cost of cultivation from the gross returns. Benefit: cost ratio was calculated by dividing the net returns with cost of cultivation under the respective treatment. Statistical analysis was done as per randomized block design (Gomez and Gomez, 1984) and treatment means were compared at 5% level of significance.

### III. RESULTS AND DISCUSSION

The crop sown of different varieties and application of fertilizer levels were recorded significant effect in growth, fibre yield and economics of roselle in Table 1 and 2.

#### ***Performance of varieties on growth and yield of roselle***

The growth, yield attributes and yield of roselle crop as influenced by different treatments are presented in Table 1. The variety AHS-286 recorded significantly higher growth and yield attributes viz., Plant height (241.36 cm), number of functional leaves (61.66), fibre yield (8.51g) per plant than the variety AMV-5 and HS-4288. Similarly, higher growth and yield attributes resulted into significantly higher green biomass yield of roselle crop. The variety AHS-286 recorded significantly higher green biomass and fibre yield (59.68 t/ ha, 23.79 q/ ha) than the variety HS-4288 (56.42 t/ha, 20.73 q/ha) and AMV-5 (51.15 t/ha, 20.01q/ha). It is recorded higher green biomass and fibre yield of 16.67 and 18.89 % than AMV-5. These findings are in harmony with results of Ali *et al*, 2017 and Islam 2019.

#### ***Performance of varieties on economics***

The different varieties of roselle crop recorded significant differences in green biomass and fibre yield. It is responsible for converted to the higher economic indices. The variety AHS-286 recorded maximum gross (Rs.93962/ha), net (Rs.55921/ha) monetary returns and B:C ratio (2.45) than the variety HS-4288 and AMV-5. The lowest economic indices like gross (Rs.79056/ha), net (41057) monetary returns and B:C ratio (2.05) were recorded by the variety AMV-5. These results are in agreement with the results of Islam, (2019) and Tripathi *et al*, 2012.

#### ***Performance of fertilizer levels on growth and yield***

The application of fertilizer levels (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O) of 80:40:40 to the roselle crop recorded significantly higher green stalk and fibre yield (64.53 t/ha and 27.07 q/ ha) than fertilizer levels of control and 40:20:20 kg/ha but it was at par with fertilizer levels (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O) of 60:30:30 kg/ ha (63.29 t/ha and 26.03 q/ha) during the period of experiment. So the optimum level of fertilizer in roselle of 60:30:30;N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O/ha is more beneficial to increase the fibre yield and it was 27.47 % higher than 40:20:20 kg/ha and 51.86 % higher than control treatment. The lowest green biomass (39.73 t/ha) and fibre yield (12.53 q/ha) of roselle crop was recorded by control treatments. The growth and yield attributes viz., Plant height (242.78 cm), number of functional leaves (61.10), basal diameter (1.51 cm) and fibre yield (9.29gm) per plant were recorded significantly higher with application of fertilizer levels (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O) of 80:40:40 to the roselle crop than rest of all treatments but it was at par with fertilizer level of 60:30:30;N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O/ha. Similar results are registered by Egharevba and Law-ogboma (2007) and Guha *et al*. (2008).

### **Performance of fertilizer levels on economics**

The application of different fertilizer levels to the roselle crop are recorded significant differences in economic indices and indicated in table 2. The application of fertilizer levels (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O/ha) of 80:40:40 to the roselle crop recorded significantly higher gross and net monetary returns (Rs.106914/ha and Rs.66185/ha) than rest of all treatments but it was par with fertilizer level of 60:30:30;N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O/ha in net returns. Similarly, the per rupees returns (2.64) of roselle crop were recorded maximum infertilizer level of 60:30:30;N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O/ha. So it is saving of 25% fertilizer dose in roselle fibre production. The lowest per rupees returns (1.40) was recorded by control treatment. Similar line of work was recorded by Guha *et al.* (2008), Getso *et al.* (2018) and Singh *et al.* (2015).

**Sustainability of genotypes:** The genotype AHS-286 recorded highest green stalk yield and field which are beneficial to increase the nutrient uptake (121.88, 21.05 and 57.74; N:P:K kg/ha) than the variety HS-4288 and AMV-5. The lowest nutrient uptake was recorded by the variety AMV-5 (115.79, 19.73 and 54.36; N:P:K kg/ha) at harvest. The nutrient availability after harvest of roselle (227.43:11.94: 316.37N:P: K kg/ha) crop was recorded by the variety AHS-286 were numerically lower as compared to rest of all variety. The variety AHS-286 is more sustained on field for increasing biomass and fibre yield as compared to rest of all varieties.

**Interaction effects:** The interaction effect between varieties and fertilizer levels were found to be significant in number of leaves, fibre yield per plant (g/ plant), green stalk weight (t/ha) and fibre yield (q/ha) and presented in Table 1a and 1b. The combined interaction effect of variety AHS-286 and fertilizer level of 80:40:40;N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O/ha was recorded significantly higher number of leaves (63.47), fibre yield per plant (10.68 g), green stalk and fibre yield (68.29 t/ha and 29.85 q/ ha) than rest of interaction combinations, but it was at par with combined effect on fertilizer level of 60:30:30 ;N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O/ha and the variety AHS-286. The lowest yield of green stalk (31.60 t/ha) and fibre yield (9.65 q/ha) was recorded by combined interaction effect control treatment with variety AMV-5.

**Table 1a Interaction effect between varieties and fertilizer levels on functional leaves and fibre yield per plant of Roselle**

Varieties Fertilizer levels (N:P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O kg ha <sup>-1</sup> )	Number of leaves /plant			Fibre yield per plant (g plant <sup>-1</sup> )		
	V <sub>1</sub> :AHS-286	V <sub>2</sub> :AMV-5	V <sub>3</sub> :HS-4288	V <sub>1</sub> :AHS-286	V <sub>2</sub> :AMV-5	V <sub>3</sub> :HS-4288
F <sub>0</sub> : Control	60.27	45.47	47.87	8.97	8.01	7.95
F <sub>1</sub> : 40:20:20	60.00	47.71	49.32	9.35	8.15	8.72
F <sub>2</sub> : 60:30:30	62.90	58.43	58.92	10.18	9.00	9.63
F <sub>3</sub> : 80:40:40	63.47	59.09	60.73	10.68	9.37	9.97
Source S.Em. +	1.05			0.21		
CD at 5%	3.08			0.61		

**Table 1b Interaction effect between varieties and fertilizer levels on green stalk and fibre yield (q/ha) of roselle at harvest.**

Varieties Fertilizer levels (N:P <sub>2</sub> O <sub>5</sub> :K <sub>2</sub> O kg ha <sup>-1</sup> )	Green weight yield (t ha <sup>-1</sup> )			Fibre yield (q ha <sup>-1</sup> )		
	V <sub>1</sub> :AHS-286	V <sub>2</sub> :AMV-5	V <sub>3</sub> :HS-4288	V <sub>1</sub> :AHS-286	V <sub>2</sub> :AMV-5	V <sub>3</sub> :HS-4288

F <sub>0</sub> : Control	44.50	31.60	43.11	14.06	9.65	13.86
F <sub>1</sub> : 40:20:20	61.08	51.53	53.70	22.97	18.42	19.86
F <sub>2</sub> : 60:30:30	64.84	60.86	64.44	28.27	25.32	24.49
F <sub>3</sub> : 80:40:40	68.29	60.60	64.42	29.85	26.66	24.69
<b>Source S.Em. +</b>	1.62			0.61		
CD at 5%	4.74			1.79		

#### IV. CONCLUSION

On the basis of experiment, it could be concluded that, the performance of newly released genotype of AHS-286 with fertilizer level of 60:30:30 (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O) kg/ha is beneficial for higher fibre yield and economic returns of roselle (*H. sabdariffa*) in *kharif* season.

**Table 1 Growth and yield attributes of tossa jute as influenced by different treatments**

Treatment	Plant height (cm)	Flower initiation	Basal diameter (cm)	Fibre yield /plant	Green wt. (t/ha)	Fibre yield (q/ha)
<b>A. Varieties</b>						
V <sub>1</sub> : AHS 286	241.36	119.39	1.43	8.51	59.68	23.79
V <sub>2</sub> : AMV 5	228.83	103.69	1.36	7.74	51.15	20.01
V <sub>3</sub> : HS 4288	233.01	113.77	1.41	8.49	56.42	20.73
SE m ±	2.36	0.60	0.02	0.10	0.81	0.31
CD (P=0.05)	6.92	1.77	NS	0.30	2.37	0.90
<b>B. Fertilizer levels (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O kg /ha)</b>						
F <sub>0</sub> : Control	224.31	101.06	1.25	6.96	39.73	12.53
F <sub>1</sub> : 40:20:20	229.60	105.69	1.35	7.63	55.44	20.42
F <sub>2</sub> : 60:30:30	240.90	118.42	1.49	9.11	63.29	26.03
F <sub>3</sub> : 80:40:40	242.78	123.96	1.51	9.29	64.53	27.07
SE m ±	2.72	0.70	0.02	0.12	0.93	0.35
CD (P=0.05)	7.99	2.04	0.07	0.35	2.74	1.04
<b>C. Interaction ( V x F)</b>						
SE m ±	4.72	1.20	0.04	0.21	1.62	0.61
CD (P=0.05)	NS	3.53	NS	0.61	4.75	1.80

**Table 2 Economics of Roselle as influenced by different treatments**

Treatments	Gross monetary returns (Rs. ha <sup>-1</sup> )	Cost of cultivation (Rs. ha <sup>-1</sup> )	Net monetary returns (Rs. ha <sup>-1</sup> )	B:C ratio
<b>A) Varieties</b>				
V <sub>1</sub> - AHS-286	93962	38041	55921	2.45
V <sub>2</sub> - AMV-5	79056	37999	41057	2.05

V <sub>3</sub> - HS-4288	81867	38048	43819	2.13
SE m $\pm$	1208	--	1208	--
CD at 5%	3543	--	3543	--
<b>B) Fertilizer levels (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O, Kg/ha)</b>				
F <sub>1</sub> - Control	49475	35329	14146	1.40
F <sub>2</sub> -40:20:20	80652	37129	43523	2.17
F <sub>3</sub> -60:30:30	102806	38929	63877	2.64
F <sub>4</sub> -80:40:40	106914	40729	66185	2.62
SE m $\pm$	1395	--	1395	--
CD at 5%	4091	--	4091	--
<b>C) Interaction effects (VXF)</b>				
SE m $\pm$	3416	--	3416	--
CD at 5%	N.S.	--	N.S.	--

**Table 3** Nutrient uptake by roselle as influenced by different treatment

Treatment	Total nutrient uptake (kg ha <sup>-1</sup> )			Soil available nutrients (kg ha <sup>-1</sup> )		
	Nitrogen (kg ha <sup>-1</sup> )	Phosphorous (kg ha <sup>-1</sup> )	Potassium (kg ha <sup>-1</sup> )	Nitrogen (kg ha <sup>-1</sup> )	Phosphorous (kg ha <sup>-1</sup> )	Potassium (kg ha <sup>-1</sup> )
<b>A. Varieties</b>						
V <sub>1</sub> - AHS-286	121.88	21.05	57.74	227.43	11.94	316.37
V <sub>2</sub> - AMV-5	115.79	19.73	54.36	228.74	12.12	320.31
V <sub>3</sub> - HS-4288	119.25	20.45	56.79	236.94	12.24	323.23
SE m $\pm$	0.73	0.47	1.72	4.65	0.79	7.29
CD at 5%	2.07	1.41	NS	NS	NS	NS
<b>B. Fertilizer levels (N:P<sub>2</sub>O<sub>5</sub>:K<sub>2</sub>O, Kg ha<sup>-1</sup>)</b>						
F <sub>0</sub> -Control	95.01	14.32	35.91	200.82	9.05	300.52
F <sub>1</sub> -40:20:20	114.42	19.47	51.96	214.94	11.58	313.46
F <sub>2</sub> -60:30:30	127.31	23.60	66.48	238.86	13.38	323.16
F <sub>3</sub> -80:40:40	139.15	25.57	72.17	269.54	14.37	342.73
SE m $\pm$	2.39	0.54	1.99	5.36	0.91	8.42
CD at 5%	7.00	1.58	5.84	15.73	2.67	24.70
<b>C. Interaction (V x F)</b>						
SE m $\pm$	4.14	0.93	3.45	9.29	1.57	14.59
CD at 5%	12.13	NS	NS	NS	NS	NS
Soil initial status	279.88	15.56	313.78			

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# Ethnobotanical Survey On Medicinal Plants Used for Cancer Treatment in Bidar District, Karnataka

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## ABSTRACT

An Ethno-botanical survey of medicinal plants used for cancer treatment in Bidar district, Karnataka region was carried out between January to December-2023, Bidar district is traditionally rich for medicinal plants and their application in health care system. *Abrus precatorius*, *Ephedra*, *Withania somnifera*, *Catharanthus roseus*, *Tinospora cardifolia*, *Andrographis paniculata*, *Curcuma longa*, *Phyllanthus amarus*, *Allium sativum*, are some of the plants employed in the preparation of cancer drug. The rich traditional knowledge is utilized in selecting plant materials. Ethnobotanical data were collected by oral interview with the traditional healers, herbalists and herb sellers. From this Ethnobotanical survey plant species belonging to different families were found to be useful in the treatment of cancer. The remedies were either prepared from dry, freshly collected plant parts. While the traditional formulation of drug solvents of choice include water aqueous extracts. Survey revealed that leaves, roots, stem, fruits, bark, are the major plant parts used for cancer treatment residents in the study area find the traditional medicines are cheaper as compared to orthodox medicines. In the present work an attempt was made to Survey the medicinal plants used for cancer treatment in Bidar district of Karnataka.

**Keywords:** Ethnobotany, Bidar, Karnataka, medicinal plants, survey, traditional healer.

## I. INTRODUCTION

Today, there is an increasing desire to unravel the role of ethno-botanical studies in trapping the centuries old traditional knowledge as well as in searching new plants resources of food, drugs etc (Jain, 1991). India is a repository of medicinal plants. At present about 65% of Indians are dependent on traditional system of medicine hundreds of medicinal plant species worldwide are used in the traditional medicine for the treatment of cancer. The art of herbal treatment has very deep root in human culture when the plants are used for not only curing diseases, but also during several ceremonies. Right through human history, people have relied on natural products and plants in particular to promote and maintain good health. This dependency of man on plant made him to acquire the knowledge on economic and medicinal properties of plants by trial and error methods. Consequently, he gained both useful and harmful knowledge, accumulated, enriched through generations and passed on from one generation to another without any written documentation. As it was a part

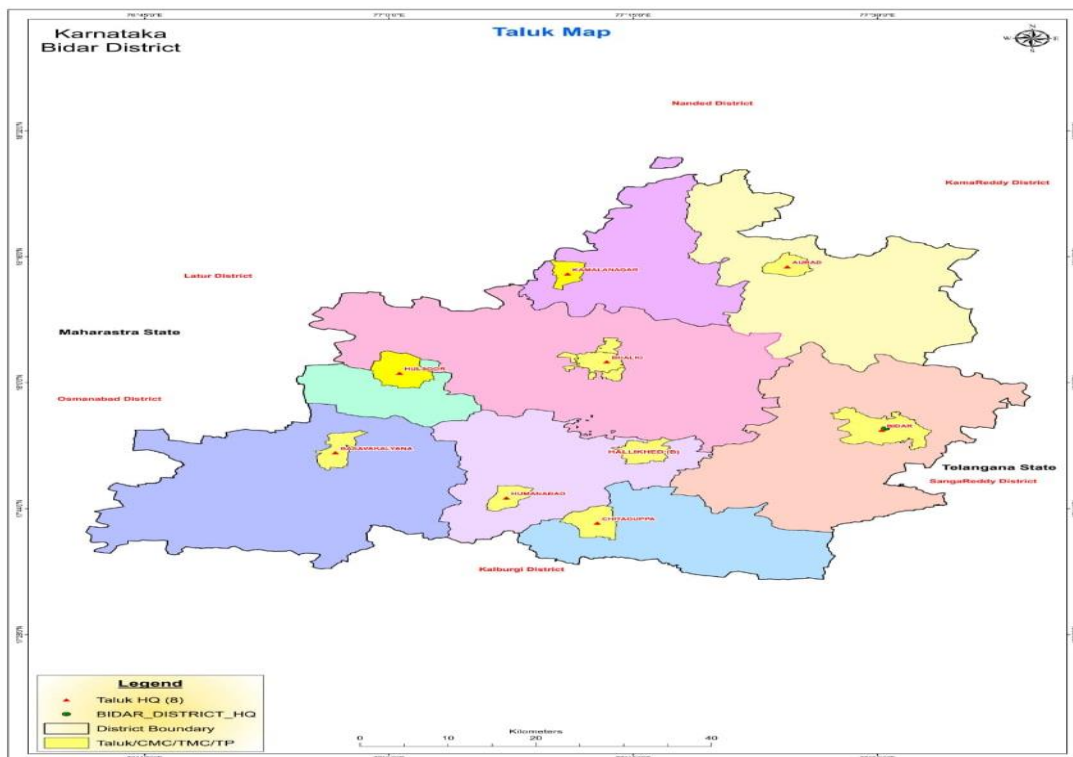
of their culture, no written document of this art and knowledge was required. However, the past 200 years have witnessed not only an acceleration in the rate of extinction of plant and animal species, but also the erosion of traditional knowledge related to medicinal properties, may be, it is due to the advances in science, which led to the isolation of many active molecules from plant in pure form and formulated the synthetic compounds for the various diseases. The ever-rising cost of the synthetic drug, its ineffectiveness in a large number of cases and its association with harmful side effects are some of the demerits leading man to rethink over the use of synthetic drugs for a longer period. Therefore, since last two decades, once again the traditional herbal medicine is gaining important all over the world. People realized the importance of documentation and preservation of traditional knowledge on medicinal plants. Present knowledge on the properties and therapeutic uses of plants in India comes from various sources and is closely linked to the rich cultural diversity that characterizes the Indian subcontinent (Jain, 1987). Ethno Indian medicine includes both folk medicine and 'codified' traditional medicine. The folk or rural medicine is an oral and is purely empirical in nature. This exists in all communities and reflects the country's broad ecological, ethic and cultural diversity. While, the 'codified' traditional medicine systems (Ayurveda, Siddha and Unani) have a strong theoretical foundation and a body of medical text dating hundreds of years (Shankar, 1996). The oral ethnic knowledge is getting eroded rapidly with the death of the knowledge holder, when the knowledge is not percolated to other individual of the community. Hence, the documentation and protection of the traditional knowledge are critical for the future well being of the community. Bidar is a hill top city in the north eastern part of Karnataka state in India. Comprises 8 talukas, namely Bidar, Humnabad, Bhalki, Aurad, Hulsoor, Chitgoppa, Kamalnagar and Basavakalyan. The people of this district are economically little backward, but culturally unique. They speak five languages and traditional knowledge flows from one culture to other. The plant diversity is very rich and a good number of medicinal plants are used in the treatment of Cancer therefore, the present study focused on the Ethnobotanical survey on medicinal plants used for cancer treatment in Bidar district.

## II. METHODS AND MATERIAL

An Ethno-botanical survey of Bidar district was conducted between January to December-2023 to identify the plants with the medicinal properties against cancer. Twenty five to thirty villages were identified from different areas of Bidar district namely Chitguppa, Mannaekheli, Humnabad, Warvatti, Bhalki, Chitta, Dhannura, Basavakalyan, Hulsoor, Aurad, Hallikhed, Bidar, the information from the use of medicinal plants were gathered by direct oral interaction with Hakem, Kadukuruba, Lambani, Vaidhya the information on the use of medicinal plants in the treatment of cancer was gathered from traditional herbal healers and other herbalists, villagers through oral interviews of the informants some are men and some are women's whose are range from 40-95 years age.

The information was recorded includes local name of the plant, part used method of drug formulation and preparation. Mode of administration probable Dosage and duration of treatment at the end of each interview plants specimens were collected and identified with the help of regional and local floras prior informed consent was taken from all the tribal and traditional healers.





**SURVEY AREA: BIDAR DISTRICT**

**III.RESULTS AND DISCUSSION**

During the present ethnobotanical survey 25 plant species belonging to 17 families were reported from 43 traditional healers for the treatment of cancer among them the predominant families were Apocynaceae, Euphorbiaceae, Amaranthaceae, Liliaceae, Rutaceae with maximum species these plants were arranged in alphabetical order of their scientific name along with family followed by local names, part used, methods of

drug preparation mode of administration and probable duration of treatment along these the plant parts used in treating cancer are present below.

1. Botanical name - *Abrus precatorius*  
Family – Fabaceae  
Local name – Gulaganj  
Part used – seeds, roots
2. Botanical name – *Adhatoda vasica*  
Family – Acanthaceae  
Local name – Adusoge  
Part used – Leaves
3. Botanical name – *Aloe vera*  
Family – Liliaceae  
Local name – Nolasara  
Part used – Leaves
4. Botanical name – *Allium cepa*  
Family – Liliaceae  
Local name – Ullagadi  
Part used – Fleshy bulb
5. Botanical name – *Allium sativum*  
Family – Liliaceae  
Local name – Belluli  
Part used – Bulb
6. Botanical name – *Andrographis paniculata*  
Family – Acanthaceae  
Local name – Kreateda  
Part used – Root, stem, leaves,
7. Botanical name – *Azadirachta indica*  
Family – Meliaceae  
Local name – Bevu  
Part used – Leaves
8. Botanical name – *Cassia tora*  
Family – Fabaceae  
Local name – Tagare  
Part used – Leaves, seed, root
9. Botanical name – *Curcuma longa*  
Family – Zingiberaceae  
Local name – Haldi  
Part used – Rhizome
10. Botanical name – *Catheranthos roseus*  
Family – Apocynaceae  
Local name – Kempu kaasi  
Part used – Leaves, Flowers, Bark

11. Botanical name – *Citrus medica*  
Family – Rutaceae  
Local name – Nimbekai  
Part used – Leaves, fruits
12. Botanical name – *Datura metel*  
Family – Solanaceae  
Local name – Umatta  
Part used – Roots, leaves, stem, fruits
13. Botanical name – *Ephedra*  
Family – Ephedraceae  
Local name – somalata, habukalli  
Part used – Root, stem
14. Botanical name – *Gloriosa superba*  
Family – Liliaceae  
Local name – Glory Lily  
Part used – Leaves, Rhizome
15. Botanical name – *Phyllanthus amarus*  
Family – Euphorbiaceae  
Local name – Nela Nelli  
Part used – Leaves, stem, flowers, fruits,
16. Botanical name – *Phyllanthus emblica*  
Family – Phyllanthaceae  
Local name – Amala  
Part used – Fruits
17. Botanical name – *Piper longum*  
Family – Piperaceae  
Local name – Menasu  
Part used – seeds
18. Botanical name – *Tectona grandis*  
Family – Verbenaceae  
Local name – Sagwan  
Part used – Leaves
19. Botanical name – *Tinospora cardifolia*  
Family – Menispermaceae  
Local name – Amrutha balli  
Part used – Aerial parts
20. Botanical name – *Tridax procumbens*  
Family – Asteraceae  
Local name – Geje Tikka  
Part used – Aerial parts

21. Botanical name – *Triticum vulgare*  
Family – Gramineaceae  
Local name – Godhi sassi  
Part used – Roots, Leaves
22. Botanical name – *Vitex negundo*  
Family – Verbenaceae  
Local name – Vaila  
Part used – Leaves
23. Botanical name – *Withania somnifera*  
Family – Solanaceae  
Local name – Ashwagandha  
Part used – Leaves, roots, fruit
24. Botanical name – *Ziziphus mauritiana*  
Family - Rhamnaceae  
Local name – Ber  
Part used – Fruits, seeds, leaves
25. Botanical name – *Zingiber officinale*  
Family – Zingiberaceae  
Local name – Hasisunti  
Part used – Rhizome

#### ANTICANCER MEDICINAL PLANTS OF BIDAR DISTRICT:









TABLE I LIST OF TRADITIONAL PRACTITIONERS OF BIDAR

NAME	AGE	ADDRESS	SEX	EXPERIENCE
Shankar Siddappa	60	Wadgaon, Aurad	Male	15
Kashinath Tukaram	58	Khernayak thanda wadgaon	Male	15
Gangaram mogalappa	65	Khanapur	Male	40
Pandurang	70	Sorahalli	Male	15
Vitthal Rao	96	Basava kalyan	Male	15
Revann appa Govind appa	45	Hulgutti Basava kalyan	Male	10
Manohar Jamadar	75	Gundur Basava Kalyan	Male	15
Narayan Rao Gundappa	55	Udamnalli Humnabad	Male	15
Prabhuling Hanmanth appa	56	Karaknalli Basava kalyan	Male	15
Hanmanth appa	70	Karaknalli Basava Kalyan	Male	20
Ramanna Shivram	95	Karaknalli Basava Kalyan	Male	60
Narasa Reddy	70	Karaknalli Basava Kalyan	Male	40
Lachamma nayak	68	Yakemba Thanda Basava Kalyan	Fe male	28
Ameen Saab Bhatti	48	Warvatti Humnabad	Male	15
Ramrao Khange	55	Tripuranth Basava Kalyan	Male	26
Phulavathi	53	Manne-E-Kheli	Male	18
Sayab patel	40	Chitguppa Humnabad	Male	10
Sattar Miya	60	Bhalki	Male	25

Gonaba Patil	84	Chitta Basava Kalyan	Male	30
Kerabai Dhullappa	65	Pratapur Basava Kalyan	Female	28
Anneppa Dhangar	58	Mudubi Basava Kalyan	Male	25
Vaijinath Kambar	62	Belur Basava Kalyan	Male	30
Sayab Patel	55	Rajola Basava Kalyan	Male	34
Baburao Bhosle	48	Rajola Basava Kalyan	Male	20
Sopan Reddy Biradar	65	Ghogga Basava Kalyan	Male	32
Pandith Rao Mooti	60	Narayan pur Basava Kalyan	Male	35
Ganoba patil	58	Chitta Basava Kalyan	Male	32
Sonabai Bhurale	65	Gutthi Basava Kalyan	Male	40
Vitthal saibanna	61	Basava Kalyan	Male	35
Ameenasab Bhatti	45	Warvatti Humnabad	Male	20
Shivaji kargar	52	Manna-E-khali	Male	52
Umesh patil	44	Madargi Humnabad	Male	28
Shantibai	80	Vithalpur Humnabad	Female	31
Maruti Sutar	55	Helalpur Humnabad	Male	20
Yadavrao Patil	70	Hotagi Humnabad	Male	34
Shivaram Pujari	70	Guditanda Humnabad	Male	31
Gundappa sada	74	Muttangi	Male	25
Veerbasayy	58	chitguppa	Male	31
Mahadev swami	75	Shadool Humnabad	Male	56
Rajkumar Beskar	40	Bembal kheda	Male	22
Sangayya Swami	60	Hotagi Humnabad	Male	34
Mallikarjun Narsappa	45	Chikpet Bidar	Male	20
Khan sab	60	Dhanur, Bidar	Male	25

#### MODE OF FORMULATION OF CANCER MEDICINE :

Take 11 New pots and add pure fertile soil in them and label them with sequence numbering 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and sow the Triticum seed in the No.1 First pot on the First day and next day in the No.2 second pot in the same way upto 11 days for 11 pots we have to sow the Triticum seeds and maintain the environment suitable for them, after 11 days from the No.1 first pot collect the Triticum whole grass along with its roots and add Ocimum sanctum and water in it and make juice of it and the cancer patient have to drink this juice in the early morning with empty stomach this type the patient should drink this for 22 days that is 2 rounds of pots this is the most effective medicine for cancer and also for other diseases we the Bidar district people call this medicine as Sasse.

#### IV. CONCLUSION

In Ethnobotanical Survey on medicinal Plants used for Cancer treatment in Bidar, District during this survey Interviewed and consulted 43 traditional healers and this type survey were conducted in Bellary, Kodagu, Uttar



Kannada, Chikmagalur, Tumkur, Districts However in Bidar district no detailed Survey on Ethnobotanical Medicinal plants used for Cancer treatment is not done yet this detailed survey represents a contribution to the existing knowledge of folk remedies that are in current practice for the treatment of cancer. The documentation of such knowledge plays an important role in forming the health policies and also for the extraction and characterization of Bioactive novel compounds so that people of the same and other regions can make use of it.

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# Status of Air Quality with Special Reference to Particulate Matter

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## ABSTRACT

On Global level air pollution is one of the serious issue. Higher levels of air pollutant putting a pressure on the human health. Among the world India is one of the country that severely affected by air pollution. Out of 50 cities of the world 39 cities of India are facing the problem of Air Pollution. This study has been undertaken to know the status of Particulate matter in the udgir city. Three sampling stations was selected covering all the city. Results are well below the permissible standards. This is present situation. It may increase as the city is coming with Industrial belt at Nagalgaon.

**Key Words:** Air Pollution, Human Health, Pollutant, Particulate Matter, India.

## I. INTRODUCTION

Global industrialization has made it such that air pollution brought on by energy usage and exhaust emissions is a significant environmental issue (Wang et al., 2021b). Fine particulate matter (PM<sub>2.5</sub>), a significant component of air pollution (Cohen et al., 2017), not only contributes to reduced atmospheric visibility but also raises disease morbidity and death rates (Ansari and Ehrampoush, 2019). Therefore, research on PM<sub>2.5</sub> source is necessary to uncover resolutions and identify key factors to guide the management of the atmospheric environment and population health protection. Air pollution has become a major problem in India which has huge health and socio-economic adverse impact. It is not restricted only to mega cities. It has spread to small cities, towns and villages. Air pollution poses a multi-faceted risk due to its adverse impact on health. It is the leading contributor of mortality from cardiovascular diseases, stroke, chronic obstructive pulmonary disease and lung cancer. India is one of the most affected countries by air pollution and there are increasing evidences of adverse effects on health due to air pollution. Several studies have shown short and long-term impacts of air pollution on human health.

Air pollution and climate change are major threats to rapidly growing cities in present times. The developing nations like India, which are switching from predominantly rural country to increasingly urban, have to face critical challenges in terms of climate action and sustainable development (Van Duijne, 2017; Singh C. et al., 2021). India is projected to have 53% of the national population as urban population by addition of 416 million urban dwellers by the year 2050 (UNDESA, 2018).

Udgir is a developing taluka of the district Latur, Maharashtra. Day by day urbanization is increasing. There are number of commercial complexes in the city. All the people from nearby by villages are coming for the marketing daily. So the levels of particulate matter must be analysed for the health of the peoples.

## II. STUDY AREA

Udgir is a city with a municipal council in Latur district in the Indian States and territories of India of Maharashtra. It is located in the Marathwada division of the state (one of the divisions of Maharashtra state based on geographical conditions). It is also the headquarters for the Udgir subdivision and Udgir Taluka., the town has achieved remarkable development in various fields like administration, transport, agriculture, education, health, hospitality and entertainment. The town is famous for its agricultural production, education and the historical Udgir Fort. The main occupation of the people of Udgir is agriculture as most of the rural area surrounding Udgir is rainfed and marginal and small farmers make up the rural setting. The soil as a part of Deccan plateau is black basalt soil, rich in humus.

Agriculture-based businesses like pulses (dal) industry, warehouses, cold storage, sugar factories run here. Udgir has around 80 dal (mils) processing units. The population of the town is 2,00,111 according to 2014 census data of which 100,148 are males and 99,963 are females. From 2001 to 2014 the population of Udgir saw an increase of 27.98%. Literacy increased from 74.21% in 2001 to 85.78% in 2011. Udgir has an average literacy rate of 85.78%, which is higher than the national average percentage.

## III. MATERIALS AND METHODS

There are three sampling stations selected in the Udgir city. The sampling stations selected on the basis of Residential, Commercial and Industrial sectors. The high volume Air Sampler is used for the determination of Particulate matter. At the Eight Hour Intervals Particulate Matter has been determined. The average of 24 hours has been calculated and the results are interpreted. In this Respirable suspended particulate matter and Suspended particulate matter has been measured and month wise data prepared.

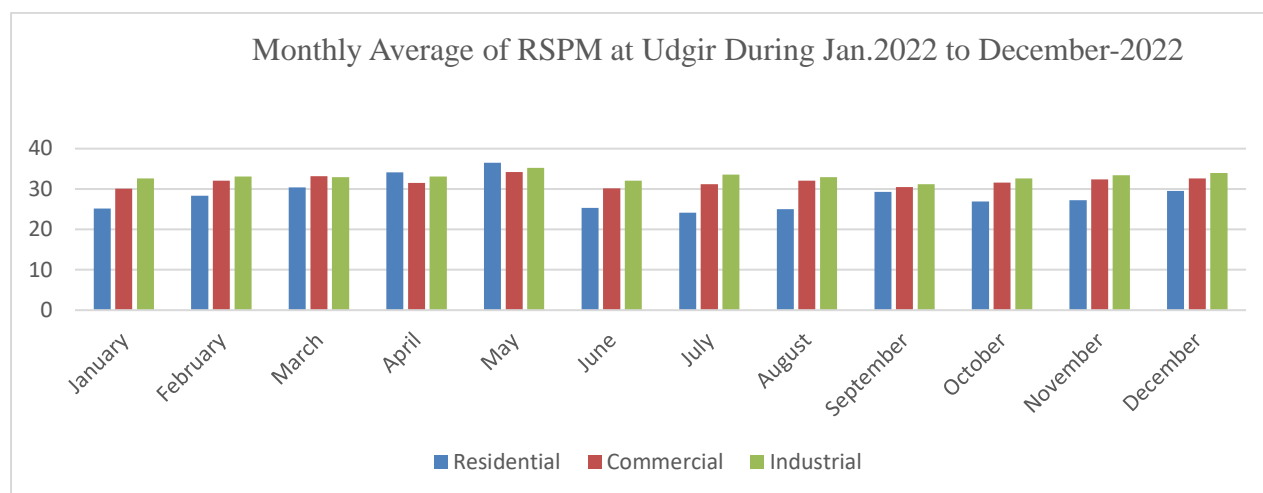
### Tables and Graphs

Monthly Average of RSPM at Udgir During Jan.2022 to December-2022

Table:1

Sr.No	Month	Residential	Commercial	Industrial
01	January	25.20	30.10	32.60
02	February	28.30	32.10	33.10
03	March	30.40	33.20	32.90
04	April	34.10	31.50	33.10
05	May	36.50	34.20	35.20
06	June	25.30	30.20	32.10
07	July	24.10	31.20	33.60
08	August	25.00	32.10	32.90
09	September	29.30	30.50	31.20
10	October	26.90	31.60	32.60
11	November	27.20	32.40	33.40
12	December	29.50	32.60	34.00

Figure: -1

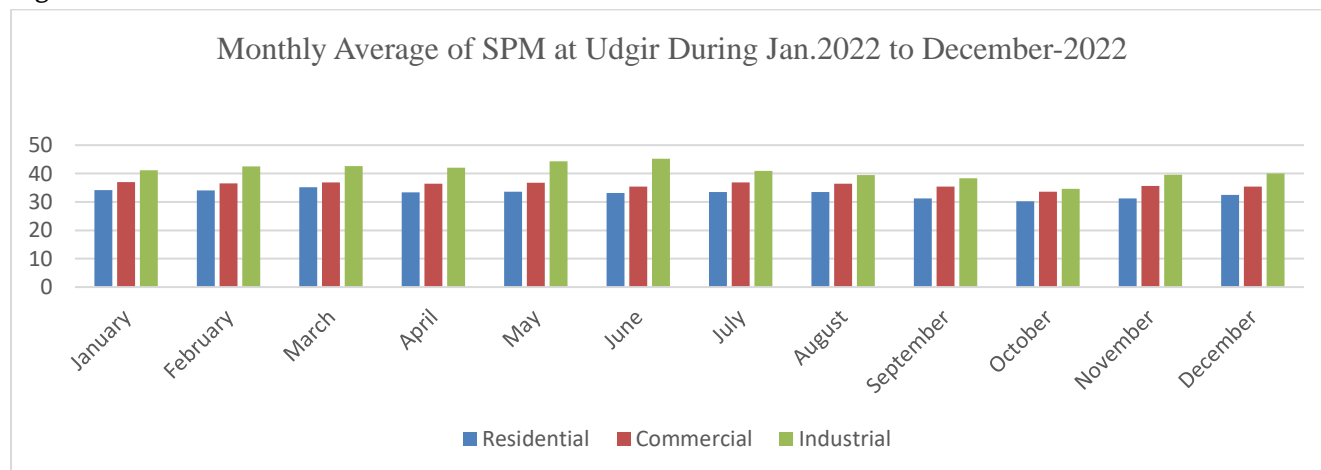


Monthly Average of SPM at Udgir During Jan.2022 to December-2022

Table:2

Sr.No	Month	Residential	Commercial	Industrial
01	January	34.20	37.00	41.20
02	February	34.00	36.50	42.50
03	March	35.20	36.90	42.60
04	April	33.40	36.40	42.00
05	May	33.60	36.80	44.30
06	June	33.20	35.40	45.20
07	July	33.50	36.90	40.90
08	August	33.50	36.40	39.50
09	September	31.20	35.40	38.30
10	October	30.20	33.60	34.60
11	November	31.20	35.60	39.60
12	December	32.50	35.40	40.00

Figure: -2



#### IV. RESULTS AND DISCUSSION

In the present study RSPM was observed maximum at residential site was in may as 36.50 microgram and minimum of 24.10 in July. At commercial site it was observed highest in the month of March as 33.20 microgram and lowest in 30.10 in January. Maximum of 34.00 microgram and 31.20 in September was observed at Industrial site.

In the present Investigation maximum levels of SPM found was 35.20 in march and minimum 30.20 microgram in October at residential site.at commercial site the highest level was observed in the month of 36.90 micro gram and lowest in the month of 33.60 in October. Maximum level was found in the month of June 45.20 and lowest was in 38.30 in September.

Various studies have been conducted regarding air pollution and their associated health impacts for Indian cities such as for Delhi (Gurjar et al., 2010; HEI, 2011; Rizwan et al., 2013; Nagpure et al., 2014); Chandigarh (Gupta et al., 2001); Kolkata (Ghose et al., 2005; Gurjar et al., 2016; Haque and Singh, 2017); Rajasthan (Rumana et al., 2014); Lucknow (Lawrence and Fatima, 2014); Mumbai (Joseph et al., 2003; Maji et al., 2016); Maharashtra (Maji et al., 2016), Agra (Maji et al., 2017); Gwalior City (Dandotiya et al., 2020); Chennai (Jayanthi and Krishnamoorthy, 2006; HEI, 2011).The levels of particulate matter are within permissible standards of CPCB. But increasing urbanization and Industrialization may increase the levels in coming years. So this data will be a baseline data for the future.

#### V. ACKNOWLEDGEMENT

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# Biodiversity Conservation in India a Review

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## ABSTRACT

The range of various living forms on Earth, comprising various plants, animals, and microorganisms, along with the genes they carry and the ecosystems they create, is known as biodiversity. Within a region, biome, or planet, it relates to genetic variety, ecosystem variation, and species variation (number of species). In light of the variety of habitats, biotic communities, and ecological processes found in the biosphere, biodiversity is essential for a number of reasons, such as enhancing the aesthetic value of the natural world and advancing our material well-being by supplying resources like food, fuel, wood, medicine, and fodder. The biodiversity is support system of life. It provides the food, drink, and oxygen that organisms need to survive. Wetlands remove pollutants from water, plants and trees absorb carbon dioxide to slow down global warming, and fungi and bacteria break down organic matter to fertilise the soil. The goal of biodiversity conservation is to preserve all kinds of life on Earth and maintain the health and function of natural ecosystems. This includes preserving, enhancing, recovering, and using biological diversity's constituent parts in a sustainable manner. Whereas conservation, which includes both protection and exploitation, is the sustainable use of resources and, one facet of conservation is preservation, which is the act of preserving something without making any changes to it. Another complex facet of biodiversity conservation is sustainable development

**Keywords:** Biodiversity, threats, loss, resources, conservation.

## I. INTRODUCTION

Walter G. Rosen first used the phrase "biodiversity" in 1985. It has been defined in a number of ways, including the diversity and variability of species present in a given area among all living things. The entirety of a region's species, genes, and ecology can be defined succinctly as biodiversity (IUCN, UNEP, 1992). At more granular levels of classification, genetic diversity refers to the genetic variation within species among individuals within a single population as well as across populations that are geographically apart. At its most fundamental level, species variety refers to the entire range of life on Earth, from microorganisms like viruses, bacteria, and protists to multicellular kingdoms of plants, animals, and fungi. On wider scale, biodiversity includes variations in the biological communities in which species live, the ecosystem in which communities exist, and the interactions among these levels called as community or ecosystem diversity. For much of the time man lived in a hunter-gather society and thus depended entirely on biodiversity for sustenance. But, with the increased dependence on agriculture and industrialization, the emphasis on biodiversity has decreased. In fact, the majority of humanity's food, medicine, clothing, housing, cultural diversity, and inspiration for thought and spirituality comes from biodiversity in both wild and tamed forms. Over the next two to three decades, 1.7

million species, or 25% of the earth's total biological diversity, which could be helpful to humanity in one form or another, could seriously risk going extinct. Man has become aware that the loss of biodiversity could endanger life itself, and he has begun to take action to protect it. The variety of animals and plants on Earth is truly wondrous. It is estimated that about 5-50 million species of living forms exists on the earth. However, only 1.7 million have been identified so far. These include 4,27,205 species of green plants, fungi, bacteria and viruses; 61,917 species of vertebrates and protochordate; and 12,32,490 species of invertebrates including protista.

## II. BIODIVERSITY OF INDIA

India is one of the 17 mega diverse countries of the world. The country has two major realms called Palearctic and the Indo-Malayan, and three biomes namely the tropical humid forests, the tropical dry/deciduous forests and the warm desert/semi deserts. India is divided into 10 biogeographic regions, Trans-Himalayan, Himalayan, Indian Desert, Semi-Arid, Western Ghats, Deccan Peninsula, Gangetic plains, North-East India, Coasts and Islands, and this diversity creates rich biodiversity in the country. The Himalaya and the Western Ghats are the two Indian mountain biodiversity global hotspots. These both show rich and unique biodiversity in terms of rich species endemism. In addition, India is one of the very important Vavilovian center of diversity and origin of over 167 important cultivated plant species, 320 species of wild crop relatives, and several species of domesticated animals. In flora, the country can boast of 45,944 species, which accounts for 10.75% of the known world plants. Of the 18,000 species of flowering plants (angiosperms) 36% are endemic and located in 26 endemic centers. Our country is very rich in faunal wealth too. The country has nearly 89,317 animal species, about 75 percent of which are insects, 4,952 vertebrates including protochordate and about 84,365 are invertebrates, including protista. In animals, the rate of endemism in reptiles is 33%, in amphibians 41%, in mammals 9%, and birds 4%.

## III. VALUE OF INDIAN BIODIVERSITY

India occupies a unique position among global biodiversity as a mega biodiversity nation. A large number of species are native to India. About 5000 species of flowering plants belonging to 141 genera and 47 families had birth in India. India is equally rich in insect, amphibia, reptiles, bird and mammalian species of great economic potential. Many of these are endemic to India, found nowhere else in the world. India is the origin place of 166 species of crop plants and 320 species of wild relatives of cultivated crops. Out of the total number of flowering plant species known in India, there are more than 4000 species used in medicines, about 3000 for food, nearly 700 as traditional religious and social purposes, about 500 yield fibre, 400 as fodder, 300 yield gum and about 100 species are used to extract essential oils and scents.

India is rich in marine biodiversity among the coastline of 7500 km with exclusive economic zone of 202 million km<sup>2</sup>, supporting the most productive ecosystems such as mangroves, coral reefs, estuaries, lagoons and backwaters. Endemic species of both plants and animals are mostly found in North-East, Western Ghats and Andaman and Nicobar Islands. About 33% of Indian endemic species belong to flowering plants. Among animals, 135 genera have been reported as endemic, of which 85 are found in North-East India. Birds, representing about 14% of global avian fauna show relatively high endemism. Among reptiles, 50% lizards are endemic, whereas 62% of amphibians are endemic, mostly in Western Ghats, Marine sediment worms, sponges and mayflies show high endemism.



#### IV. DIFFERENT THREATS TO THE BIODIVERSITY

The various habitats found on Earth, including forests, mountains, rivers, seas, deserts, marshlands, and grassy plains, are uniquely adapted to the organisms that inhabit them. However, alterations to an ecosystem's surrounding conditions can be fatal to its indigenous flora and fauna, and regrettably, this is occurring far too quickly these days. A great number of species are in danger of going extinct. The state of biodiversity loss in India is equally concerning. The nation's tropical forests are declining at a pace of roughly 0.6% year. In 175 years, all closed tropical forests would vanish if this continued unchecked. Numerous indigenous species call these woodlands home, and they will perish with the forest. According to Botanical Survey of India, about 6000 plant species belonging to over 41 genera of 47 families of angiosperms are endemic. Biodiversity is declining rapidly due to factors such as habitat alteration and destruction by the land use change, over exploitation of biological resources, climate change, pollution and invasive species.

##### 1. Alteration and destruction of habitat

Overall, the main factor directly driving biodiversity loss worldwide is habitat alteration and destruction. Habitat destruction renders entire habitats functionally unable to support the species present in the habitat. Biodiversity reduced in this process when existing organisms in the habitat are displaced or destroyed (Ayoade et al., 2009; Agarwal et al., 2011). The natural habitat may be destroyed by man for his settlement, grazing grounds, agriculture, mining, industries, highway construction, drainage, dam building, etc. because of this; the species must adapt to the changes, move elsewhere or may succumb to predation, starvation or disease and eventually die. This is the most pervasive threat to birds, mammals and plants affecting 89% of all threatened birds, 83% of the threatened animals assessed. In our country, several rare butterfly species are facing extinction with the uncannily swift habitat destruction of the Western Ghats. Of the 370 butterfly species available in the Ghats, up to 70 are at the brink of extinction.

##### 2. Hunting and Poaching

People have sought for food since the beginning of time. Wild animals are hunted for their goods on a commercial basis, including fur meat, tusks, hides and skins, medicines, cosmetics, and decorations. For instance, tigers are killed in India for their bones and skin, jackals are pursued for their lucrative fur trade in Kashmir, musk deer are hunted for their musk (which has therapeutic value), elephants are hunted for their ivory, and rhinos are hunted for their horns. Whale hunting is one of the most well-known commercial hunts. Combs and other goods are manufactured from whalebone, sometimes known as "baleen."

Poaching of the Indian tiger has been risen because of the increasing demand from pharmaceutical industries, which consume the bones of 100 tigers per year. Such huge demand has been met by poachers from India. Even the Project tiger Programme failed to check poaching and resultantly the tigers have been almost disappeared from Ranthambore Ph ton eBooks 6and Keoladeo national parks. Smuggling of tiger bones and skins is a lucrative business. Hunting for sport is also a factor for loss of wild animals.

##### 3. Over-exploitation

Increasing human population has escalated the use of natural resources. Methods of harvesting have been dramatically modified to have maximum gains. Overexploitation of resources also occurs when a commercial

market develops for a previously unexploited or locally used species. Overexploitation remains a serious threat to many species, such as marine fish and invertebrates, trees, and animals hunted for meat. The grazing pressure on most of the high-altitude grasslands of the Uttarakhand state both from migrant and local communities, is the extensive extraction of medicinal herbs in these areas resulting in their over exploitation (Rawat, 1998). Worldwide, collections of plants and animals are made for zoos and biological labs for scientific and medical study and research. For example, because of their morphological, genetic, and physiological similarities to humans, primates like chimpanzees and monkeys are slaughtered for scientific purposes.

#### **4. Climate change**

This is of great concern especially when global CO<sub>2</sub> increases in the atmosphere resulting to global warming. By the end of the century, climate change and its impacts may become the main direct driver of overall biodiversity loss.

#### **5. Pollution**

In the last fifty years, pollutants both organic and inorganic have come to light as a major contributing factor to the decline of biodiversity in freshwater, aquatic, and terrestrial ecosystems. Particularly harmed are the biotic elements of the coastal and estuary ecosystems by water pollution. Aquatic ecosystems are disrupted when toxic wastes find their way into water bodies, upsetting the food chain. The plant and animal species are negatively impacted by insecticides, pesticides, sulphur dioxide, nitrogen oxides, acid rain, ozone depletion, and global warming. A deterioration in certain oceanic coral reef ecosystems was caused by changes in temperature. The extinction of wildlife is also a result of noise pollution. Arctic whales are thought to be in danger of going extinct due to increased ship noise, especially from ice breakers and tankers, according to a study.

#### **6. Invasion of species**

This may be an accident or a deliberate action. An ecosystem's structure will alter when new species are added. Introduced species are living things that emerge in regions/environments that they had not before been as contaminants of a biological kind. Several of the ecological effects of the invasion consist: out competence, hybridization, and disturbance of the natural environment, pathogenic plants factors, the spread of disease, the breaking up of food webs, and in certain cases, extinction. Certain species may be purposefully added for aesthetic reasons, farming, spotting and hunting operations, biotechnology for both commercial and scientific purposes.

### **V. BIODIVERSITY CONSERVATION**

The biodiversity is support system of life. It provides the food, drink, and oxygen that organisms need to survive. Wetlands remove pollutants from water, plants and trees absorb carbon dioxide to slow down global warming, and fungi and bacteria break down organic matter to fertilise the soil. The goal of biodiversity conservation is to preserve all kinds of life on Earth and maintain the health and function of natural ecosystems. This includes preserving, enhancing, recovering, and using biological diversity's constituent parts in a sustainable manner. Whereas conservation, which includes both protection and exploitation, is the sustainable use of resources and, one facet of conservation is preservation, which is the act of preserving something without making any changes to it. Sustainable development is another intricate aspect of biodiversity

conservation. This refers to development that meets the needs of the current generation without compromising the ability of future generations to meet their needs.

## VI. BIODIVERSITY CONSERVATION STRATEGIES

Given that biodiversity impacts all living things on Earth and is heavily impacted by human activity, it is imperative that all nations and groups share the responsibility of safeguarding it. The Convention on Biological Diversity (CBD) in this particular setting (signed in 1992) was motivated by the increasing global dedication to sustainable growth. It is a significant advancement for the preservation of biological variety, the responsible use of its constituent parts and the just and equal distribution of any advantages that result via the application of genetic resources. One of the first countries to sign the UN CBD was India. The following were the legal measures in place to preserve biodiversity before CBD.

- ◆ Indian Forest Act, 1927
- ◆ Wildlife (Protection) Act 1972
- ◆ Forest (Conservation) Act 1980

Indian Forest Act 1927 and Forest (Conservation) Act conservation of forest land respectively. Wildlife (Protection) Act 1972 is for the protection of wild animals, birds and plants, and basically aims at protecting, propagating or developing wildlife or its environment through national parks, sanctuaries etc. Besides, the Act has a provision to prohibit picking and uprooting of specified plants.

To conserve rare and threatened species it is necessary to protect their natural habitats and specific measures are taken to prevent their unplanned exploitation and illegal trade. The two known methods of conservation, namely In-situ (conservation in its natural habitat) and ex-situ conservation (conservation outside the natural area).

### ❖ In-situ conservation

This is the conservation of genetic resources through their maintenance within natural or even human made ecosystem in which they occur. Natural habitats are declared as protected areas. This system of protected areas include different categories such as -

- Biosphere Reserve
- National Parks
- Wildlife Sanctuaries
- World Heritage sites/ Sacred Groves/National Monuments/Cultural Landscapes

### ❖ Ex-situ conservation

This is the conservation outside their habitats, which includes

- Botanical Gardens/Arboreta/Herbal Gardens
- Seed (Germplasm) Banks
- Pollen Banks/Semen Banks/Ovum Banks
- Biotechnology use (Tissue culture, genetic engineering etc.)

Despite population pressure on land, India has more than 600 Protected Areas, covering approximately 5% of the total geographical area of the country, in a network of National Parks, Wildlife Sanctuaries, and Conservation Reserves. India has special programmes for some high-profile endangered species like tigers and elephants. In 2010, the country level status assessment for tigers showed an increase in their number to an

estimated 1706 from an estimated 1411 in the year 2006. Subsequent to becoming a party to the CBD, India has taken the following steps towards maintenance of biodiversity.

India has passed and notified the Biological Diversity Act, 2002. The act primarily addresses access to genetic resources and associated knowledge by foreign individuals, institutions or companies, to ensure equitable sharing of benefits arising out of the use of these resources and knowledge to the country and the people. As per the provision of the Biological Diversity Act 2002, a National Biodiversity Authority has been set up at Chennai on 1st October, 2003 to facilitate implementation of the Act. In compliance with the provisions of the Act, states have formed State Biodiversity Boards and at local level, Biodiversity Management Committees have been formed. India chaired the Group of Like Minded Mega diverse Countries (LMMCs) for a period of two years (March, 2004 to March, 2006). India played an important role in the development of a common position of LMMCs for the negotiations for developing an international regime on access and benefit sharing.

Subsequent to the approval of the National Environment Policy (NEP) by the Cabinet in 2006, National Biodiversity Action Plan (NBAP) was approved in November 2008 to augment natural resource base and its sustainable utilization.

In the recent past, India has taken the following steps in the direction of biodiversity conservation.

India has recently ratified the Nagoya Protocol and formalized the commitment to it. The Nagoya Protocol on access and benefit sharing has been negotiated under the aegis of CBD, and adopted by the Tenth Conference of Parties (COP-10) held in Nagoya, Japan in October 2010. The Nagoya Protocol would contribute to fair and equitable sharing of benefits ensuing from utilization of genetic resources would act as incentive to biodiversity-rich countries and their local communities to conserve and sustainably use their biodiversity.

India has, for the first time, hosted the 11th Conference of Parties (CoP-11) to the Convention on Biological Diversity. This is also the first such Conference since the launch of the United Nations Decade of Biodiversity in 2011.

At the CoP-11, India has launched the Hyderabad Pledge and announced that our Government will earmark a sum of US\$ 50 million during India's presidency of the Conference of Parties to the Convention on Biological Diversity to strengthen the institutional mechanism for biodiversity conservation in India. India will use these funds to enhance the technical and human capabilities of our national and state-level mechanisms to attain the Convention on Biological Diversity objectives.

India has also earmarked funds to promote similar capacity building in developing countries. In recent years there has been concern that this public knowledge may become restricted in its use property system. India has tried a unique approach to protection of traditional knowledge by establishing a Traditional Knowledge Digital Library. This database has 34 million pages of information in five international languages in formats easily accessible by patent examiners. This Library promotes the objectives of the Nagoya Protocol on the issue of protection of codified traditional knowledge systems such as the celebrated Ayurveda. India decided to build this knowledge database because of the patent on the use of 'neem' extract in Europe and another on the use of 'turmeric' as a healing agent. Since then, because of this database, over 1000 cases of biopiracy have been identified and over 105 claims withdrawn or cancelled by patent offices.

Many development schemes have been realigned to provide biodiversity-related benefits. This is vital to protect habitats, including our water bodies, which are beyond our protected areas. The Mahatma Gandhi National Rural Employment Guarantee Scheme, for example, aims to create legally mandated green jobs for every rural household in our country.

## VII. CONCLUSION

It is essential to recognise that biodiversity is a very broad, intricate, and interrelated phenomenon, and that diversity has no one overarching impact on stability or productivity. The environmental context and the time frame over which the impacts are realised will have a significant impact on Studies are conducted on the effects. Nonetheless, it is now clear that biodiversity is significant. both naturally occurring and managed ecosystems, even while the proportional contributions of diversity and composition is still unknown. Therefore, it is imperative that lawmakers comprehend the fundamental research in order to preserve diversity as it exists today. It seems likely that we will lose many significant species and that the world's ecosystems may never recover if current patterns of resource management and population growth continue.

In present review paper the various conservation strategies by government, voluntary organizations, public participation as well as the individual efforts have been discussed, that how they commutatively plays a major role for the conservation of the biodiversity.

Humans are merely another species of nature, and they shouldn't be incompatible with other living things. It is morally wrong for us to damage the environment and other living things. All plants and animals should be treated with kindness. Each person can make a little but nonetheless substantial work in the fight to preserve biodiversity and save the world.

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# Cost, Return and Profitability Structure of bWheat and Pearl millet Production in Rajasthan, India

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## ABSTRACT

The cost of cultivation of crops is an important economic indicator for framing the agricultural policies by Government of India. The present investigation was conducted on economics of cost of cultivation and return of wheat and pearl millet in Rajasthan. The study used the cost of cultivation data for the period from 2000-01 to 2015-16 compiled from various sources and publications for profitability analysis of wheat and bajra crop. In total cost of wheat crop, Cost C<sub>3</sub> was increased from Rs. 22323.18 to Rs.55444.59 during the study period with 148.37 per cent increase. Net income of farmer at Cost A<sub>2</sub> and at Cost C<sub>2</sub> showed that farmer's income were increasing and return per rupee invested (A<sub>2</sub> cost) increased from 2.78 in TE 2003 to 3.05 in TE 2015 with 9.77 per cent increase. Thus, the wheat crop is profitable to the farmers on all kinds of parameters during the study period. Total cost of per hectare production of pearl millet increased from Rs. 6472.79 to Rs. 23229.24, which showed 258.87 Per cent increase. Pearl millet gross income has increased from Rs.7445.55/ha to Rs. 22098.64/ha between TE 2003 to TE 2015 with 196.80 per cent increase in gross returns. Net income at Cost A<sub>2</sub> increasing and net income at Cost C<sub>2</sub> decreasing during TE 2003 to TE 2015. Return per rupee invested (A<sub>2</sub> cost) decreased from 3.69 in TE 2003 to 2.82 in TE 2015 with -23.59 per cent decrease in return per rupee invested during the study period.

**Keywords :** Cost, Return, Wheat, Pearl Millet And Income

## Introduction

The Indian economy has undergone structural changes over time, with the anticipated decline of the share of agriculture in the gross domestic product (GDP). Despite a fall in its share from 55.1 per cent in 1950-51 to 13.9 per cent in 2015-16, the importance of agriculture has not diminished for two major reasons. Firstly, the country has achieved self-sufficiency in food grain production at the macro level, but still it is a food deficit country facing massive challenges of high prevalence of malnourished children and high incidence of rural poverty. The pressure on agriculture to produce more and to raise farmers' income is high. Secondly, the dependence of the rural workforce on agriculture for employment has not declined in proportion to the sectoral contribution to GDP. This has resulted in widening the income disparity between the agricultural and non-agricultural sectors. In general, the experiences of developed countries showed that there was a transfer of labour force from agriculture to non-agriculture and to manufacturing sector. This had brought enhanced

productivity growth in agriculture and hence higher income .Under these circumstances, higher growth in agriculture assumes great importance and is a matter of concern for policy planners and research scholars in recent times (Balakrishnan *et al.* 2000).

The productivity of various crops show that there exists a large yield differences from country to country, state to state, district to district, village to village, farm to farm and finally plot to plot. The important factors responsible for productivity differences at various levels are physical, natural, economical and sociological in nature. Moreover, the differential impact of new technology, for whatever reason, has further increased the inter-regional as well as the inter-farm disparities in agriculture productivity. Technological and input use differentials, which together contributed to the total productivity difference of crop. (Basavraj *et al.*;1990) .The cost of cultivation of crops is an important economic indicator for framing the agricultural policies by Government of India. Cost of cultivation of an agricultural commodity is the total expenditure incurred on various inputs that are used in the production of the commodity. (Verma *et al.* ; 2016) Accurate measurement of all the components of costs is, thus, of crucial importance for correct assessment of cost of cultivation for any agricultural commodity.

## MATERIALS AND METHODS

The study used the cost of cultivation data for the period from 2000-01 to 2015-16, which was compiled from various published sources. In the present study, the cost C2 was considered for computing the profitability. Cost C2 in CCPC data covers all the variables and fixed costs. Cost of cultivation of selected crops of the Rajasthan state is carried out and the items of cost of cultivation covers following costs.

The cost concepts and the items of costs included under each concept used in the study are given below:

### *Cost A1:*

- i) *Value of hired human labour*
- ii) *Value of hired bullock labour*
- iii) *Value of owned bullock labour*
- iv) *Value of owned machinery labour*
- v) *Hired machinery charges*
- vi) *Value of seed (both farm produced & purchased)*
- vii) *Value of insecticides and pesticides*
- viii) *Value of manure (owned and purchased)*
- ix) *Value of fertilizers*
- x) *Depreciation on implements and farm bulidings*
- xi) *Irrigation charges*
- xii) *Land revenue, cesses and other taxes*
- xiii) *Interest on working capital*
- xiv) *Miscellaneous expenses (artisans etc.)*

*Cost A2: Cost A1 + rent paid for leased-in land.*

*Cost B1: Cost A1 + interest on value of owned fixed capital assets (excluding land)*

*Cost B2: Cost A2 + Rental value of owned land (net of land revenue) and interest on value of owned fixed capital asset (excluding land)*

*Cost C1: Cost B1 + Imputed value of family labour*

*Cost C2: Cost B2 + Imputed value of family labour*

*Cost C3: Cost C2 \*+ 10 per cent of Cost C2\* to account for managerial input of the farmer.*

**Income measures:** Following income measures were calculated –

**(a) Gross income (GI):** It is the value of main product –

$$GI = (Q_m \times P_m)$$

Where,

GI = Gross income

GI = Gross income

$Q_m$  = Quantity of main product

$P_m$  = Price of main product

**(b) Returns over variable cost (RVC):**

$$RVC = \text{Gross income} - \text{Cost } A_1$$

**(c) Farm business income (FBI):**

$$FBI = \text{Gross income} - \text{Cost } A_2$$

**(d) Family labour income (FLI) or returns to family labour:**

$$FLI = \text{Gross income} - \text{Cost } B_2$$

**(e) Farm investment income (FII):**

$$FII = \text{Gross income} - (\text{Cost } A_2 + \text{imputed value of family labour})$$

**(f) Returns to management (RM):**

$$RM = \text{Gross income} - \text{Cost } C_2$$

**(g) Returns per rupee (RPR):**

$$RPR = \frac{\text{Gross income/ha}}{\text{Cost } A_2/\text{ha}}$$

## RESULTS AND DISCUSSION

### Cost of Cultivation and Cost of Production of Wheat

The estimates of different costs incurred in wheat cultivation and production are given in Table 1

Cost of cultivation of wheat refers to total expenses incurred in cultivation on one hectare of land. Cost  $A_1$  is called as direct cost because this cost covers all expenses paid by the farmer in cash and kind which accounted for Rs.9552.42 and Rs.21880.43 during TE 2003 and TE 2015 respectively. Cost  $A_2$  includes cut of pocket cost of farmer, rent paid for leased –in land value which showed 125.59 per cent increase during the study period. Cost  $B_1$  was Rs. 11429.35 / ha in TE 2003 and Rs.25926.13 /ha in TE 2015. Cost  $B_1$  showed 126.84 per cent increase between TE 2003 to TE 2015 which included direct costs plus interest on working capital (excluding land). Because cost of cultivation increased with increase in level of adoption of new technology and increased input prices. It included use of machinery, family and hired labour, seeds and fertilizers. Cost  $C_2$  included the actual expenses incurred in cash and in kind by the farmer, interest on value of owned capital assets, rental value of land and imputed value of family labour. Cost  $C_2$  showed 148.37 per cent increase during the study period. Cost  $C_3$  which is called as total cost covers all the component of Cost  $C_2$  and adds 10 per cent of Cost  $C_2$  on account of managerial functions performed by farmer. Which was increased from Rs. 22323.18 to Rs.55444.59 during the study period with 148.37 per cent increase.

Cost of production was calculated by estimating all the costs which are incurred in producing one quintal of production or output. It included material costs, rent cost, wage cost, interest cost and normal profit of the entrepreneur as per different cost concepts. From the above table it could be seen that Rs. 227.83 in TE 2003 and Rs.479.52 in TE 2015 was spent as cash expenses (Cost  $A_1$ ) for producing one quintal of cotton. If all the



actual and imputed costs are considered for hired and owned resources both, then the cost of production was Rs.530.25 per quintal in TE 2003 which increased to Rs. 1248.86 per quintal in TE 2015.

### **Income from Wheat Cultivation**

Table 2 showed gross and net income per hectare from wheat cultivation to the farmers.

Gross income of wheat cultivation has increased from Rs. 27378.01/ha to Rs. 67796.52/ha between TE 2003 to TE 2015 due to use of improved technology like timely sowing , quality seed ,use of machinery etc. which showed 147.63 per cent increase in gross returns. Gross income comprised of value of main produce and by produce of wheat. Value of main produce increased from Rs.21875.74 per hectare to Rs.54395.22 per hectare along with 148.66 per cent increase in value of main produce. Value of by-product increased from Rs. 5502.27 to Rs.13401.30 per hectare, which showed 143.56 per cent increase in value of by-product between TE 2003 to TE 2015.Net income at Cost A<sub>2</sub> showed 160.00 per cent increase in income during the study period and net income at Cost C<sub>2</sub> showed 734.48 per cent change during TE 2003 to TE 2015. Net income of farmer at Cost A<sub>2</sub> and at Cost C<sub>2</sub> showed that farmer's income were increasing during the study period.

### **Income Measures of Wheat Cultivation**

A comparison of various income measures of wheat cultivation in Rajasthan are given in Table 3. Income measures act as the indicators which gave correct income expenditure statement of the crop and also that crop was profitable or not to the farmer.

The income measures revealed that returns over variable cost increased from Rs.17825.59 to Rs. 45916.09 during the study period. As the variable cost incurred on the purchase of inputs like seed, fertilizer, manure and irrigation charges etc. and return over variable cost assess the revenue of the crop over its costs. Farm business income which shows returns over fixed capital including owned land and family labour remained positive and showed increment of 160.00 per cent over the study years. The family labour income per hectare from wheat cultivation increased from Rs. 11251.03 in TE 2003 to Rs. 30425.11 in TE 2015. The farm investment income which is the return to fixed capital including land showed definite increased trend with 145.51 per cent increase during the study years. Return per rupee invested (A<sub>2</sub> cost) increased from 2.78 in TE 2003 to 3.05 in TE 2015 which showed 9.77 per cent increase in return per rupee invested during the study period. Thus, the wheat crop is profitable to the farmers on all kinds of parameters.

### **Pearl millet**

#### **Cost of Cultivation and Cost of Production of Pearl Millet**

The estimates of different costs incurred in pearl millet cultivation and production are given in Table 4.

Cost of cultivation of pearl millet refers to total expenses incurred in cultivation on one hectare of land. Cost A<sub>1</sub> which denotes the cut of pocket cost of the farmer because this cost covers all expenses paid by the farmer in cash and kind which accounted for Rs.1992.54 and Rs.7827.89 during TE 2003 and TE 2015 respectively. Cost A<sub>2</sub> includes cut of pocket cost of farmer, rent paid for leased in land value which showed 288.42 per cent increase during the study period. Cost C<sub>2</sub> included the actual expenses incurred in cash and in kind by the farmer, interest on value of owned capital assets, rental value of land and imputed value of family labour. Cost C<sub>2</sub> showed 258.87 per cent increase during the study period. Cost C<sub>3</sub> which is called as total cost covers all the component of Cost C<sub>2</sub> and adds 10 per cent of Cost C<sub>2</sub> on account of managerial functions performed by farmer. Which was increased from Rs. 7120.06 to Rs.25552.15 during the study period with 259.77 per cent increase.

Cost of production was calculated by estimating all the costs which are incurred in producing one quintal of production or output. It included material costs, rent cost, wage cost, interest cost and normal profit of the

entrepreneur as per different cost concepts. From the above table it could be seen that Rs. 124.69 in TE 2003 and Rs.389.78 in TE 2015 was spent as cash expenses (Cost A<sub>1</sub>) for producing one quintal of pearl millet. If all the actual and imputed costs are considered for hired and owned resources both, then the cost of production was Rs. 439.41 per quintal in TE 2003 which increased to Rs. 1278.29 per quintal in TE 2015.

### Income from Pearl Millet Cultivation

Table 5 showed gross and net income per hectare from pearl millet cultivation to the farmers.

Gross income of pearl millet cultivation has increased from Rs.7445.55/ha to Rs. 22098.64/ha between TE 2003 to TE 2015 due to use of improved technology like timely sowing , quality seed ,use of machinery etc. which showed 196.80 per cent increase in gross returns. Gross income comprised of value of main produce and by produce of pearl millet. Value of main produce increased from Rs.3933.23 per hectare to Rs.11649.76 per hectare along with 196.19 per cent increase in value of main produce. Value of by-product increased from Rs. 3512.31 to Rs.10448.88 per hectare ,which showed 197.49 per cent increase in value of by-product between TE 2003 to TE 2015.Net income at Cost A<sub>2</sub> showed 162.36 per cent increase in income during the study period and net income at Cost C<sub>2</sub> showed -16.22 per cent decrease during TE 2003 to TE 2015.

### Income Measures for Pearl Millet Cultivation

A comparison of various income measures from pearl millet cultivation in Rajasthan are given in Table 6. Income measure provide exact financial position that famer has gained by deducting expenses occurred for cultivation of the crop.

The income measures revealed that returns over variable cost increased from Rs. 5453.01 to Rs. 14270.75 during the study period. As the variable cost incurred on the purchase of inputs like seed, fertilizer, manure and irrigation charges etc. and return over variable cost assess the revenue of the crop over its costs. Farm business income which shows returns over fixed capital including owned land and family labour remained positive and showed increment of 162.69 per cent over the study years. The family labour income per hectare from pearl millet cultivation increased from Rs. 3445.17 in TE 2003 to Rs. 11772.06 in TE 2015. The farm investment income which is the return to fixed capital including land showed definite increased trend with 267.77 per cent increase during the study years. Return per rupee invested (A<sub>2</sub> cost) decreased from 3.69 in TE 2003 to 2.82 in TE 2015 which showed -23.59 per cent decrease in return per rupee invested during the study period. Thus pearl millet cultivation was not profitable to the farmers on return per rupee invested.

**Table 1: Cost of Cultivation and Cost of Production of Wheat**

Sr.no	Costs	Cost of cultivation (Rs./Hectare)			Cost of production (Rs./ quintal)		
		TE 2003	TE 2015	Per cent change	TE 2003	TE 2015	Per cent change
1	Cost A <sub>1</sub>	9552.42	21880.43	129.06	227.83	479.52	110.48
2	Cost A <sub>2</sub>	9841.99	22202.08	125.59	234.04	486.31	107.79
3	Cost B <sub>1</sub>	11429.35	25926.13	126.84	271.62	566.83	108.69
4	Cost B <sub>2</sub>	16126.98	37371.41	131.73	383.62	814.02	112.19
5	Cost C <sub>1</sub>	15596.17	38958.90	149.80	370.04	856.15	131.36
6	Cost C <sub>2</sub>	20293.80	50404.18	148.37	482.05	1103.34	128.89
7	Cost C <sub>3</sub>	22323.18	55444.59	148.37	530.25	1248.86	135.52

**Table 2: Gross and Net Income per Hectare from Wheat Cultivation**

Sr.no	Items	TE 2003	TE 2015	Per cent change
1	Value of Main Product (Rs./Hectare)	21875.74	54395.22	148.66
2	Value of By- Product (Rs./Hectare)	5502.27	13401.3	143.56
3	Gross income (Rs./Hectare)	27378.0	67796.52	147.63
4	Net income at Cost A <sub>2</sub>	17536.02	45594.44	160.00
5	Net income at Cost C <sub>2</sub>	2084.21	17392.34	734.48

**Table 3: Return from Cultivation of Wheat Crop per Hectare**

(Rs./hectare)

Particulars	TE 2003	TE 2015	Per Cent Change
Returns over variable cost	17825.59	45916.09	157.59
Farm business income	17536.02	45594.44	160.00
Family labour income	11251.03	30425.11	170.42
Farm investment income	13369.2	44921.76	236.01
Return to management	7084.21	17392.34	145.51
Return per rupee (Cost A <sub>2</sub> )	2.78	3.05	9.77

**Table 4 : Cost of Cultivation and Cost of Production of Pearl Millet**

Sr.no	Costs	Cost of cultivation (Rs./Hectare)			Cost of production (Rs./ quintal)		
		TE 2003	TE 2015	Per cent change	TE 2003	TE 2015	Per cent change
1	Cost A <sub>1</sub>	1992.54	7827.89	292.86	124.69	389.78	212.59
2	Cost A <sub>2</sub>	2020.00	7846.04	288.42	125.91	390.59	210.21
3	Cost B <sub>1</sub>	2745.45	10326.58	276.13	167.60	494.89	195.28
4	Cost B <sub>2</sub>	4000.38	14011.50	250.25	241.22	680.67	182.17
5	Cost C <sub>1</sub>	5217.86	19544.31	274.57	317.83	944.85	197.28
6	Cost C <sub>2</sub>	6472.79	23229.23	258.87	391.45	1130.61	188.82
7	Cost C <sub>3</sub>	7120.06	25552.15	259.77	439.41	1278.29	190.91

**Table 5: Gross and Net Income per Hectare from Pearl Millet Cultivation**

Sr.No	Items	TE 2003	TE 2015	Per Cent Change
1	Value of Main Product (Rs./Hectare)	3933.23	11649.76	196.19
2	Value of By- Product (Rs./Hectare)	3512.32	10448.88	197.49
3	Gross income (Rs./ha)	7445.55	22098.64	196.80

4	Net income at Cost A <sub>2</sub>	5425.55	14252.6	162.36
5	Net income at Cost C <sub>2</sub>	972.76	-1130.59	-16.22

**Table 6: Return from Cultivation of Pearl Millet Crop per Hectare  
(Rs. /hectare)**

Particulars	TE 2003	TE 2015	Per Cent Change
Returns over variable cost	5453.01	14270.75	161.70
Farm business income	5425.55	14252.6	162.69
Family labour income	3445.17	11772.06	241.70
Farm investment income	2953.14	10860.91	267.77
Return to management	972.76	-1130.59	-216.22
Return per rupee (Cost A <sub>2</sub> )	3.69	2.82	-23.59

### Conclusions

Cost, returns and profitability of barley and maize cultivation was analysed by using CACP data In Rajasthan. Different costs affect wheat and pearl millet returns and profitability. In this study, some important costs were taken into account to calculate economics of selected crop. Return per rupee invested in wheat crop was increased during the study period. Return per rupee invested was decreased during the study period. Return per rupee invested was not profitable for pearl millet. There should be better pricing and procurement policy for all the crops grown by the farmers.

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# An Overview of Poultry industry in and after Covid-19 in India

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## ABSTRACT

Covid-19 pandemic after its first outbreak in Wuhan, China in the late 2019, became a threat to the entire world affecting all sectors associated with human economy and health. The effects were more severe than moderate. Like all other sectors, poultry industry was badly hit by the flood called covid-19. This industry was destroyed due to the uncontrolled rumors spread across social media platforms in the early period of the pandemic. It was speculated that consumption of poultry, eggs and meat brings corona virus infection. This misinformation brought over 70% loss in egg market but the poultry industry was back on track after the authorities world over like World Health Organization (WHO) clarified that this outbreak is not spread through chicken or any other non vegetarian food consumption. This is an overview which documents how the poultry industry in the country was affected in the initial period of the outbreak and what were the factors which turned out to be boost for the industry.

## Introduction:

The covid-19 outbreak has affected more than 200 countries across the world. There have been 540,923,532 confirmed cases and 6,325,785 deaths across the world <sup>(1)</sup>. India is also one the most affected countries in the world. There are a total of 4,34,07,046 confirmed cases while there are 5,25020 deaths so far <sup>(1)</sup>. Poultry industry is a fast growing sector in India. With an annual production increasing by 8-10% per year, India now stands at the third position after China and United States in egg production and as far as the broiler production is concerned, India is ranked fourth in the world after China, Brazil and United States <sup>(2)</sup>. There are several factors which helped India to reach to this position like increasing population, increase in per capita income and cheap prices. In just 40 years, India's poultry industry has transformed into a major commercial activity. But, despite being placed at the fifth rank worldwide, consumption of poultry products like eggs and poultry meat is considerably low <sup>(3)</sup>. It is found that in rural areas, it is least preferred food commodity compared to the urban areas. It has recorded as a continuous increase over years. In the year 2020, the consumption rate was 3.9 million metric tons <sup>(4, 5)</sup>. There were floods of misinformation ever since the outbreak all across the world. People feared that the virus spreads from an animal especially from poultry and meat and as a result of it; people started avoiding non-vegetarian food items <sup>(6, 7)</sup>. This belief directly affected poultry industry in India. The demand to chicken and other non-vegetarian food items decreased as low as by 80%. Chicken was available for INR 50-60/kg. Some poultry farmers were selling the chicken for free while others preferred

killing of the chickens collectively <sup>(8,9)</sup> . This has also struck egg market as it has recorded decrease in the egg prices by 15-30% across the country <sup>(5)</sup> . In light of such rumors, it was found that there no evidence recorded that novel corona virus does not spread through the food <sup>(6)</sup> . It was declared that there is still no authentic information about the spread the novel corona virus through animals or by the consumption of non-vegetarian food along with eggs. As per the recent reports, SARS-CoV-2 does not transmit from animals but it can be transmitted from an infected person to animals <sup>(7)</sup> . This authentic information turned out to be a boost for the poultry industry. Chicken is a favorite non-vegetarian food in India. It is rich in vitamin D that promotes the immune system fighting against covid-19. The supplementation of vitamin D can reduce the risk of influenza and Covid-1 <sup>(8, 9, 10, 11)</sup> . The prices are now recovered and the demand has risen. But there is another problem that the banks are not ready to lend money to the poultry farmers <sup>(4)</sup> . This may hamper the poultry industry again. The present overview documents the problems faced by the poultry industry and how it is trying to overcome.

#### **Importance of Eggs:**

Apart from having high concentrations of proteins (amino acids) and anti-oxidants, consumption of eggs and chicken increases vitamin D concentration in the body that promotes the functioning of the immune system enabling people to fight against the infection of novel corona virus. It helps in reducing the risk of influenza for many years <sup>(8, 9, 10)</sup> . The eggs also are rich in vitamin A, B and K. The eggs are enriched with vitamin B, helping the body to convert food into energy which is required by the recovering patients. Hence, eggs are nowadays prescribed for COVID-19 patients <sup>(16)</sup> .

#### **Importance of chicken:**

As a rich source of proteins, chicken helps to build muscles without excess fats. It is also rich in calcium and phosphorous keeping the bones healthy and thereby increasing the activity of the immune system positively. Along with this, chicken removes stress and makes you happy because of the presence of vitamin B5 and tryptophan. It helps in increasing sperm production and regulates testosterone levels in the body. Vitamin B6 from chickens helps in reducing the risk of heart attacks. Chicken soups have been proved to be the best remedy against cold and flu <sup>(17)</sup> .

#### **Effects on Poultry industry after Covid-19 outbreak:**

In the initial phase of the pandemic in India, the poultry industry was ruined due to the misinformation spread over the social media which speculated that the bird is a possible vector of the novel corona virus. As the doubts related to the consumption of eggs and chicken meats were cleared like there is no harm in consuming them, the poultry industry came back on track with an increase. Here are some of the major impacts of covid-19 pandemic has had on the poultry industry in India:

##### **1. Impact on selling of eggs and chicken meat:**

Chicken is the most popular and easily available non- vegetarian food item in India. In the year 2019, a total of 3.8 million metric tons of poultry meat was consumed in India <sup>(3)</sup> . But due to the rumors, people started avoiding not just but all other non vegetarian food items resulting in a sharp decline in the demand of the chicken meat and eggs. In January 2020 to March 2020, the industry has recorded a total loss of 236 million USD. The poultry meat sale went down drastically by 80 % <sup>(12)</sup> . The chicken was available in the range of INR 60-150/ kg in the retail market. There are several reports of mass culling of birds in light of the rumors. As per the data obtained by National Egg Coordination Committee (NECC), there was a decline in the prices of eggs in the country i.e. by 12-16 % <sup>(5)</sup> . It was envisaged that the poultry industry will increase by 70% compared to the sale in the pre-covid-19 level <sup>(12, 18)</sup> .

As expected, the poultry industry is now in full swing. The covid-19 patients were prescribed to have eggs as it boosts immunity. It led to high demands of eggs and chicken. Due to high demand and low availability, the chicken prices were recorded to be the highest i.e. Rs 220/kg while in the wholesale market, the price per kg was Rs 5 but in the month of November, it was around Rs 110 per kg <sup>(19)</sup> while in the month of June, it recorded an increase of 25% <sup>(20)</sup>. The prices of eggs went high as well (Rs 7/egg) while the branded eggs are sold at a price of Rs 10/egg in the retail market <sup>(21)</sup>.

## **2. Impact on employment:**

Poultry industry engages the activities like production of the poultry, poultry feed, trading of poultry feed and poultry products, logistics and export as well. Nearly 50 million jobs which are directly or indirectly associated with poultry industry are affected. The covid-19 pandemic forced lockdown in the country. The businesses were stopped increasing the debts from banks. This has led shutting down of many poultry farmers <sup>(3)</sup>.

After the restrictions of lockdown are taken back, there is some relief in the employees of poultry industry. Even if India stands at the third position in largest egg producers of the world and fourth in the largest chicken meat producers of the world, per capita consumption rate of the Indian population is considerably low. It is estimated that an increase of 1 egg or 50gm poultry meat may create 25,000 new job opportunities <sup>(22)</sup>.

## **3. Impact on the availability of poultry feed:**

The poultry industry is of a great benefit to poultry feed producing farmers; over 10 million soya and maize farmers have been benefitted. Having a total worth of USD \$16 billion, India's poultry feed industry has faced a drop of USD \$2 billion during the lockdown <sup>(23)</sup>. The outbreak of Covid-19 has also affected the poultry feed providers as well. Due to sharp decline in the demand of chickens and eggs, the poultry farmers cancelled their orders. Companies have stopped purchasing soybean and maize to prepare poultry feed <sup>(3, 12)</sup>, banks are not ready to lend money to poultry farmers <sup>(4)</sup>. With all such industries working with only 10-20% of their capacity, the feed production went down. The prices decreased by 10 to 20% i.e. before Covid-19, a quintal of feed was fetching USD \$ 47 but it gave only USD \$ 41 but it is envisioned that poultry feed industry will see growth in November <sup>(23)</sup>.

## **4. Impact on logistics:**

With a loss of USD \$ 200 million per day, the poultry industry in India was greatly impacted by the pandemic <sup>(23)</sup>. The logistics of poultry products was also affected heavily as the country was facing lockdown. The inter-state transportation of poultry meat, eggs and poultry feed was disturbed and therefore it led to shortage despite high demands. As a result of gap in the supply chains, the prices of poultry products were observed to go high. This issue of logistics was seen by 60% of the country during lockdown <sup>(12)</sup>.

## **Conclusion:**

World is currently finding it difficult to fight against SARS-CoV-2 virus. The outbreak has taken millions of lives and the subsequent lockdown has affected almost all the sectors. The poultry industry in India was also hit hard by the pandemic causing over USD \$ 200 loss per day. The current overview of the status of poultry industry in India during the covid-19 pandemic concluded that during the initial period of Covid-19 chaos, the poultry industry was shattered because of the rumors spread through the social media linking the bird with the spread of this novel corona virus. This directly affected the selling of chicken meat and eggs. Some of the poultry farmers preferred to kill their birds while others sold them almost free of its cost. The eggs were also avoided by non-vegetarian food lovers. The lockdown has affected poultry production, poultry feed, processing,



logistics etc and over 5 crore jobs which are directly and indirectly associated with the industry were at risk of losing their jobs.

But ever since the government started spreading awareness and de-linked the birds from the spread of the virus, the industry seemed to be back in the business. The prices of the chicken meat and eggs are now stable and profiting to the farmers. As the covid-19 patients and those who are recovering from Covid-19 are prescribed to eat eggs to boost immunity, the egg market has witnessed a sudden increase in the rates of the eggs which led to shortage for some time. The shortage was due to unavailability of birds, labors, logistics and high demands. But, it is believed that the poultry industry will be back in full swing in the coming future.

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# A Review on Relative Selectivity of Nimesulide

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## ABSTRACT

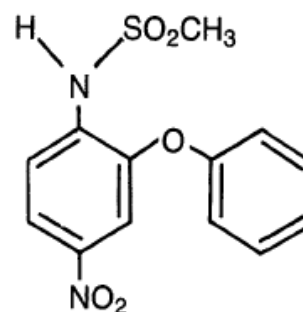
Nimesulide is a non-steroidal anti-inflammatory drug widely used drug is administered orally. It inhibits cyclooxygenase-2 (COX-2) and partial reduction in cyclooxygenase-1 (COX-1) activity therefore showing effect on gastrointestinal mucosa. Primarily increasing toxic effect on digestive system which need to have safer NSAIDs Nimesulide. Nimesulide have least comparable in efficacy, to other NSAIDs, but is better tolerated and has low potential for side effect. Due to less solubility, bioavailability issues were facing in-vivo.

**Keywords:** Nimesulide, effect, NSAIDs, anti-inflammatory, Selectivity, drugs.

## I. INTRODUCTION

Nimesulide is widely used analgesic. evidence showing that Nimesulide 200- 400mg is significantly to reduce pain, fever and inflammatory diseases. Studies shows that Nimesulide along with certain drugs antibiotics give more efficacy. Like Serrito peptidases in dental pain, mefenamic acid in dysmenorrhea, mefenamic acid in respiratory infection, benzydamine in genitourinary inflammation and paracetamol in fever. etc. About safety profile of Nimesulide as well, except has Very less incidence of gastrointestinal problems are observed. Nimesulide, effective against pain and fever in class of non-steroidal anti-inflammatory drugs However, compared with other drug, Nimusulide required more efficacy and tolerability.

Nimesulide is a NSAID drug shows antipyretic and analgesic properties. It is weakly acidic. From structure it has sulfonanilide moiety as the acidic group. They have ability to inhibit prostaglandin synthesis via inhibition of cyclo-oxygenase (COX). And this effect causes inhibition of gastroprotective prostaglandins, which leads to gastrointestinal problems. *In vitro*, it is weak inhibitor of prostaglandin synthesis shows various effects.



Structure of Nimesulide

## II. METHODS AND MATERIAL

There are five healthy fit students which are not having any disease, illness and allergy were selected as a volunteer for the study. On their own will they participate in the study. Except Nimesulide they are not taking other drugs during study.

The study was designed in three phases having interval of four weeks. The volunteers were taking orally Nimesulide 100 mg tablet. On morning 7 am the volunteers orally taking the Nimesulide, the volunteers fasted ten hours before administration of a drug and continued fasting for another two hours. Immediately taking blood samples were drawn immediately before administration of a drug and after administration of a drug 1, 6, 12, 18 and 24 hours for

assessing the production of blood prostaglandin and platelet thromboxane.

**Cyclo-oxygenase (COX-1) assay:** In glass tube the non-anticoagulated blood was collected to clot at 37° for 30 min. By centrifugation the serum was separated and thromboxane B<sub>2</sub> in the diluted serum were subjected to radio-immune assay. In the assay production of thromboxane B<sub>2</sub> shows COX-1 activity stimulated by formed thrombin.

**Cyclo-oxygenase (COX-2) assay:** 1 ml of blood along with sodium heparin were incubated in presence of lipopolysaccharide for 24 hours at human body temperature i.e. at 37°C. After centrifugation Plasma was separated and stored at low temperature. In the assay, in blood production of lipopolysaccharide-stimulated prostaglandin E<sub>2</sub> shows inducible COX-2 activity.

### III. RESULTS AND DISCUSSION

**Effects of Nimesulides on COX-1 activity:** The maximum action of Nimesulide caused during 1-5 hours after an oral administration and the maximum effect was after 6 hours. After 1 hours of an oral administration inhibitions of thromboxane B<sub>2</sub> synthesis caused by Nimesulide is partial and the effect was disappeared after 24 hours.

**Effects of Nimesulides on COX-2 activity:** Nimesulide shows maximal action at 1-5 hour. After 1 hour of oral administration the inhibitions of prostaglandin E<sub>2</sub> synthesis caused by Nimesulide 79% . After 5 hours after the oral administration of drug, the inhibitions of prostaglandin E<sub>2</sub> synthesis were: Nimesulide 81%. Nimesulide shows prolonged effect of 30% inhibition after 24 hours.

### IV. CONCLUSION

The study shows effects of Nimesulide in the blood assay, which measure of COX-1/COX-2 selectivity.

COX-1 activity determined by thromboxane B<sub>2</sub>, which is produced during blood clotting and COX-2 activity determined by prostaglandin production. It shows Nimesulide have high selectivity towards COX-2 than COX-1. This study shows when Nimesulide in a single dose of 100 mg causes 79% suppression of COX-2 and partial reduction of COX-1 activity confirming the relative selectivity of COX-2. Action of COX-1 disappeared in 24 hours but COX-2 shows prolonged which indicate interaction suggesting a different interaction of Nimesulide with the two isozymes. Good activity. Nimesulide suppress COX-2 activity compare to COX-1 activity and this give relative selectivity of COX-2.

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