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**MAHARANI LAKSHMI AMMANNI COLLEGE FOR WOMEN AUTONOMOUS**

**Affiliated to Bengaluru City University**

**Accredited by NAAC (IV cycle) with "A" Grade**

**Recognised by UGC under section 2(f) and 12 (b) of the UGC Act 1956**

**Conferred the status of college with potential for Excellence by UGC**



# SAMAGATHA 2023

SCIENCE ASSOCIATION

In collaboration with

KARNATAKA STATE COUNCIL FOR SCIENCE AND TECHNOLOGY

IISc, BENGALURU

organizes

## स्वास्थ्य परियवरण

### National Conference

**"Environmental Sustainability: New Perspectives  
and Paradigms"**

**21<sup>st</sup> June 2023**

## PROCEEDINGS

This publication contains the proceedings of the National conference on “**Environmental Sustainability: New Perspectives and Paradigms**” conducted by **Samagatha-Science Association, mLAC** in association with **Karnataka State Council for Science and Technology, IISc, Bengaluru**.

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**A top destination for young women,  
Preparing to meet the challenges of the 21<sup>st</sup> Century**

## About mLAC

- **Maharani Lakshmi Ammanni College for Women Autonomous established in 1972 has made a significant progress in the last five decades empowering women students with quality education along with instilling moral values and transforming each student into a responsible citizen.**
- **Recognized as College with Potential for Excellence – Phase I & II by UGC.**
- **Star College Status under DBT - Govt. of India.**
- **Bioinformatics Infrastructure Facility (BIF) under DBT - Govt. of India.**
- **Biotechnology Skill Enhancement Programme (BiSEP) in Clinical Research and Data Management by DBT - Govt. of India and IT-BT, Govt. of Karnataka.**
- **DST- FIST Programme for the PG Level O in Biotechnology and Biochemistry.**
- **Intellectual Property Cell in association with Karnataka State Council for Science and Technology (KSCST).**
- **Recognized by Bangalore University as Pioneer in establishment of Business lab.**
- **mLAC Autonomous re-accredited (IV cycle) by NAAC with “A” grade in the year 2022.**

## **VISION**

To empower women through education for character formation.

## **MISSION**

mLAC seeks to realize its vision by

- ❖ Focusing on providing education based on holistic and ethical values
- ❖ Facilitating an invigorating teaching and learning environment
- ❖ Fostering research culture to serve the needs of society
- ❖ Providing opportunities for selfless service to the nation
- ❖ Preparing a strong foundation for life-long learning
- ❖ Promoting cognitive, socio-emotional and behavioral skills for global citizenship

## **CORE VALUES**

- ❖ Excellence
- ❖ Integrity
- ❖ Responsiveness
- ❖ Team Work
- ❖ Inclusivity



- ❖ The 3 sky facing arrows show a peer group motivating each other to fly higher.
- ❖ It shows a synergy of strengths working together- resources, processes and vision.
- ❖ It indicates stakeholders working together- students, faculty and industry.
- ❖ The 3 colors - red, yellow and blue symbolize energy, optimism and confidence.

## Science at mLAC

- **Undergraduate programs - Physical sciences (Physics, Chemistry, Mathematics, Computer Science) & Life sciences (Botany, Zoology, Microbiology, Biotechnology, Biochemistry, Psychology).**
- **Postgraduate programs – Biotechnology, Biochemistry and Botany.**
- **Well equipped labs, highly qualified and experienced faculties.**
- **Star College Status by DBT-GoI for Life science departments and Star program for Physical science departments.**
- **Department of Physics as Nodal center to host IIRS-ISRO Outreach programs and ISRO-START.**
- **IIT-JAM and CSIR-NET Coaching program for UG and PG students.**
- **Biotechnology Research Centre recognized under Bengaluru City University and Animal house recognized under CPCSEA.**
- **Study circle for Life science to bridge the gap between industry and academia.**
- **Department Forums – platform for students to develop leadership, communication, team building and time management.**
- **Skill Oriented & Value-added courses - Bio-informatics, Nutraceuticals, Computer Aided Drug Design, Quality Control Analyst, Cosmetic Chemistry, Medical Parasitology, Medical Lab Technician, Vermiculture, Sericulture, Molecular Techniques, Clinical Biochemistry and Data Management.**

## **SAMAGATHA-Science Association**

- ❖ Initiative under DBT-Star College Program.
- ❖ With the objective of enhancing the quest for knowledge, nurturing the latest talents, and kindling the scientific temper of students, the Science association- “SAMAGATHA” organizes science fest every year to empower the goal towards knowledge of science.
- ❖ Organizing theme based intercollegiate competition, National level workshop and conferences every year to update the science fraternity about current advancements in research.
- ❖ Integrate effort of departments of Sciences that addresses not only the academic needs but also the overall perspective of scientific thinking among students and young faculties.

## **Preamble**

The conference has been organized with the objective of G20 - ‘One Earth, One Family, One Future’ and Science-20 - “Clean Energy for Greener Future”. The theme proposed for the fest “Environmental Sustainability” is to emphasize on the sustainability of life. This conference will be a platform for students, research scholars and academicians to interact and address the Sustainability Science in a holistic perspective.

We hope that this conference aims to improve the quality of life on earth’s ecosystem, to maintain an ecological balance and conserve our natural resources to support the well-being of current and future generations. It addresses the Sustainability Science in a holistic perspective. This conference provide platform for students, research scholars and academicians to interact and address the Sustainability Science in a holistic perspective.

**Dr. Nagalaxmi B.N.**

Principal, mLAC



## ***Foreword***



I am happy to learn about the **National Conference** on "**Environmental Sustainability: New Perspectives and Paradigms**" organized by mLAC science Association.

The need to conserve natural resources and reduce pollution is an important concern of all nations. Environmental degradation on account of over exploitation and mindless consumerism has led to an alarming rise of world temperature causing havoc.

The ancient rishis of India were conscious of this pious obligation to maintain harmony among all elements and taught us to respect and revere the environment.

Bhagawan Sri Krishna in Chapter 5 verse 25 of Bhagawat Gita explains how seers attain peace or moksha. He says

**" Labhante brahma-nirvanam rushayah ksheena kalmashaha  
Chinnadvaidha yatatmanaha SARVA BHUTA HITE RATHAHA."**

Seers who have been purged of their sins and whose doubts have been dispelled by knowledge; whose disciplined minds are firmly established in God and WHO ARE DEVOTED TO THE WELFARE OF ALL BEINGS, attain Brahma, which is Peace.

Our scriptures emphasize on the need to be considerate to every living being and the environment.

May the conference be a glorious success.

**Shri S. S. Naganand**  
*Chairman, mLAC*

## ***Foreword***



Embarking on the legacy of empowering women from last 5 decades, the vision of institution is well articulated by the teaching and student community at mLAC.

Associations such as **Samagatha** and its theme-based events have indeed escalated the interest in basic sciences amongst today's generation.

The theme of the conference on environmental sustainability is the need of the day and will have an impact in instilling values to sustain and save natural resources and orient them to think concepts with subtle exploitation of earth but still progressively serve the needs of life.

I wish all the best to the organizing team, student volunteers and hope the outcome to be magnanimous.

**Shri. K. Jairaj, IAS (Retd.)**  
***Managing Trustee, mLAC***

## *Foreword*



I am happy that KSCST in collaboration with Maharanis Lakshmi Ammanni College for Women Autonomous is organizing “**SAMAGATHA 2023**” a two days Intercollegiate Science Fest and National Conference on “**Environmental Sustainability: New Perspectives and Paradigms**” on 21<sup>st</sup> June 2023 at MLACW, Bengaluru.

Environmental sustainability is a broad conceptualization around the globe. It is a practice that maintains a condition without harming the environment by means of reducing, reusing, and recycling. In a modernized world science plays a major role in understanding the natural process that affects the sustaining capacity, science and technology can provide the information needed for environmentally sound development. To maintain sustainability in the future, we have to focus and adopt principal pillars of the economy, society, and environment on the intersection of sustainability, environment, and technology and their larger implications for corporations, government, institutions, regions, and society.

In the present era of globalization, an integrated approach to development is the only possible course for sustainability. The main agenda to maintain sustainable development is to end hunger, achieve food security, control waste management, affordable low-cost housing, women empowerment in S&T, and technological advancements in the field of agriculture.

Organizing a national conference with the objective of enhancing the quest for knowledge, nurturing young talents, and kindling the scientific temper of students, Research Scholars and young faculty is appreciable and commendable.

I express my gratitude to Maharanis Lakshmi Ammanni College for Women for organizing such a national conference and hope this National Conference will help the students and research scholars to understand and strive towards developing a sustainable environment. I wish all the best to the organisers and the student participants for the National Conference.

**Dr. U.T. Vijay**

*Executive Secretary, KSCST*

## ***Foreword***



It is my great pleasure to be a patron for the National Conference organized under the banner of the **Samagatha 2023-Science Association** on **21<sup>st</sup> June 2023** at **mLAC**.

Samagatha- an initiative under the DBT-Star college program organizes theme-based intercollegiate competitions, National level workshops and conferences every year to update the science fraternity about the current advancements in the field of scientific research.

With the objective of G20- ‘**One Earth, one family, One future**’ and Science-20-‘**Clean Energy for Greener Future**’, the theme opted for the intercollegiate fest and National conference this year is *Swasthira Pariyavaran: “Environmental Sustainability: New Perspectives and Paradigms”* to emphasize on the environmental sustainability.

The conference particularly encourages the interaction of researchers, students and academicians in an informal setting to present and discuss new and current work.

We would like to express our gratitude to Karnataka State Council for Science and Technology, IISc, Bengaluru, for collaborating with us in organizing this event.

We thank all the participants and authors for their contributions.

**Dr. Nagalaxmi B.N.**  
*Principal, mLAC*

## ***Foreword***



It is a pleasure to Congratulate mLAC Science Departments for conducting **SWASTHIRA PARIYAVARAN** - Samagatha 2023.

Science Fest began under DBT STAR COLLEGE PROGRAM, is a platform to ignite scientific temperament of students by conducting interclass and intercollegiate competitions and one day National conference.

mLAC has always strived to give the quality education to the students in terms of imparting values, develop research interest and provide awareness related to environment, societal issues etc. Thus, the graduating students are prepared to face the outside world.

This year aligning with G20 “**One Earth, One Family and one Future**” and S20 “**Clean Energy for Greener Future**”, on the most relevant issue, the national conference is organized on Environmental sustainability.

I am sure that the two days event will keep up the objective of the fest and uphold the name of the college in the society, which will help the college to attain long term objectives and goals.

I extend my warm wishes to the Departments (Botany and Physics) for jointly organizing the fest.

Congratulations and Best wishes to all the Science Faculty and Students!

**Prof. Sharmistha Dutta**

*Vice Principal, mLAC*

## ***Foreword***



It's my pleasure to be part of the National conference organized by Samagatha, mLAC Science Association. The theme for the conference is very apt for the scientific and student fraternity to think and contribute stabilize the changing environment,

I wish the organizers, convenors and all the faculty and students best of luck for grand success of the event.

**Dr. B.A. Annadanesha**

*Administrative officer (Academics), mLAC*

## ***Foreword***



**“The sustainability of Science is understanding nature and aligning with its terms for better tomorrow”.** It is my pleasure to be part of **Samagatha 2023** which is organizing **“Environmental Sustainability: New Perspectives and Paradigms”**.

Samagatha- mLAC Science association since its existence from 2016 has been organizing National level conferences envisioning the needs of students and research community keeping in pace with the current trends and technology.

This conference is another milestone in the successful journey of mLAC and on this occasion I wish the team under able all leadership ‘ALL THE BEST’ and congratulate the authors/ participants who are part of our ventures by contributing their valuable findings for the proceedings

**Dr. Jolitha A.B.**

*Academic Coordinator, mLAC*

## *Foreword*



Clean air, water, soil, forests, rivers, lakes, oceans, minerals, wildlife habitats and biodiversity are the wealth of a nation. Over billions of years, nature has taken care of sustaining itself through biodiversity, solar energy and regulation of population. The resources and services provided by nature has defined our lives and economy which is estimated to be worth \$125 trillion and provides employment to 1.2 billion people. The term sustainability refers to using these resources and services without depleting or degrading them.

In global context increased population associated with rise in life expectancy and good socio-economic standards in developed countries has led to over usage of resources and services resulting in huge amounts of waste generation. Unscientific disposal of wastes has caused deterioration of ecosystems. They affect the air we breathe, the water we drink and the food we consume. Healthy ecosystems generate more sources of livelihoods than one would imagine. Declined and dysfunctional ecosystems will have severe adverse effects on our health, livelihoods and productivity.

A prelude to environmental sustainability, UN Decade on Ecosystem Restoration was launched in 2021 as a 10-year effort to prevent, halt and reverse the degradation of ecosystems worldwide. Environmental sustainability approaches include emphasis on population regulation, waste management, protecting habitat, environmental restoration, reducing resource waste- the collective efforts for mitigating climate change and its adverse effects.

An awareness about environmental sustainability has become very imperative in the present scenario and I am very happy to note that science forum of mLAC “SAMAGATHA” has organized intercollegiate events on 20<sup>th</sup> June 2023 and national conference on the theme “**Environmental Sustainability: New Perspectives and Paradigms**” on 21<sup>st</sup> June 2023. These events are convened by departments of botany and physics which is a laudable endeavour. I wish the organizers and participants a great success and let the deliberation of SAMAGATHA 2023 leave a strong impact on all.

**Prof. Aruna H.K.**  
*IQAC Coordinator, mLAC*



## ***Foreword***

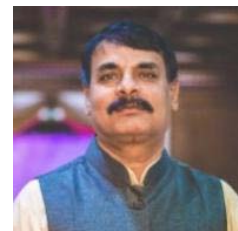


Reducing the greenhouse gas emissions that contribute to climate change will aid in the development of a more sustainable global economy. Therefore, it is crucial that the international community achieves the Sustainable Development Goals of the UN as well as the emission reduction targets set forth in the 2015 Paris Climate Agreement. The future and present well-being of humanity depend on both sustainable development and climate action.

I am very happy to see that SAMAGATHA 2023 is organizing two-day events at mLAC, to celebrate the “SWASTHIRA PARIYAVARAN” dedicating to “Environmental Sustainability: New Perspectives and Paradigms”. I wish these events – supported by the Karnataka State Council for Science and Technology (KSCST)– all success, and hope they will be memorable, both for the invited lectures on the 20<sup>th</sup> and 21<sup>st</sup> for Intercollegiate Events. I wish all the young minds who will gather at mLAC for these events, an exciting and fulfilling future in coming years!

**Dr. Sushil Kumar Middha**, DST-TARE FELLOW  
*Research Coordinator & PG Coordinator,  
Department of Biotechnology, mLAC*

## ***Foreword***



The National Conference on “**Environmental Sustainability: New Perspectives and Paradigms**” serves as a platform for expanding our understanding of the environmental issues we face today. Our climate is rapidly changing, natural resources are getting depleted, and biodiversity is facing terrible declines. We need to take an urgent action to protect our environment. This conference aims to bring together experts and young researchers from diverse disciplines, providing a forum for knowledge sharing and collaborative work on environmental challenges.

We will explore a wide range of topics, including energy conservation, renewable energy, waste management, and innovative technologies developed for environmental sustainability. Our goal is to generate innovative ideas and practical solutions that promote sustainable practices, thereby ensuring the well-being of our planet and future generations.

I extend my heartfelt gratitude to the Management and Principal for extending their support to the realization of this conference.

Together, let us take hold of this opportunity to inspire and shape for a greener and more sustainable future for our environment.

**Prof. M.D. Lakshmana**  
*HOD, Department of Physics*  
*Convenor, Samagatha 2023*

## ***Foreword***



It's my pleasure to wish mLAC Science departments for conducting **SWASTHIRA PARIYAVARAN- Samagatha 2023**. Science fest began under DBT STAR college program which is a platform to ignite scientific temperament of students by conducting various interclass, inter-collegiate competitions and a national conference.

The main aim in organizing this conference is to share and enhance the knowledge of every individual in this fast-moving Era. We have given a good opportunity for those who have a thirst in knowing the latest developments and share their ideas. Additionally, this conference will also facilitate the participants to expose and share various novel ideas. The conference aims to bridge the researchers working in academia and other professionals through research presentations and keynote addresses in current trends.

In alignment with G20 “One Earth, One Family and one Future” and S20 “Clean energy for greener future “, one of the most relevant issue, environmental sustainability has been aptly selected as the theme for the national conference.

My best wishes to the all the Science departments, students, and participants from various institutions.

**Dr. S. SriLakshmi**

***HOD, Department of Botany, mLAC  
Convenor, Samagatha 2023***

## ***Foreword***



SAMAGATHA- Science Association, an initiative under DBT-Star College Program, involving integrated effort of ten departments of Science i.e., Biochemistry, Biotechnology, Botany, Chemistry, Computer science, Mathematics, Microbiology, Physics, Psychology and Zoology organizes Science Fest every year to empower the science community with knowledge of advances in Science and Technology.

With the objective of **G20-One Earth, One Family, One Future** and **S20-Clean Energy for Greener Future** of this year SAMAGATHA 2023 Intercollegiate Fest and National Level Conference on June 20<sup>th</sup> and June 21<sup>st</sup>, 2023 respectively in collaboration with Karnataka State Council for Science and Technology (KSCST) providing a platform to exchange scientific ideas with all stakeholder of society-young minds, policymakers, industry experts, environmentalists, NGOs.

The two days event with Intercollegiate Fest focusing on theme-based events to spread the message to student community. National level Conference with eminent speakers addressing on challenges and solutions in Environment Sustainability; Oral and poster presentations by faculties, students and research scholars giving an edge over recent trends to unveil a sustainable solution for a Greener Planet.

Congratulations to this initiative to all the Science departments and wishing success in delivering an effective output to the society.

My best wishes to the participants to gain a rich experience and contribute to society for sustainable solutions to environment.

**Dr. Babitha B.**

*Science Co ordinator*

*Department of Biotechnology, mLAC*

*Convenor, Samagatha 2023*

## ***Foreword***



On behalf of the Organizing Committee, I would like to extend my warm welcome to all the participants and presenters. I also express my sincere gratitude to the Chief Guest, Guest of Honour, and Resource Persons.

This year National Conference is based on the theme – “Environmental Sustainability: New Perspectives and Paradigms” under SAMAGATHA organized on 21<sup>st</sup> June 2023 mainly focuses on diverse areas of research emphasizing on the sustainability of life.

I believe this National Conference will provide opportunities for exchanging latest research ideas, opinions, inspiring talks, gaining knowledge about various fields working on environment sustainability. It aims to stimulate interactions among researchers in sharing their practical experiences that provide a platform for current and future research.

It gives me an immense pleasure to thank our Chairman, Managing Trustee, Principal, Vice Principal, Management and Staff for their guidance, support, and motivation.

Finally, I thank each one of you who have associated with this National Conference for their hard work in making this conference a grand success.

Let Us Together Infuse New Enthusiasm in Young Minds to Conserve Our Environment.

**Ms. Kavya B.**

*Assistant Professor, Department of Botany, mLAC*

*Organizing Secretary, Samagatha 2023*

## ***Foreword***



I take this opportunity to place on record my compliments to all distinguished delegates of the National Conference on Environmental Sustainability: New Perspectives and Paradigms on 21<sup>st</sup> June 2023 who have brought glory and greatness to this event by their benign presence and active participation.

The entire world is looking forward with greater expectations to the scientific community for alleviation of pain and hunger. The joint venture of Researcher, Academicians, and Industrialists with emphasis on global priorities would certainly pave way for interdisciplinary research for serving the, mankind and shaping a better and healthier world.

I sincerely hope that event where Researchers, academicians and Industrialist working in the field of Sustainable development are coming together to discuss issues concerning Energy, Environment, Health, and Agriculture of global interest. I express my gratitude to the Management and Principal for having lent their unflinching support for organizing the National Conference in successful manner.

I am sure all this will bring fruitful results that will impact mankind.

I wish everyone a pleasant stay and happy deliberation.

**Mr. Akshay S.**

*Assistant Professor, Department of Physics  
Associate Administrative officer (Academics)  
Organizing Secretary, Samagatha 2023.*

## CONFERENCE SCHEDULE

<b>INAUGURAL SESSION</b>	
<b>Registration</b>	<b>9.00am-10.00am</b>
<b>Lighting the lamp and Invocation</b>	<b>10.00am-10.05am</b>
<b>Welcome address by Principal</b>	<b>10.05am-10.10am</b>
<b>Keynote address by Chief Guest</b>  <b>Sri. Mahantesh Bilagi, IAS</b> <i>Managing Director, BESCO Corporate Office, Bengaluru</i>	<b>10.10am-11.00am</b>
<b>Address by Guest of Honour</b>  <b>Dr. U.T. Vijay</b> <i>Executive Secretary, KSCST, Bengaluru</i>	<b>11.00am-11.05am</b>
<b>Presidential Address</b>	<b>11.05am-11.10am</b>
<b>Vote of Thanks</b>	<b>11.10am-11.15am</b>
<b>Tea Break</b>	<b>11.15am-11.30am</b>

<b>TECHNICAL SESSION</b>	
<b>Technical Session I</b> <b>Dr. Siddhartha Krishnan</b> Assistant Professor, Suri Sehgal Centre for Biodiversity And Conservation, ATREE, Bengaluru	<b>11.30am-12.20pm</b>
<b>Technical Session II</b> <b>Dr. G .Nagendra Prabhu</b> Associate Professor, Dept. of Zoology (PG), Centre for Research on Aquatic Resources, Sanathana Dharma College, Alapuzzha, Kerala	<b>12.20pm-1.10pm</b>
<b>Lunch Break</b>	<b>1.10pm-2.00pm</b>
<b>Technical Session III</b> <b>Ms. Reva Malik</b> Co-founder, Primalise, Bengaluru	<b>2.00pm-2.40pm</b>
<b>Poster/Oral presentation</b>	<b>2.45pm-3.45pm</b>
<b>Tea Break</b>	<b>3.45pm-4.00pm</b>
<b>VALEDICTORY SESSION</b>	
<b>Address by Chief guest</b> <b>Sri. Subhash K. Malkhede, IFS</b> PCCF, Karnataka Forest Department, Bengaluru	<b>4.00-4.15pm</b>
<b>Report Reading</b>	<b>4.15pm-4.30pm</b>
<b>Prize distribution</b>	<b>4.30pm-5.00pm</b>
<b>Vote of Thanks</b>	<b>5.00-5.15pm</b>
<b>National Anthem</b>	<b>5.15pm</b>



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## **Green Growth and Degrowth: New Debates on Environmental Sustainability**

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As the planet stares at a climate and biodiversity crisis, the question of environmental sustainability occupies academics, businesses, civil society, and policy makers. While market actors and liberal democracies feel that the world can and must ecologically modernize, critics question this market solution to the environmental crisis. This talk introduces a young audience to two interesting and influential discourses, namely, green growth and degrowth. The former advocates for economic growth to continue, but sustainably. The latter radically questions the very idea of economic growth. What are the implications of these for Karnataka and India?

## **Sustainable Livelihood Programmes using Aquatic Weeds – Challenges and Opportunities**

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Aquatic plants are plants that normally grow in water, in soil covered by water, or in soil that is normally saturated with water. In nature, these plants perform many important functions in maintaining a balanced aquatic environment. But at the same time, their uncontrolled growth has multiple impacts on the water bodies. Their growth has been explosive in many parts of the world, especially, Asia, Africa and Latin America because of favourable climatic conditions and suitable habitats for its unchecked growth. In India, it has been estimated that more than two lakh hectares of water bodies are infested by aquatic weeds such as water hyacinth. While the approach of the developed nations is mainly focused on *control* and *eradication*, the third world countries have approached this problem in a different manner. They have been able to derive many positive benefits from these weeds by their innovative approaches. Thus the perceived negative economic impacts of the aquatic weeds have been transformed into positive income-generating enterprises. The authors' innovations in making value added products from the troublesome aquatic weeds of Kerala are presented along with some of the approaches by other researchers. The recent developments such as a major international project on water hyacinth monitoring in India worth Rs. 3 crores, successful establishment of Student Start-ups and other sustainable alternate livelihood activities will be highlighted in the presentation.

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## **Navigating Living-Learning-Livelihood Inspired by nature**

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Sustainability has become an important topic as our existence depends on it. It should be considered an essential life-skill that every generation passes on to the next and should be taught in all learning institutions. Modern living is distancing us from nature, and in turn making us dependent on artificial means of living, which are limiting. Such linearity in our living processes ends up creating heaps of non-biodegradable garbage which everyone wants to disown, put away out-of-sight, and eventually out-of-mind. We keep our houses squeaky clean, while Bellandur lake foams up and the lake ecosystem dies. This kind of distancing from the crucial civic issues seem to have become the norm, and we are becoming numb to them. We continue to just watch the problems grow, be it traffic congestion, air pollution, or water scarcity but refuse to believe that we might be contributing to them through the lifestyle choices we are making.

These sure are wicked problems. Problems that no single entity in the ecosystem can solve on its own. The whole ecosystem must come together to solve them. The whole ecosystem includes us, the citizens; we are the biggest stakeholders. If we choose to look away, the other stakeholders can't do much.

Modern man is anthropocentric. We feel the world and all its beings are for us to rule over and exploit. This sense of superiority takes us away from being part of the web-of-life. For us success means not having to perform our own life processes. We outsource everything that we believe comes in the way of our obsessive pursuit of success. We are driven by insecurity that perpetually keeps us in crisis-of-survival mode. We operate with a sense of scarcity; we compete and beat others. Others must lose for us to succeed. What we need today is a mindset of abundance – we thrive, others thrive and the larger ecosystem thrives.

My family and I too felt overwhelmed by the complexity and enormity of the issues around us. We decided to solve these problems at our own family level. Our inspiration was Nature - an elegant regenerative system that has survived 4.5 billion years and is still thriving. To be able to live off natural resources and to follow principles of nature has given us many insights into the synergies between our own living, learning and livelihood processes. To simplify the complexity,

modern lifestyles separate out the three. We have realized that the congruence between them leads to an elegant system that is in tune with nature – within us and without.

We have been trying to mend the broken loops – processes that are linear but should ideally be cyclical. Just the way it happens in nature. It reconnects us with natural elements; we become part of the web-of-life. Sustainable living is a consequence of living a congruent life. And true learning is a consequence of living. If everyday living nourishes us enough physically, mentally and socially, we don't need artificial supplementary processes like, say a gym routine to keep ourselves fit; our life processes do.

The change won't be as difficult as it seems. It is a small critical mass that must begin to be it. The rest will follow. If we don't, nature has its ways to make the correction and those ways might be too harsh on the errant beings that we have been.



## **Solar Technology for Sustainable Development: A review**

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Among the most significant renewable energy sources, solar energy is a technology that is kind to the environment, a reliable source of electricity. It contributes substantially to identifying energy solutions for sustainable development. As a consequence, the enormous amount of solar energy that may be generated each day makes it a particularly alluring resource for the production of power. To satisfy our energy needs, both technologies-solar photovoltaics and applications of concentrated solar power-are constantly being upgraded. Thus, in the same context, a high installed capacity of solar energy applications fosters the energy sector and meets the employment market for achieving enough development. The paper explores how solar energy applications contribute to sustainable development. As a result, it offers insights and analysis on the sustainability of solar energy, including environmental and economic development. Furthermore, it has been emphasized how solar energy applications contribute to sustainable development by addressing energy needs, creating opportunities for employment, and enhancing environmental protection. Finally, the application of solar energy technology has grown in the energy sector and provides a view of its potential future growth.

**Key words:** Solar energy, sustainability, power, photovoltaic.

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## **Microbial fuel cell-based bio catalyst from industrial waste water and Biomass for alternative energy production**

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World has become global village with increasing requirement of energy population across the globe. Everywhere there is a huge need of energy for survival and its related services to fulfil human social and economic development, welfare and health. Development of alternative renewables to help alleviate climate change is an excellent, sustainable approach to meet energy demand of future generations. In the present-day world, it is very essential to find better and productive sources of renewable energy. MFCs are a promising method of generating renewable energy while also treating wastewater and utilizing biomass. By optimizing the MFC process, we can create a sustainable source of renewable energy through waste treatment.

Petroleum, coal, and natural gas reservoir were depleting continuously due to an increase in industrialization, globalization and high population. The renewable resources have become the most essential energy source for environmental problem reduction.

In the last few decades, the exploitation of bio-masses has arisen as pivotal towards a green and circular economy to overcome over use of the natural resources for energy generation. The current study focuses on microbial fuel cells along with the Nanomaterials could be a problem-solving approach for waste and energy scarcity. MFC could be better in performances based on optimized process parameters for handling any industrial wastewater.

**Keywords:** Microbial Fuel Cells (MFCs), biomass utilization, renewable sources, waste water

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## Rechargeable Batteries for Sustainable Development in the Energy Sector

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The demand for green and sustainable energy is significantly influenced by electrical energy storage technology. The energy is subsequently preserved as chemical potential in the electrodes of batteries that are rechargeable or secondary batteries like Li-ion, Na-, and Mg-ion batteries using the reversible conversion of electrical and chemical energy. Taking into account that Li-ion batteries can store more energy than other typical kinds of batteries, they have occupied the top spot in the battery hierarchy for over a decade. However, with the goal to build a more sustainable future, researchers have continued in search of a battery technology that might eventually replace the Li-ion and address its many drawbacks. The output of lithium-ion rechargeable batteries is ideal for addressing many of our regular power needs.

**Key words:** Batteries, sustainability, electrodes, energy

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## Bio batteries a remedial tool to convert waste into electricity

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Microbial fuel cell (MFC) is a biochemical system that produces electric energy through the oxidation of chemical bonds present in organic matter. MFC serves as a tool for bioremediation of wastewater effluents from various sectors such as industries, domestic/ municipal, pharmaceuticals, and agriculture. Wastewater has a high amount of organic matter and diverse microflora, which makes it suitable fuel for MFC. Domestic wastewater is the most abundant effluent whose large proportion is disposed untreated into ecosystem. Domestic wastewater acts as anolyte and the exoelectrogenic microbes catalyze the biodegradation of wastewater and transfer electrons from anode to cathode, thereby generating current. Individual open circuit MFC units during domestic wastewater treatment were able to produce approximately 0.08V-1.1V, series and parallel connections were reported to produce a maximum of 4.9V and 24mA/m<sup>2</sup> respectively. This indicates that a constant supply and breakdown of organic matter is essential for generating optimum current. Practical applications of MFC are currently limited due to their low voltage output. At least a minimum output of 3V is essential to be used as Direct current. The working efficiency of MFC depends on the configuration of MFC, electron transfer mechanism, electrodes and the substrates used. Hence optimization of these parameters along with storing the electricity in devices such as capacitors would make MFC an efficient biobattery.

**Keywords:** Biobatteries, MFC, domestic wastewater, voltage output, exoelectrogenic microbes

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### **Extraction of bio-diesel from used cooking oil.**

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Increased energy consumption and the depletion of petroleum reserve have made an impact on oil prices globally. To face the challenges in this energy sector, utilization of a potential new and renewable energy is need of the hour. Biodiesel refers to a vegetable oil or animal fat-based diesel fuel consisting of long chain alkyl esters. Used cooking oil, raw material for Biodiesel production involves chemical composition containing free fatty acids (FFA) and when reacted with alcohol and using simple technology can be converted into biodiesel. Used cooking oil offer advantage of easy availability, price is low and usually disposed of otherwise. In present study an attempt made to produce Biodiesel from used cooking oil. Biodiesel was produced by used cooking oil and ethanol by transesterification method using KOH catalyst. Glycerol, by-product of the process was also obtained. Further purification and characterization of Biodiesel is in progress.

**Keywords:** Energy, biodiesel, used cooking oil

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## Energy Conservation: A Review

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Energy is crucial to the world's existence, growth, and evolution as a whole. The environment is negatively impacted by the rising energy consumption, which also puts more pressure on the government. The energy criteria determine a growing nation's growth, such as India. The nation is governed by energy demand and shortage despite being the third-largest power generator in the world. In our nation, the need for energy is exponentially rising. The best response to the rising energy demand may be energy conservation. By using fewer energy services, energy conservation lowers the amount of energy consumed. Energy audits are a crucial part in improving energy conservation. The challenge is to conserve energy without sacrificing consumption. The paper emphasizes the significance of energy conservation by taking into account the loads in a classroom of a learning establishment, taking into account the energy consumed by the current loads, and recommending energy-efficient appliances and an effective yet simple sensor-based model to reduce the energy consumption.

**Key words:** Energy, sensor, environment

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**Production of bioethanol from sugarcane bagasse, corn, and wheat- a bioresource prospective study**

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Bioethanol is a renewal bioenergy source that can be utilized to minimize the consumption of fossil fuels and the emission of greenhouse gases. On the other side bioethanol produced domestically will lessen reliance on foreign nations and it can also reduce the instance of burning agricultural waste in favour of using the waste to produce more valuable products and increase farmer revenue. Bioethanol is produced using raw materials like sugarcane bagasse, corn, and wheat i.e., sugarcane bagasse is second-generation cellulosic material, corn, and wheat are first-generation starchy materials. Bioethanol is extracted downstream to get pure ethanol using simple stages such as grinding, liquefaction, saccharification, and fermentation with enzymes (alpha-amylase, glucoamylase) and yeast (*Saccharomyces cerevisiae*). The fermentation process is done by incubating at 37°C. Following fermentation, ethanol was extracted by freezing method, and the ethanol confirmation test was determined by qualitative analysis using sodium metal test and quantitative analysis using potassium dichromate by calorimetry method. The result was further analysed and the ethanol thus produced was subjected to quantitative analysis using potassium which revealed the highest concentration of bioethanol was produced from Sugarcane Bagasse.

**Keywords:** Bioethanol, sugarcane bagasse, corn, wheat, fermentation.

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## **Impact of Milk Packet Snippings on Plastic Pollution**

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The impetus behind this paper is to map the literature on the impact of milk packet snipping's on plastic pollution, using data from original research papers published from 2016 to 2021 using bibliometric analysis. This paper also uses data collected from 400 individuals and its statistical analysis. The dairy industry in India is a massive conglomerate, consequently, the waste generated by the industries and domestically has rapidly increased in recent years to the extent that it has become a leading cause of plastic pollution. The incorrect way of cutting milk packets has caused the generation of extremely small snipping that has posed a challenge in recycling. This paper aims to investigate the amount of unrecyclable waste generated by a household and its contribution to plastic pollution along with its solution.

**Keywords:** Dairy effluents, dairy waste management, milk packet snippings, plastic pollution, waste management.

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## Waste Management

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Waste management or waste disposal includes the processes and actions required to manage waste from its inception to its final disposal. This includes the collection, transport, treatment and disposal of waste, together with monitoring and regulation of the waste management process and waste-related laws, technologies, economic mechanisms. The aim of waste management is to reduce the dangerous effects of such waste on the environment and human health. A big part of waste management deals with municipal solid waste, which is created by industrial, commercial, and household activity.

Effective 'Waste Management' involves the practice of '7R' - 'R'efuse, 'R'educe', 'R'euse, 'R'epair, 'R'epurpose, 'R'ecycle and 'R'ecover. Amongst these '7R's, the first two ('Refuse' and 'Reduce') relates to the non-creation of waste - by refusing to buy non-essential products and by reducing consumption. The next two ('Reuse' and 'Repair') refers to increasing the usage of the existing product, with or without the substitution of certain parts of the product. 'Repurpose' and 'Recycle' involves maximum usage of the materials used in the product, and 'Recover' is the least preferred and least efficient waste management practice involving the recovery of embedded energy in the waste material. For example, burning the waste to produce heat (and electricity from heat). Certain non-bio-degradable products are also dumped away as 'Disposal', and this is not a "waste-'management'" there are many reasons why we should recycle. Recycling helps in conserving natural resources, saving energy, reducing pollution, and creating employment opportunities. It also reduces the amount of waste that is sent to landfills.

**Keywords:** Pollution prevention, source reduction, recycling of materials within the waste, reclamation, disposal through incineration.

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## **Degradation of Flower Waste Using Microbial Consortium: An Approach Towards Environmental Sustainability and Waste Management**

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India is one of the largest flowers producing countries in the world. According to the estimates of the national horticulture board, in 2021-2022 the production is 341.63 million tonnes across the country and according to the statistics, floral waste is one of India's biggest pollution, accounting for nearly a third of all solid waste in the country. Floral waste degradation is an extremely slow process compare to degradation of kitchen waste, thus no suitable modes for disposal of this significant organic solid waste. In nature microorganisms do not live isolated, they co-exist with microorganisms establishing relationship that makes the highly complex organic compounds into simpler forms. The present study was taken to develop efficient microbial consortium to degrade the flower waste. Soil samples were collected from different places in which the flower waste was dumped. The isolation and screening of microbes that are capable of degrading the flower waste is performed with the help of flower extract media. A flower-based media was used to develop a microbial consortium for degrading flower waste instead of conventional microbial media. The different enzymatic test was performed to find out the enzymes produced by the organisms to degrade the flower waste. One chamber was created with inoculation of the microbial consortium along with flower waste and another chamber with flower waste without the microbes. Degradation was checked at different time intervals and it showed that the microbial consortium helped in degrading a large amount of flower waste faster.

**Keywords:** Flower waste, degradation, flower-based media, microbial consortium.

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## **Waste Management**

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Most human activities generate waste. In recent times, the rate and quantity of waste generation have been increasing compare to pre historic period. Proper management was not a major issue as the population was small. A substantial increase in the volume of waste generation is due to industrial revolution. Migration of people led to surge volume and variety in composition of wastes generated in cities.

Waste disposal leads to direct and indirect environmental impacts, such as land occupation, resource depletion, amplification of global warming, water intoxication due to land filling, acidification. waste management includes collection transport treatment and disposal of waste together with monitoring and regulation. This approach allows us to better utilize resources in three keys areas they are; (i) economy (ii) environment (iii) society.

Sustainability is deeply rooted with in waste management as consider it to be the bases of which concept of the 3R's sustainability are reduce reuse and recycle.

Waste reduction; is most preferable to us as it provides the best sustainable outcome.

Waste reuse; whenever we find an inevitable source of waste, we look at opportunities to reuse either for same purpose or for another this provides us with moderates sustainable.

Waste recycling; it provides minimal to sustainability returns.

**Keywords:** Reuse, recycle, reduce, monitoring, generation.

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**Black Soldier Fly (*Hermetia illucens*) - a solution for bio waste management****Ananya S.S.,** Monisha R., Hema S., Aruna H.K.\**Department of Zoology, Maharani Lakshmi Ammanni College for Women, Bengaluru*

Urban solid waste management has become a matter of importance due to rapid urbanization and population. Many ways of combating this issue have been addressed by waste experts worldwide by developing sustainable methods of managing the municipal waste. In this context recycling of organic waste material (biowaste) has not yet gained momentum even though it constitutes major parts of all municipal waste generated. Conversion of organic waste can reduce threats to public health and environment.

One of the approaches of biowaste conversion is by using insect larvae. One of them is Black Soldier Fly (BSF), *Hermetia illucens*. Harvested BSF larvae can also be used as a source of protein for animal feed (poultry).

A unique method of treating organic waste is employing insects which is gaining popularity as it has various advantages over conventional methods. Installation costs are low and conversion of biowaste is high. The insects used in bioconversion can also be used as source of protein. However, certain conditions have to be provided and taken care of such as feed components, proper temperature, humidity and suitable environment for the insects to survive and live. Among the insects, black soldier fly (*Hermetia illucens*) larvae (BSFL) are gaining significant attention, as it very efficiently converts organic waste into useful bio products.

A composter prototype is designed by investigators to convert the biowaste by BSFL. These larvae will be used to decompose more organic waste or processed as animal feed, used in poultry.

**Keywords:** Black soldier fly, composter, biowaste

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## **Managing Waste through Physical Laws**

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Today's significant environmental issues, such as waste management and air pollution, demand effective, long-term result-oriented initiatives in order to find sustainable solutions. These are related to the production of energy resources and the usage of those resources. Understanding the rules of physics, especially the laws of thermodynamics, may be helpful in offering a long-lasting solution to these critical problems. The paper explores the connections between effective energy resource utilization and waste and environmental issues. Waste generation and disposal seem to be well addressed by renewable energy. Their potential patterns of energy use might be estimated using the many principles of physics. These laws do not offer complete solution to such waste production and environmental degradation but provide ways to minimize them to such an extent that it remains within the limit of human tolerance. This can also demonstrate how using energy resources wisely and economically, especially renewable energy, can lead to long-term waste reduction solutions.

**Key words:** Thermodynamics, energy, pollution, environment

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## **Fungal-based waste management: An innovative approach for sustainable waste treatment**

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Waste management is a global challenge that requires ingenious and sustainable solutions to diminish its environmental impacts. In recent years, fungi have emerged as a promising tool in waste management due to their unique metabolic capabilities and their potential to transform various types of waste into valuable resources. The present study explores the application of fungi in waste management, focusing their role in biodegradation, bioremediation, and resource recovery. The present study discusses the mechanisms by which fungi interact with different waste types, their ability to degrade complex organic compounds, and their potential for heavy metal immobilization. Furthermore, the present study examines the challenges and opportunities associated with fungal-based waste management systems and provide awareness into future research directions and practical implementation.

**Keywords:** Biodegradation, bioremediation, fungi, metabolic activity, waste management.

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## **Isolation of bacteria from different surfaces and analysis of antibacterial property.**

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Bacteria are cosmopolitan in occurrence and can be found at every place even on the floor. Routine surface cleaning is recommended to control the spread of pathogens in the environment. Though there are number of floor cleaners available in the market but still there are some natural substances available in our surrounding which possess antibacterial properties. In this project we have tried to isolate the bacteria commonly found on floors and then analyse the antibacterial properties of Guava leaf (*Psidium guajava*), Mango leaf (*Mangifera indica*) and Aloe Vera leaf (*Aloe barbadensis*) extract.

**Keywords:** Floor bacteria, antibacterial property, guavaleaf extract, mangoleaf extract, aloe vera leaf extract.

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## **Waste management towards environment sustainability: plastic mattress**

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Plastic has contaminated all possible sources and its extensive usage has turned to be a global threat. Due to high usage and improper way of disposal and to extent ignorance of people without knowing the harmful effect, it has raised serious issues and has affected every organism's life and existence. Out of a huge bulk of plastic waste, only a fraction of it is recycled and used. Microplastic is also found in the blood of human beings as well thus raising questions about safety usage of plastic. In spite of knowing the harmful effect of plastic, its usage has become inevitable due to convenience.

Repurpose and recycle are the mantras for plastic pollution and in this context making of plastic mattress can be one of the effective ways for safe use of plastic. This effort will decrease the harsh effect of plastic on ecosystem and help us take a step towards conservation of environment.

**Keywords:** Plastic mattress, waste management, recycle

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**Study on pectin extraction and characterization from lemon peel.**

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Pectin is a heteropolysaccharide found in the primary cell walls of many plants, mainly extracted from citrus fruits and is used as a gelling agent particularly in drinks. It is also widely used as emulsifier, thickener, fat and sugar. Pectin can be extracted from by- products of the manufacture of starch from potatoes, sunflower heads in oil making and onions. . Citrus peels are the most important sources of pectin. In the present study, Pectin was extracted from citrus fruits waste i.e., lemon peels purchased from local market. Extraction of Pectin was achieved by two methods- water-based extraction and microwave extraction method. A comparative account on yield of pectin was determined. Purification and characterization of pectin is in progress.

**Keywords:** Lemon peel, water-based extraction, microwave extraction

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**Study on effects of vermicompost manure on growth characteristics of *Momordica charantia* (Bitter Gourd) and physico-chemical parameters of soil**

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Agriculture productivity depends on many factors; two of them being nutrient availability in the soil and type of manure used. Long term usage of inorganic fertilizer without organic supplement damage the soil physical, chemical and biological properties and causes environmental pollution. Vermicompost is the organic material in which any organic waste is converted into useful fertilizer and an effective soil conditioner. Organic matter present in vermicompost affects crop growth yield either directly by supplying nutrients or indirectly by modifying soil physical properties. The main objective of present study is to produce vermicompost using organic waste and assess the status of soil by growing bitter gourd (*Momordica charantia*) and evaluating its growth characteristics. The current study focused on the effect of the application of vermicompost on agricultural field soil collected from Iverukandapura, Hesaragatta Lake post Bengaluru North, Karnataka. The physicochemical properties like bulk density ( $1.19\text{g/cm}^3$ ), particle density ( $1.53\text{g/cm}^3$ ) and water holding capacity (64%), soil pH (5.43), electrical conductivity ( $0.10\text{ds/m}$ ), organic carbon (0.32%), calcium and magnesium (2.5m e/L and 5m e/L) of soil sample from different sampling sites were analysed. The nutrient content of the soil was also analysed for better understanding of soil profile. Vermicompost was produced with modification in the protocol. The study also involved the comparison of different manures suitable for growth of *Bitter gourd* (*Momordica charantia*). The combination of waste materials also used for making the vermicompost makes it rich in all the nutrients that are required for increased plant growth and yield.

**Key words:** Soil texture, bitter gourd, vermicompost.

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## Emergence of heavy metal tolerance among multidrug resistant human pathogens

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Co-existence of metal and antibiotic resistance in bacterial strains poses a potential threat to human health and environment. From recent decades heavy metal pollution has caused selective pressure that leads to the development of multiple drug resistance among bacterial populations (Biswas et al., 2021). *Escherichia coli*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus* were used in the study. Out of 8 antibiotics tested it was observed that *E.coli* was resistant to 4 (streptomycin  $10.67\pm 0.57$ , erythromycin  $11.00\pm 1.00$ , ciprofloxacin  $23.67\pm 1.52$ , doxycycline hydrochloride  $16.33\pm 1.15$ ), *S. aureus* was resistant only to one (co-trimoxazole  $23.00\pm 2.00$ ) and *P. aeruginosa* susceptible to all the antibiotics. The isolates were found to grow at high concentration of copper ( $\text{CuSO}_4$ ) and varying degrees of chromium ( $\text{K}_2\text{Cr}_2\text{O}_7$ ) with all the three sensitive to mercuric chloride ( $\text{HgCl}_2$ ), while *S. aureus* showed highest tolerance to mercury chloride. *E. coli*, *P. aeruginosa*, and *S. aureus* were inhibited at  $0.84\pm 0.01$ ,  $6.78\pm 0.01$  and  $2.55\pm 0.01$   $\mu\text{M}$  /ml respectively by chromium salt; similarly, *E. coli*, *P. aeruginosa*, and *S. aureus* had a minimum inhibitory concentration (MIC) of  $1.56\pm 0.55$   $\mu\text{M}$  /ml,  $1.25\pm 0.35$   $\mu\text{M}$  /ml,  $1.56\pm 0.51$   $\mu\text{M}$  /ml respectively for copper and all three isolates had a MIC of  $9.20\pm 0.05$   $\mu\text{M}$  /ml for mercury. Further studies were carried out by SDS-PAGE, Two-dimensional Gel (2D) Electrophoresis and agarose gel electrophoresis, respectively, for the characterization of heavy metal stress protein and R-plasmid among the isolated bacteria. Using qPCR and a particular primer, the genes for streptomycin and co-trimoxazole resistance were shown to be present on a single plasmid (54 kb) present in the isolates, which also contributed to the development of heavy metal tolerance; the SDS-PAGE analysis and Two-dimensional Gel Electrophoresis demonstrated the expression of heavy metal stress proteins. The study results grant an insight into the co-occurrence of antibiotic resistance and heavy metal tolerance among clinically relevant bacteria prompting an intense health impact over antibiotic usage.

**Keywords:** Heavy metal tolerance, multiple drug resistance, stress proteins, copper, chromium.

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## Assessing the health impacts and recycling landscape of polyethylene terephthalate (pet) plastic in India: A comprehensive review

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Polyethylene terephthalate (PET) plastic has gained wide popularity and widespread use in various industries, including packaging, textiles and beverage containers. However, the health impacts associated with PET plastics and the recycling statistics in India have raised concerns about their environmental sustainability and potential risks to living beings. This review paper aims to provide a comprehensive overview of the health impacts and recycling statistics of PET plastics in India. It examines the production and consumption trends of the PET plastics, highlighting the significant growth and corresponding waste generation in the country. The paper then delves into the environmental consequences of PET plastic waste, emphasizing the challenges posed by the improper disposal and inadequate recycling infrastructure. Furthermore, the study highlights the potential health risks associated with PET plastics, focusing on the concerns such as leaching of the harmful chemicals including phthalates and antimony, into food and beverages. The paper also explores the long-term health implications of the exposure to these chemicals, such as endocrine disruption and carcinogenic effects. Additionally, the review considers the current state of PET recycling in India, analysing the limitations and the bottlenecks faced by the recycling industry, such as lack of awareness, inadequate segregation practices, and technological constraints. Finally, the paper proposes recommendations to mitigate the health impacts and improve the recycling statistics of PET plastics in India. It emphasizes the need for the enhanced public awareness campaigns, strengthened regulatory frameworks, and investments in recycling infrastructure and research and development.

**Keywords:** PET, plastics, recycling, health impacts, sustainability

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## **In-situ degradation of solid wastes- production of industrially important enzymes**

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### **ABSTRACT**

A cheap and effective method in treating of solid waste from municipal and waste dumps for composting is the need of the current scenario. Bioconversion of cellulosic biomass by microbial enzymes that contributes to about 60 to 70% of solid waste is a promising sustainable idea to manage the menace of solid waste (SW). Organic substances such as paper, wood, plant materials, cloths yard trimmings, and food waste, kitchen wastes continue to be the largest components of solid waste in India. Mismanagement of solid waste by unscientific dumping at dumpyard, burning has accelerated the rate of air and soil pollution. Microbial bioremediation of solid wastes though a well-known process that involves biodegradation of organic wastes by production of microbial enzymes such as Cellulases, Amylases, Lipases and proteinases can be a promising solution. Microorganism such as spp. *Pseudomonas* has potential to degrade the polyethylene component of the plastics within a period of 30 days with high rate of production of these enzymes. These Microbial enzymes are potentially used in Paper, pulp, food, leather and detergent industries but their production cost is higher owing to the higher cost of raw materials used. Hence it can be concluded that new methods of *In situ* degradation of municipal waste by microorganisms within a period of 30 days with high rate of production of the industrially beneficial enzymes will be an effective way to improve the waste management strategies.

The crude enzymes collected from decomposed purified municipal waste can be good candidates that find various applications such as treating drains with blockage, removal of oil and other blocks from huge ducts and primary treatment of industrial effluents.

Keywords: composting, microbial degradation.

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## Life style changes and their role in environmental sustainability

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Environmental sustainability refers to the practices and policies that aim to conserve natural resources and minimize harm to the environment while meeting the needs of the present and future generations. The concept of environmental sustainability gained importance in the recent years due to growing concerns about climate change and environmental degradation. Global change has a direct and negative impact on the environment which leads to climate change, rapid urbanization, socio-ecological consequences, deforestation, biological invasion, anthropogenic factors, increasing population pressure and in enriched technologies. As the globalization has entered in various aspects of life, its impact on the environment is vast. One way to reduce the environmental impact is to focus on adapting changes in life style for sustainable practices and their changes can be beneficial to both the individuals and to create healthier planet. Small changes can be implemented gradually by giving awareness programmes on environmental issues, educating self, arising eco-friendly products, using plant-based diets, waste management by reducing, reusing and recycling, green technologies, reducing the consumption of natural resources can significantly contribute to a sustainable environment. The Green Office Model is a great way to encourage sustainability and the involvement of student and staff communities at universities, contribute to promote sustainable development. Adopting a sustainable lifestyle not only benefits the environment but also offers numerous advantages to individuals. A collaborative effort from individuals, policy makers, NGO's need to be involved for a sustainable future. Taking action for a greener future is a crucial step towards ensuring the sustainability of our planet.

**Keywords:** Environment, sustainability, deforestation.

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**NRM in Need!!!!****Geetha K.N, Mangala Srinivasan, RanjithaKurdekar\***

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Natural resources are naturally available sources in environment like land, water, air, plants and animals on which humans are depended on for their survival. Due to various factors such as global warming, over population, industrial growth etc have a drastic impact on the natural resources. To maintain the sustainability of the ecosystem and to prevent further damage to environment Management of the natural resources is very important for the present and future generations. By implementing some of measure like 3r's of waste management i.e.; Reduce, Reuse and Recycle. By practicing activities as planting trees, promoting responsible mining and extraction, sustainable fisheries and agriculture, efficient use of resources. All individuals should use the natural resources in minimal amount which helps the management in environment and for future generation too.

**Keywords:** Global warming, industrial growth, sustainable, ecosystem, 3r's

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## Natural Resources Utilization and Management

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Water is a precious natural resource for sustaining of life and environment. Effective usage and sustainable management of water resources plays a vital role in ensuring sustainable development. Due to the major importance of water for human, animal, and plant life for maintaining ecological balance and developmental activities of all living kinds, there is an utmost urge and very much necessity for the management of water resource. The various sectors where water is mainly needed are agricultural, industrial, domestic, hydroelectric power, environment and transportation sector. The major sector where water is mainly getting devastated is in the domestic purposes and in the basic usage of water in the agricultural and industrial sectors. Other main aspects of global water crisis are rapid population growth, also with industrialization, urbanization. Water management includes qualitative and quantitative management of water resources through efficient strategies and advanced techniques.

Rainwater harvesting provide a good supplement to other water sources and utility methods, thus replacing other water sources. It can reduce storm drainage load and flooding in cities, it can be a flexible technology for construction, operation, and maintenance, so it is very much important to understand the types of rainwater harvesting and implementation in urban areas more significantly. Few sustainable water strategies of rainwater harvesting are self-sufficiency in water supply, conventional life-line approach, water supply demand management etc. Ultimate water resource management needs for the combined initiative and action of all socioeconomic progress. The vital role of water as a natural resource is maintaining adequate and productive agricultural needs and needs of our environment.

**Keywords:** Water resource, ecological balance, global water crisis, rainwater harvesting, sustainable water strategy

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## **Role of indigenous microbes in environmental sustainability**

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Microbes are part of us and part of the entire ecosystem (from earth to space). Microbes play a vital role in biogeochemical cycles which is important for our sustenance. The large number of microbes is beneficial to plants, animals and human but some are harmful as well. Environmental protection has become the prime importance in present day life of mankind. The indigenous microbial populations exemplify the interaction between the energy, life, environment and to countenance the forthcoming challenges faced by the young generations to come. The microbes are involved in different fields like Agriculture, health sector, clean water and sanitation, affordable energy, climate action etc. Microbes are indeed a treasure to ecosystem, if exploited prudently can contribute to the sustainable developments.

**Key Word:** Environmental protection, agriculture, affordable energy, climate action

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## A macro analysis of pteridophytes in medicines and their current context in India

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Medicinal values of Pteridophytes are known to man from more than 2000 years. They have healing and curing power and are used in Homeopathic, Ayurveda and Unani medicines. The medicinal applications of some Pteridophytes of those that grow in Western Ghats, West Bengal, Himachal Pradesh, Uttarakhand and Rajasthan are presented in this paper. Out of 70 families from different parts of the present Indian political boundary, selected species are considered under 12 families for the analysis. There are 219 species of Pteridophytes measured as 'At risk' in India. Of these, 160 are featured to designate that they fall into IUCN category of 'Critically endangered'.

Henceforth, for immediate and strict conservation of all these species, there is a need of an urgent and special study including locality-mapping by State Governments and creating public awareness. Pteridophytes are forest-dwelling species; they can be taken as good indicators of deforestation and habitat-destruction. Pteridophytes have substantial importance in traditional pharmacopoeias; scientific studies on pharmacology of this group are scanty.

**Keywords:** Critically endangered, IUCN, medicinal values, species and families.

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## Assessing the Impacts of Tree Poisoning: An Ecological Perspective

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Tree poisoning is the practice of poisoning trees by injecting poisonous toxic chemical substances and leaving them standing to rot on the landscape which may be done intentionally or unintentionally. The injected poison not only affects the tree but also destroys its nearby ecosystem. This study investigates the effects of tree poisoning from an ecological standpoint, aiming to enhance our understanding of the ecological consequences and develop strategies for mitigation. The objectives were to Conduct a detailed survey on tree poisoning in different areas of Bengaluru and to indicate possible reason of tree poisoning. Detailed survey was done in different areas of Bengaluru to analyze the specific site where trees have been subject to poisoning, to understand any potential associations between tree poisoning and the observed diseases. Trees with holes at the base were found in different areas of Bengaluru. Relevant photographs and videos were taken in areas. Some of them were unhealthy (fungal patches, decaying tree bark, unhealthy leaves). The widespread use of herbicides that kill trees on thousands of acres raises high concerns on threats to water and soil quality and ecosystem. It was concluded that the combination of different approaches used in tree and tree-ring sciences represent very valuable tools for criminal investigations, as they allow a narrowing-down of the timing of the poisoning and identification and spread of the harmful substances used in the root, stem and leave systems.

**Key words:** Tree poisoning, ecosystem, toxic chemical, Bengaluru

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## Sacred groves- An efficient strategy for Forest Sustenance

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Sacred groves comprises of forest patches which are significant in holding the tradition of conserving specific geographical areas that have cultural and religious importance. India has over 100,000 sacred forests with its diversity of cultures and traditions. Sacred groves are defined as segments of landscape containing trees and other forms of life and geographical features, that are delimited and protected by human societies believing that preserving such a patch of vegetation in a relatively undisturbed state is necessary for expressing one's relation to the divine or to nature. Many of these groves are found as fragments amidst agricultural lands. Though sacred groves are seen in many other parts of the world and in India, Western Ghats in India is a unique landscape known for sustaining the tradition of sacred groves. Western Ghats region has been identified as one of the eight hottest hot spots of biodiversity in the world and comprises of forests distributed majorly among the states of Maharashtra, Karnataka and Kerala. In this review we discuss about the selected sacred groves in these states and their current status in ecological sustenance. Though sacred groves have been successful in forest conservation, there have been threats in the recent times because of pressures for use of timber and other forest products as well as clearing for agriculture, It can also be due to changes in cultural traditions and beliefs towards sacred groves. As a result sacred groves are being increasingly exposed to various kinds of dangers leading to either gradual degradation or losing its existence. Hence there is a need for creating awareness among people about the significance of sacred groves and their role in forest conservation.

**Keywords:** Sacred grove, tradition, Western Ghats, forest conservation

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## Climate crisis and Well-being

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Climate change refers to fluctuations in temperature and weather conditions. Since a long time, the activities by humans have been the driving force of climate change. Climate change is one of the biggest threats worldwide. The rising temperatures and extreme climate change possesses a great risk to mankind and welfare of humanity. People whose health is being harmed first and worst by the climate change belong to low-income families and disadvantaged countries and communities. The climate crisis has been playing a significant role in widening the existing health inequalities between the two poles of the society and population. Climate disasters are resulting in an increased risk of gender-based violence, decreased access to maternal and child healthcare, HIV and Sexual and Reproductive Health Rights services (SRHR); increase in child marriages and early and unintended pregnancies. At the recent 27th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP27) in Egypt, the impression of climate change on human health was a key theme. This is a crucial signal of the increasing importance of climate change and health discourse. The paper aims to understand the impacts of climate change on the health sector and have better understanding of the practises to combat the same.

**Key words:** Climate change, health, risks, temperature.

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## Climate Change and Its Impact on Human Health: A Comprehensive Review

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Climate change is one of the greatest challenges facing by humanity in the 21<sup>st</sup> century. It not only poses threats to ecosystems and economies but also has a significant impact on human health. The present study aims to provide a comprehensive review of the current scientific knowledge on the various ways in which climate change affects human health. It explores the direct and indirect health impacts associated with climate change, including increased heat-related illnesses, changes in the distribution of infectious diseases, exacerbated respiratory conditions, mental health implications, and nutritional challenges. Additionally, this paper discusses the disproportionate burden of climate change on vulnerable populations and provides insights into adaptation and mitigation strategies to minimize the adverse health consequences of climate change. The findings emphasize the urgent need for interdisciplinary collaboration and coordinated action to address the health implications of climate change.

**Keywords:** Climate change, ecosystem, economies, human health, interdisciplinary collaboration.

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**Diabetes and Climate Change -An overview****G.Priyanka<sup>1</sup>, S. Shreemathi Giri<sup>2</sup>, Akshay S<sup>1\*</sup>**

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Change in climate is impacting human lives and health in many ways. It harms the essential factors for healthy lifestyle– healthy surroundings, safe water supply, nutritious food supply and safe shelter – and has the potential to gradually increase the global health and lifetime of human beings. In the next 20 years, change in the climate is anticipated to create more than 2 lakhs greater deaths resulting from cancer, malaria, Diarrhea and cardiac attacks alone. The expenses resulting from direct health damage are anticipated to reach \$2 to \$4 billion USD annually by 2030. Those Areas with low medical infrastructure will be facing scuffling in improving their health aspect and prepare to respond. Greenhouse gas emitted from burning of fossil fuel results to drastic change in the climate and various pollution. In this review, we will provide an overview of studies looking into the influence of threat factors for ecological health associated with climate change on increase of diabetic patients.

**Key words:** Diabetic, greenhouse, climate change

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## Climate change – Trends and Impacts on Human Health

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The life on earth in recent years is threatened with climate change. Climate change is the resultant of emission of greenhouse gases viz., carbon dioxide, methane, nitrous oxide, sulphur dioxide and CFC's due to anthropogenic activities viz., industrialization, burning of fossil fuels like coal, gas, oil for transportation and energy sector, unscientific agricultural activities viz., submergence in paddy, fertilizers and enteric fermentation, deforestation etc. The climate change is witnessed through increased temperature, raising ocean, melting of glaciers, weather aberrations viz., flood, drought, heat waves etc. The global temperature at present is 1.1°C warmer compared to 1800 and projected to rise by 1.5-2.0°C by the end of this century. The decade between 2011-2020 was warmest and the temperature in each decade are increasing alarmingly. Air and water pollution are other dimensions of climate change. The pollution, temperature rise, increased carbon dioxide, aberrant weather viz., floods, droughts, heat waves, hail stones etc. affect life and health. The health effects in human being with these weather extremes and pollution leads to respiratory and cardiovascular disease, injuries and premature deaths. The changes in vector ecology with climate changes increases malaria, dengue, encephalitis, cholera, etc and threats to mental health. The Inter-governmental Panel on Climate Change (IPCC) has concluded that to prevent disastrous health impacts and deaths, we must limit temperature rise to 1.5°C however; every additional tenth of a degree of warming will take a serious toll on human health.

**Keywords:** Climate change, greenhouse gases, weather, pollution, energy, temperature

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## Environmentalexposuretoman-madeelectromagneticfieldsandits biologicaleffects

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Magneticfields as a subject have receivedmixed reviews inthe real estate andenergy world. Bury the power lines and increase the distance to the power source to reduce the magnetic field.Due to the immense power consumption, transmission lines generate weak magnetic fields andstrong electric currents that can cause serious disturbances. Electricity and magnetism are formed by changing the voltage, the higher the voltage, the stronger the magnetism. Electric fields are also produced when the current flows and magneticfields are also produced when the current flows.

Animals can use the Earth's magnetic field to guide and move the needle. Exposure to electromagneticfieldsintheenvironmenthaveincreasedduetoincreasedelectricitydemand.Withdraw al from low levels can cause headaches, anxiety, sadness, nausea, fatigue, anddecreased libido, among other symptoms. There is no scientific evidence that radiation is associated with these symptoms. Evaluating thepotentialhealth effects of EMFs requires multidisciplinary research.

Research on human health and epidemiology directly tells us the consequences of trauma overtime. The magnetic field is the strongest next to the motor and equipment. Although there maybe health risks in these areas, epidemiological studies and animal studies should be more conclusive. Despite extensive research, none of these conditions have been met, and animal studieshelpdeterminetheimpactonhumanhealth.Electromagneticfieldsareaffectedbymanydevices, including televisions, computers, microwave ovens, radar, electric trains, trains, andhigh voltages.

**Keywords:-**Environment, magneticfield, man-made, biologicaleffects.

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## The climate change past, present and future science 20 (G20)

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G20 summit has motto as one earth, one family, one future science 20 has made all of us to think how climate change occurs with various factor to environmental sustainability in past, present, and future. As we see the crisis in climate change effects everyone as an example nearly one billion children are at highest risk due to climate change and environmental hazard. Under environmental index released on world Environment Day India has been 180 ranked position which shows how badly India is lacked in a conservation of Environment which directly affecting the climate change in India. This study highlights the climate action changes in present scenario let us join hands to know more about the crisis for environmental sustainability by improvement in transportation, afforestation and by conducting awareness programs to young minds and as a curriculum for school kids as skill-based learning. To control the rapid changes in the climate one must adopt for different solutions such as electric vehicle which has been bought some amount of change in increasing pollution in Bengaluru as well other urban cities.

**Key words:** Climate change, environmental sustainability, future science 20, G20.

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## Effects of Urbanisation on Bird Diversity

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This project investigates the effects of urbanization on bird counts, with a specific focus on two key factors: cell tower radiation and the decline in lakes. The study was conducted in Bengaluru, India, where rapid urbanization has led to significant changes in the landscape and habitats available to birds. To collect the data, bird counts were conducted at multiple locations around the lakes for 100m and around the cell towers for 300m across the city. A systematic approach was employed to ensure accurate and comparable observations. The study included various lakes that have experienced substantial degradation due to urban development, as well as cell towers distributed in urban and suburban areas. Preliminary results indicate that the decline in lakes has had a noticeable impact on bird count. The loss of water bodies and associated vegetation has resulted in decreased species richness and abundance of water-dependent bird species. Increase in cell phone towers are equally dangerous and life threatening to many organisms especially of the birds. Recent studies have established the effects of electromagnetic radiation (EMR) from the cell phone on birds. The EMR damaged the adult bird's skull, birds' eggs and the developing embryos. The radio frequency waves from towers disturbs the earth's magnetic field which birds utilize for navigation. This project contributes to the understanding of how urbanization affects bird populations in Bengaluru. The results highlight the importance of preserving lakes and preventive measures to protect the avian fauna in cities.

**Keywords:** Urbanization, diversity, electromagnetic radiation, magnetic field

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**Impact of environmental pollutants and changing lifestyle on reproduction**

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Seasonal breeding in mammals, excluding humans, is influenced by environmental impacts on reproductive processes. Endogenous hormones play a crucial role in fetus development, ensuring future fertility. Environmental exposure to endocrine disruptors poses a threat to fertility.

Seasonality can be observed in birth peaks and fertility performance, highlighting the importance of environmental factors in reproductive health. To assess both male and female fertility, it is important to consider four main factors: (i) the value of fetal life; (ii) environmental influences on adult fertility; (iii) the effects of lifestyle and diet; and (iv) maternal-fetal environmental influences on fetal fertility. Inadequate hormone levels or inappropriate hormone exposure can cause the reproductive system and genitalia to mature more slowly, which can lead to difficulties with fertility later in life. Other hormones, especially those that are influenced by nutrition, have an impact on the hormones that control fertility. The effects of diet on fertility are well documented. Obesity, changed leptin levels, and undernutrition harm the reproductive system.

Smoking negatively impacts both male and female fertility, causing a decrease in semen quality and sperm concentration and adverse effects on sperm DNA tests. Adverse effects on female fertility include reduced oocyte numbers, suppressed folliculogenesis, anovulation, conception rates, and Intrauterine growth restriction (IUGR). Paternal smoking can lead to sperm DNA fragmentation and an increased risk of childhood cancer in non-smoking Chinese mothers. Alcohol consumption's effects on fertility are dependent on the quantity of alcohol intake. To address reproductive health concerns, it is crucial to develop suitable programs for international, national, and regional populations.

**Keywords:** Environment, pollution, lifestyle, DNA fragmentation, reproduction, impact.

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## **A Review on Global Warming**

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Concerns regarding variations in the planet's overall climate are being addressed by a large number of scientists, engineers, and environmentalists. The generation of electricity is constantly driven by fossil fuels. These fuels burn, releasing gases including carbon dioxide, methane, and nitrous oxides that contribute to global warming. Temperatures are rising as a result of deforestation. The environment of the Earth is always impacted by the threat of global warming. The majority of people still have no idea what global warming is, and they do not believe it will bring about any trouble in the future. The majority of people are unaware that global warming is already occurring and that we are already feeling some of its debilitating impacts. Ecosystems are already being affected negatively, and this trend will continue. Certain solutions must be developed due to the dangerous effects of global warming. This article provides an overview of global warming explains its origins and hazards and suggests some options to address this critical issue. Alternative energy sources, such as solar, wind, hydro, geothermal, and biomass, must be seriously investigated. Finding and using renewable energy sources is one way to effectively combat the ever-growing effects of global warming.

**Key Words:** Global warming, energy sources, ecosystems, electricity

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## Climate Change and Extreme Weather: Impacts on Population Health and the Health System

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Climatic variability is expressed in extreme weather and climatic events including heat waves, cyclones, and floods. These occurrences and those affected by climate change, such as wildfires, continue to have a substantial negative impact on human morbidity and mortality as well as mental health and wellbeing. Although the negative effects of extreme events on people's health have decreased over the past several decades, climate change and an increase in the number of people living in dangerous areas could reverse this pattern. Under specific greenhouse gas emission scenarios, trends are expected to accelerate, which will result in an increase in the frequency, intensity, and likelihood of numerous severe events that constitute long-term alterations to Earth's energy balance. Even if most of these occurrences cannot be entirely averted, many health concerns could be minimized by developing climate-resilient health systems. Extreme weather and climatic phenomena like heat waves, cyclones, and floods are manifestations of climatic variability. The morbidity and mortality of people as well as their mental health and general well-being continue to be significantly negatively impacted by these events as well as those brought on by climate change, such as wildfires. Despite the fact that during the past few decades, the detrimental effects of extreme events on people's health have diminished, climate change and a rise in the population of high-risk areas have the potential to modify this trend. Trends are predicted to pick up speed under particular greenhouse gas emission scenarios, which will increase the frequency, intensity, and possibility of a number of extreme events that will cause long-term changes to Earth's energy balance. Even while most of these incidents can't be prevented fully. Even if the majority of these incidents cannot be completely avoided, by creating climate-resilient health systems, many health risks could be reduced.

**Keywords:** Climate change, climate variability, extreme events, population health, health systems

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## Climate Change and its Impact on Health

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Climate change according to science point of view is an increase in sea surface temperature, increases in the severity of weather events, declining air quality and destabilizing natural systems due to Climate increases in greenhouse gas emissions. The direct and indirect health results of such a global imbalance include excessive heat – related illnesses, vector and water – borne diseases, increased exposure to environmental toxins, exacerbation of cardiovascular and respiratory diseases due to declining air quality and mental health stress among others. Vulnerability to these health effects will increase as elderly and urban populations increase and are less able to adapt to climate change. In addition, the level of vulnerability to certain health impacts will vary by location. As a result, the co-benefits of improving health while addressing climate change will improve public health infrastructure today, while mitigating the negative consequences of a changing climate for future generations. The worldwide effects of climate change are apparent from the evidence of global destabilization of natural systems. These effects include the melting of icecaps and glaciers, the early arrival of spring, the warming of oceans, raising sea level, extreme weather patterns and the disintegration of coral reefs.

**Keywords:** Climate change, drought, wild fires, heat waves, food security, vector borne diseases

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## **Fabrication of Ag-Bi<sub>2</sub>MoO<sub>6</sub>/TiO<sub>2</sub>@Graphene composite for enhanced Photocatalytic dye degradation and biosensing of Dopamine**

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Environmental remediation and biosensing applications have drawn much attention to developing innovative composite materials with multifunctional features. In this context, the authors created a new Ag-Bi<sub>2</sub>MoO<sub>6</sub>/TiO<sub>2</sub>/GO composite that enhanced photocatalytic activity for MB dye degradation as well as effective biosensing capabilities for the neurotransmitter dopamine. Then, synthesized materials were thoroughly characterized by various analytical techniques such as XRD, XPS, FTIR, UV – DRS, SEM and TEM. Additionally, the prepared composite material has shown enhanced photocatalytic activity towards the degradation of MB compared to bare materials. The increased activity is attributed to less electron-hole recombination and increased conductivity from the inclusion of graphene, which creates a channel for electron flow and shields the materials from structural degradation. This composite material also showed good activity towards the electrochemical sensing of Dopamine with a detection limit of up to 1.4 μM.

**Keywords:** Environmental remediation, biosensing applications, composite materials, photocatalytic activity, methylene blue dye degradation, neurotransmitter, dopamine

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## **Studies on synthesis, characterization, antimicrobial and anticancer property of Silver Nanoparticles from leaf extract of common Indian medicinal plants.**

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Nanoparticles are tiny particles that have at least one dimension less than 100nm. They can be made from a variety of materials including metals, polymers, semiconductors or ceramics. Synthesis of Silver Nanoparticles (AgNPs) using plant extract has gained significant attention in environmental applications due to the eco-friendly, cost-effectiveness and sustainable nature of the method. In the present study, the synthesis of AgNPs using leaf extracts has been reported for plant species *Tulsi (Ocimumtenuiflorum)*, *Banana (Musa species)* and *Neem (Azadirachta)*. The leaves were collected and extracted using Soxhlet method. The Silver Nanoparticles were synthesized from bioreduction of silver nitrate as a source and preliminary characterization was done by UV – Vis Spectroscopy and confirmed by FTIR analysis. During bioreduction, results revealed the colour change from faint light to yellowish brown to reddish brown indicated the AgNP formation. The pathogenic strains of *E.coli* and *Bacillus* were used to determine the antimicrobial activity of AgNPs by using well diffusion method. The zone of inhibition obtained indicated maximum antimicrobial activity in Tulsi. The anticancer activity in HeLa cell lines was also determined whose results are in progress.

**Key words:** Nanoparticles, Soxhlet, FTIR, UV –Vis spectroscopy.

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## Natural and sustainable medicine development for predominant uropathogen

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The main objective of the present study is to unveil the antibacterial activity of natural products extracted from *Myristica fragrans* against the predominant uropathogen. *M. fragrans* It is widely grown across the tropics including Guangdong and Yunnan in China, Taiwan, Indonesia, Malaysia, Grenada in the Caribbean, Kerala in India, Sri Lanka and South America. And thus, the sustainability and reproductivity of medicinal product ensured for prolonged time. One compound, N-(2-(dibenzo[b,d]furan-2-yl)ethyl)-3-phenylpropanamide, from *Myristica fragrans* was purely isolated and identified by analytical techniques such as TLC, GCMS, FTIR and NMR. Antibacterial activity by means of antibiofilm assay using crystal violet and further confirmation by SEM analysis was executed. N-(2-(dibenzo[b,d]furan-2-yl)ethyl)-3-phenylpropanamide was docked with Fim-H receptor protein, which is highly involved in the adhesion of bacteria to uro-epithelial cells that might serve as supportive evidence. To confirm N-(2-(dibenzo[b,d]furan-2-yl)ethyl)-3-phenylpropanamide drug efficacy, ADME properties were also calculated. N-(2-(dibenzo[b,d]furan-2-yl)ethyl)-3-phenylpropanamide exhibited a remarkable inhibition against the bacterial pathogen. Molecular docking with Fim-H receptor protein (PDB ID: 4X5R) showed a doorstep way to understand the mechanism of action through the molecular interaction as well as the established molecular mechanics values that are including the least binding affinity, ligand efficiency and inhibitory constant (*ki*). This helped in determining the mode of action of possible drug moiety that interacts with the target of interest in the best possible way. Thus, our entire focus has been on identifying the anti-uropathogenic bacterial property of pyrogallol from *Myristica fragrans* providing a valuable foothold for detailed research in the near future.

**Keywords:**ADME, Biofilm, *E. coli*, Fim-H, *Terminalia chebula*, uropathogens

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## **Metabolic Footprinting Technology -- A versatile tool in Environmental Biotechnology**

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Metabolic foot printing implies the measurement and analysis of metabolic activity within a biological system or organism. It involves studying the set of chemical reactions that occur within cells, tissues, or organisms, collectively known as metabolism, to gain insights into their functions, dynamics, and responses to external stimuli. Metabolism foot printing provides a quantitative assessment of the metabolic state, identifying metabolites produced and consumed, and tracking metabolic fluxes. It can be implemented in bioremediation, in elucidation of biodegradation pathways, and thereby the improvement of the biodegradation process via metabolic engineering. By analysing the metabolic capabilities of known pollutant-degrading microorganisms, researchers can predict the potential breakdown products and intermediate metabolites that may be formed during bioremediation. This information assists in understanding the fate of contaminants in the environment and their potential transformation products. Metabolic foot printing can be used to design and engineer microbial consortia with enhanced bioremediation capabilities. By identifying key metabolic pathways and enzymes involved in pollutant degradation, researchers can select or genetically modify microorganisms to optimize their metabolic activity. Metabolic foot printing is a versatile tool for the development of more efficient and tailored bioremediation strategies.

**Keywords:** Environmental biotechnology, xenobiotics, metabolic foot printing, Metabolomics.

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## **Algae: The Green Guardians of Environmental Sustainability**

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Despite humanity's significant achievements in agriculture, medicine and technology, our ability to control and manipulate nature remains paradoxical. The Earth is currently experiencing a severe phase of biodiversity loss, the consequences of which are unforeseen and unpredictable. While advanced technology has made our lives easier, it has also led to diverse effects such as global warming, greenhouse gas emissions and overexploitation of natural resources, leaving us powerless.

As we become increasingly aware of our environmental situation, it is crucial that we develop sustainable and eco-friendly solutions. One promising advancement in this field is the utilization of algae, which has found applications in biofuels, food products and many more. It is not an exaggeration to say: "Our reliance on algae is essential" since these humble organisms are assisting us in addressing everyday challenges across various domains.

The potential of algae extends far beyond their traditional role, from being a simple organism in an aquatic ecosystem to becoming the green guardians of environmental sustainability, they play a significant role in the environment.

The versatility of algae and its potential applications in various industries hold great promise for a sustainable future. From combating climate change to providing nutritious food options, algae offer a path towards a more balanced and harmonious relationship between humanity and nature. By embracing the potential of algae through research and development, we can unlock innovative solutions to address the environmental challenges we are facing today.

**Keywords:** Algae, environmental sustainability, climate change.

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**Biowaste for sustainable environment; a friendly Battery material**

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Human population generate around 105 billion tons of organic waste annually, directly or indirectly. According to the world bank around 33% of waste is not managed in an environmentally safe manner. The biowaste is rich in several useful components and can be used to boost the country's economy. One such component is secondary metabolites like tannins that are present in high concentrations in berries, nut kernels, oak bark and pomegranate peel, a biowaste. India being the third largest producer of pomegranate in world, generates tonnes of biowaste every year. This study hypothesizes, tannins from biowaste as an organic electrode material that can serve as bio-conductors. The extracted tannins were analysed for its oxidation/reduction potential using cyclic voltameter. Further experiments will be carried out to understand bio-conducting properties of the tannins extracted from biowaste.

**Keywords:** Biobatteries, pomegranate waste, organic electrode, tannins.

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## A Study on Degradation of Plastic Waste by *Aspergillus niger*

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Plastic materials have become widely used during the past 25 years as a result of their increased application in the food, clothing, shelter, transportation, construction, medical, industries. There is a lot of interest in the microbial degradation of plastic and other synthetic materials since bacteria and fungi can break down the majority of organic and inorganic materials. The current study encompasses around isolation of microorganisms from a dumpsite containing low-density polyethylene (LDP), and the potential for microbial decomposition of plastic waste. *Aspergillus niger* was isolated as one of the most predominant strains and subsequently employed to biodegrade plastic trash. The medium used for the experiment contained 0.2 g of magnesium sulphate, 1 g of potassium dihydrogen phosphate, 1 g of dipotassium hydrogen phosphate, 1 g of ammonium nitrate, 0.05 g of ferric chloride, and 0.02 g of calcium chloride and 1000 ml of water. 10 ml of fungal-containing medium was added to test tubes, and 0.1 g of the plastic sample that had already been treated with ethanol was added. PH was maintained at 7.0. Plastic trash buildup is a significant environmental problem. Biodegradation of plastic using *Aspergillus niger* can be used as a strategic solution to the problem. *Aspergillus niger*, caused weight loss by 6.5% in each trial that was observed over a period of 30 days.

**Keywords:** Plastic waste, biodegradation, *Aspergillus niger*, Low Density Polythene (LDP)

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## **Advancing Sustainability in Agriculture and Environment: Integrating Host-Mediated Gene Engineering, Microbiome-Based Technologies and Bio-prospecting Endophytes**

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This abstract provides a comprehensive overview of research papers focused on advancing sustainability in agriculture and the environment through various approaches. Host-mediated gene engineering, microbiome-based technologies, bio-prospecting endophytes offer promising avenues for improving agricultural sustainability. These techniques enable the enhancement of crop traits, such as disease resistance, plant growth and stress tolerance resulting in increased productivity and reduced environmental impacts. These technologies harness the beneficial interactions between plants and their microbial communities to enhance nutrient cycling, plant health, and ecosystem resilience. Reducing food loss in perishable produce is a vital aspect of sustainable agriculture. The tomato supply chain in South India is a case study to understand the factors contributing to post-harvest losses. Furthermore, the Indian Smart Cities Environmental Sustainability Index (ISCESI) is designed as a comprehensive framework to evaluate the environmental performance of smart cities, by considering indicators such as waste management, water conservation, and green spaces. A combination of quantitative and qualitative methods, including surveys, data analysis is employed at improving the efficiency, sustainability and optimizing agriculture practices. In summary, these research papers collectively highlight the findings contributing to the development of innovative strategies, such as increase in crop yield , evaluating smart city initiatives, reducing food losses, and harnessing the potential of endophytes, ultimately promoting environmental sustainability in various domains.

**Keywords:** Host-mediated gene engineering, microbiome-based technologies, bio-prospecting endophytes, ISCESI, sustainability.

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## Ecologically benign, green synthesized vanillin-based pyridyl-benzylidene-5-fluoroindolins for DNA gyrase inhibition

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Presenting here the substituted (Z)-5-fluoro-3-(3-methoxy-4-pyridin-2-yl)methoxy)benzylidene)indolin-2-one (**4a-d**) prepared from eco-friendly solvents and catalysts by the condensation of 4-((4-(substituted)-3-methylpyridin-2-yl)methoxy)-3-methoxy benzaldehyde (**3a-d**) with 5-fluorooxindole in presence of pyrrolidine as reagent, by-product of the reaction is water, isolated by mere filtration with excellent yield and high purity without purification. All synthesized compounds were characterized by IR, NMR ( $^1\text{H}$ ,  $^{13}\text{C}$ ,  $^{19}\text{F}$ ) and Mass spectra (LCMS, HRMS). Current studies have shown a remarkable outcome of DNA gyrase inhibition on the development of atherosclerosis in animal models. The significant role for DNA gyrase inhibitors in reducing escaping mechanism of bacteria through negative supercoiling. DNA gyrase ability of **3a-d** and **4a-d** was tested using a DNA-gyrase competitive inhibition-based assay. Mode of interaction and preliminary therapeutic efficacy of all compounds was assessed by molecular docking, MD simulations and DFT & ADMET calculations. Cytotoxicity of **3a-d** and **4a-d** assessed in macrophages. The structure-activity relationship was established by comparing all experimental as well as *in silico* analysis. In the results, excellent DNA gyrase (96.25±2.14 % inhibition and  $\text{IC}_{50}$  0.004  $\mu\text{M}$ ) of compound **5a** was almost correlated with the molecular docking results ( $\text{IC}_{50}$  0.0039  $\mu\text{M}$ ). In conclusion, it is highly possible that the blood pressure effects of DNA gyrase-inhibitors could play a role in the anti-microbial effect shown by these compounds.

**Keywords:** Anti-microbial, drug design, molecular docking, DNA gyrase

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## **E-Fuel: Marks the Source of Future Transport**

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Over dependence on fossil fuels is a worldwide problem, currently the uncontrolled use of fossil fuel is harming the earth and emptying the resources. We have just been through the hottest decade ever recorded and besides climate change, combustion engines spit out pollution that causes millions of deaths each year. Hence the world needs rapid transition away from fossil fuels. Due to this the pressure is on to develop new technologies, one of which is e-fuels. It is a sustainable alternative carbon-based fuel where inside the container's hydrogen and air captured carbon dioxide are turned into gaseous hydrocarbons, further processing turns them into liquid synthetic fuels. This syn fuel can be almost carbon neutral as long as the entire production process is powered only by excess electricity from renewable sources. But all these electricity based syn fuels have some minor disadvantages: all that green electricity has to be generated in the first place and that can only happen in presence of enough sun, wind, water or geothermal power. Syn fuels aren't cheap either about 4 euros 50 a liter in current scenario. So, while e-fuels might have their use cases this doesn't marks end of combustion engines yet, it will be around for another few years but there will also be electric cars and new technologies.

**Keywords:** e-fuel, carbon dioxide, hydrogen, electricity, synthetic fuel, fossil fuels, climate.

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## Surface Enhanced Raman Spectroscopy (SERS) for environmental monitoring

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With the rapid growth of industrial and agricultural activities, there is a crucial need for environmental monitoring to study the impact of pollutants on ecosystems and human health. Surface-Enhanced Raman Spectroscopy (SERS) has gained prominence as a powerful analytical technique for environmental monitoring owing to its ultrahigh sensitivity, selectivity, and its ability to provide molecular-level information. It is a technique that amplifies Raman scattering signals from analyte molecules adsorbed onto rough nanostructured metal surfaces, thereby enhancing the sensitivity of detection. The review opens with a brief introduction to the mechanisms underlying SERS [1] and its advantages over normal Raman spectroscopy. The review presents a summary of the applications of SERS in environmental monitoring, highlighting its potential as a versatile device for detecting pollutants. This technique enables to detect trace levels of contaminants in various matrices such as water, soil, and air [2]. Future perspectives in the field with the advancement of portable and field-deployable SERS devices for on-site environmental analysis are also discussed.

**Keywords:** SERS, environmental pollutants, portable devices

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## Greener Herbage Therapeutics for More Sustainable Healthcare for Cancer

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Sustainable cultivation of medicinal plants a multi-dimensional solution of global problems. and these Medicinal plants are worldwide significant sources of herbal commodities, yet they are rapidly disappearing. To meet the worldwide need for medical plants, huge production of medicinal plants using organic farming in a sustainable manner is required. It can fulfil worldwide demand, supply raw pharmaceuticals to pharmaceutical enterprises, protect endangered medicinal plants, and protect the environment from hazards effects. Medicines are essential to human health but can also impact the aquatic and terrestrial environment after use by patients and release via excreta into wastewater. Recently, numerous side effects of synthetic drugs have led to using medicinal plants as a reliable source of new therapy. Pain is a global public health problem with a high impact on life quality and a huge economic implication, becoming one of the most important enemies in modern medicine. The health of livestock, humans, and environments is tied to plant diversity and associated phytochemical richness across landscapes. The current study was aimed to review evaluate the effect of harvesting age and harvesting frequency towards herbal yield, phytochemicals synthesis, antioxidant activities, and bioactive compounds from greener herbage. Circumstantial evidence supports the hypothesis that phytochemical richness of herbivore diets enhances biochemical richness of meat and dairy, which is linked with human and environmental health. Among many roles they play in health, phytochemicals in herbivore diets protect meat and dairy from protein oxidation and lipid peroxidation that cause low-grade systemic inflammation implicated in heart disease and cancer in humans. We discuss the feasibility of including these criteria for green by design active pharmaceutical ingredients in the process of drug discovery and development and which tools or assays are needed to accomplish this. The integrated GREENER herbage approach can be used to accelerate discussions about future innovations in drug discovery and development.

**Key words:** Herbage, cancer healthcare, phytochemicals, drug discovery, human and environmental health.

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## Role of Biofertilizers in improving Soil Health

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Continued degradation of the Earth's natural resources and increase due to harmful chemical fertilizers. It has a huge impact. Anxiety about the future of agriculture. Organic fertilizers are promising alternatives to hazardous chemical fertilizers and are becoming increasingly important for sustainable agriculture. Organic fertilizers play an important role increasing crop yields and maintaining the long-term soil fertility essential to meeting the world's food needs. Microorganisms can interact act with crop sand enhance their immunity growth and development. Nitrogen, phosphorus, potassium, zinc and silica are essential nutrients that need for proper growth. However, these nutrients exist in insoluble or complex forms in nature. Certain microorganisms' solubility them and make the available to plants. Organic fertilizers are cheap, non-toxic and environmentally friendly, and serve as an excellent alternative to expensive and harmful chemical fertilizers. This will help us understand the importance of microbes in agriculture for sustainable production. A major effect of the use of harmful chemical fertilizers is soil degradation, which reduces the physical, chemical and biological quality of the soil. Overuse and abuse of chemical fertilizers such as NPK lead to increased soil salinity. To restore soil salinity, organic fertilizers are excellent tools for soil sustainability.

**Keywords:** Organic fertilizer, soil concentration, microorganisms, soil degradation, salinity

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## Innovative technologies for Environmental Sustainability

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After the United Nation adopted the 17 sustainable development goals [SDGs] to ‘end poverty, protect the planet and ensure prosperity for all’. Environmental sustainability is a key to allow for human development without compromising natural resources. There are various technologies which can be implemented for the betterment of environment. Some of the technologies that can be followed are:

- Solar cell, it is an electronic device that converts the energy of light into electricity.
- Wind Turbines, they help in the process in which wind is used to generate electricity.

Edible plastic, scientists have developed a new 'green plastic's that is produced from gelatine, clay and a mono emulsion of black pepper essential oil. These are some of the innovative technologies that can bring about sustainable environment.

**Key Words:** Design for environment, life cycle design, eco design methods, value analysis, eco friendly products.

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**An innovative ideology and a developmental strategy related to  
Environmental Sustainability and its new perspectives and its patterns for  
interactions of human welfare.**

**(An easy tackling and a knowledge gaining review aspects and its significance)**

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Science in Latin means Scientia or knowledge. The principle of science is marking a departure of bookish learning which continues to shape our system and causes a gap between college home and community inculcating creativity and initiative is possible if we perceive and treat children as participants in learning not as receivers of a fixed body of knowledge where syllabus designers of life sciences have tried to address the problem of greater consideration for the child psychology giving high priority and space to opportunities for contemplations and wondering discussions in small groups activities requiring hands on experience through a novel mind trickling plot related to is discussed like a game making children life at college at all levels a happy experience rather than a source of stress or boredom which gives a more hope to encourage more and more goal achievers to reach great heights which plays a very important role and in inclusive development of monitoring their curriculum and also research and development through a creative and innovative mechanism following the strategies of Sustainability is discussed.

**Key words:** Energy, waste management, natural resources utility, climatic changes, innovative

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## Green synthesis of novel fluoro-indolines for microbial infections

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In this study, we aimed to develop few DNA gyrase inhibitors and antimicrobial agents. Green synthesized and ecologically benign, novel fluoro-indolines derivatives were synthesized, characterized for the same. The inhibitory outcome on DNA gyrase A and B and antimicrobial activities were evaluated through both *in silico* and *in vitro*. The agar well diffusion method based antimicrobial activity against Gram<sup>-ve</sup> *Pseudomonas aeruginosa* (MTCC 424) & *Escherichia coli* (MTCC 443), Gram<sup>+ve</sup> *Streptococcus pyogenes* (MTCC 442) & *Staphylococcus aureus* (MTCC 96), and the antifungal activity against a clinical isolate of *Candida albicans* (Fungi) was executed. The cytotoxicity of the fluoro-indolines derivatives was assessed by using the macrophages by means of the MTT assay. In the overall results, the fluoro-indolines derivatives exhibited a broad-spectrum antimicrobial activity against both bacterial types and fungal as apart from their efficient DNA gyrase inhibition activity. The DNA gyrase activity was dose depended and a range of 10 to 30 nM concentration of compound **4a** and **5a** showed good activity and above and below this value did not show any remarkable values. Compound **4a** showed a maximum DNA gyrase A inhibition at  $0.325 \pm 0.025$   $\mu\text{M}$  and DNA gyrase B at  $0.250 \pm 0.03$   $\mu\text{M}$  and **5a** showed a maximum activity at  $0.285 \pm 0.025$   $\mu\text{M}$  and  $0.225$   $\mu\text{M}$  against DNA gyrase A and B respectively. The cell viability of J774A.1 macrophage was evaluated using compounds **4a** and **5a**. Low concentrations (1 to 5 (nM)) did not affect cell viability, whereas 6 and 30 nM **4a** and **5a** did affect cell viability. Consequently, we suggest the concentration 8-10 nM of **4a** and 10-20 nM **5a** in future animal study evaluations.

**Keywords:** Anti-microbial, biofilm, *Candida albicans*, DNA gyrase, *E. coli*, molecular docking

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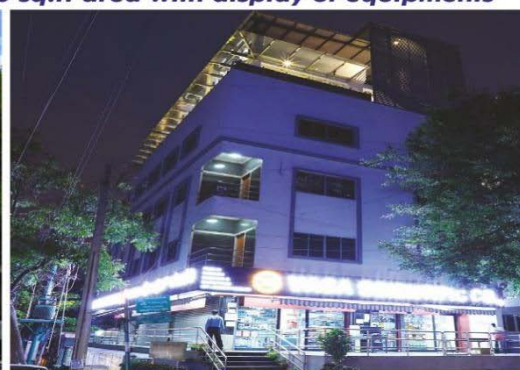
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