PROGRESS REPORT 2022-23

Manav Rachna University

Declared as State Private University vide Haryana Act 26 of 2014

Content

1. Preamble

Sustainable Development Goal 12 (SDG 12) focuses on "ensuring sustainable consumption and production patterns." The aim is to promote the efficient use of resources, reduce waste, and encourage environmentally friendly practices across industries and consumer behaviour. This goal is critical for addressing the depletion of natural resources, environmental degradation, and the growing impact of waste and pollution. By fostering a circular economy and responsible practices, SDG 12 aims to create a balance between meeting current needs and preserving resources for future generations.

2. Responsible Purchasing at MRU

Responsible purchasing practices at MRU involve making informed decisions to minimize environmental impact, prioritize eco-friendly products, and support ethical supply chains.

- **Eco-friendly Procurement Policy**: MRU aims to procure products with minimal environmental impact, such as recycled paper, biodegradable cleaning products, and sustainably produced goods. The procurement team prioritizes suppliers who adhere to sustainable practices, thereby reducing the carbon footprint associated with purchased goods.
- **Reducing Single-use Plastics**: The university has restricted single-use plastics on campus, encouraging the use of reusable containers, cutlery, and water bottles. Initiatives like 'Plastic-Free Campus Days' promote awareness and help reduce plastic waste.
- **Local and Ethical Sourcing**: Whenever feasible, MRU sources materials from local suppliers to support the regional economy and reduce transportation-related emissions. The university also

ensures that the products it purchases align with fair labor practices, supporting ethical sourcing.

3. Mindful Consumption at MRU

To achieve responsible consumption, MRU encourages practices that minimize waste and promote conscious use of resources.

- **Digitalization Initiatives**: MRU has implemented digital solutions, reducing the need for paper in administrative and academic processes. E-assignments, online examinations, and digital record-keeping are examples of initiatives that reduce paper waste significantly.
- **Sustainable Dining Practices**: The campus cafeteria provides options for plant-based meals and encourages balanced portions to minimize food waste. Composting bins are available to dispose of organic waste responsibly, and waste audits are regularly conducted to identify further areas of improvement.
- **Waste Segregation and Recycling**: MRU has installed separate bins for recyclable, non-recyclable, and organic waste across the campus. Regular workshops on waste management and recycling

practices are held to ensure the community understands the importance of proper waste disposal and recycling.

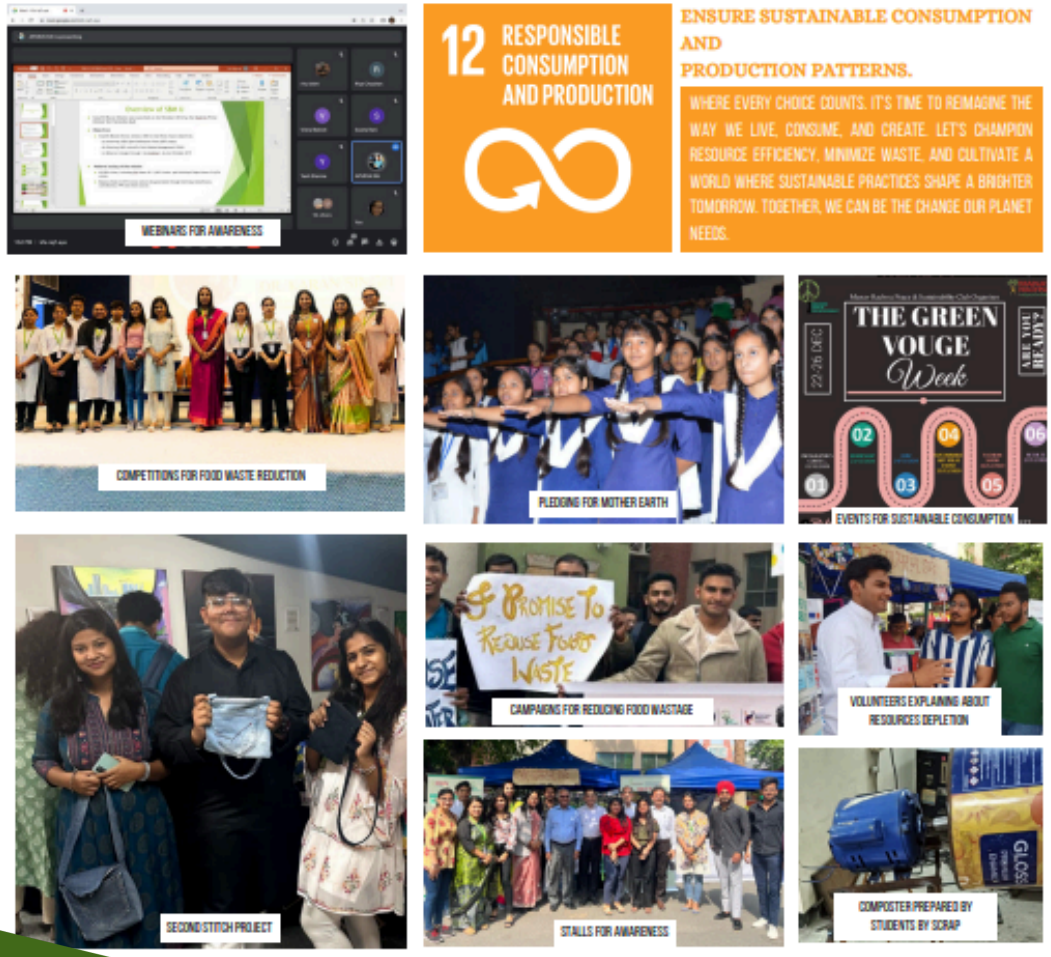
4. Attitude Formation Towards Sustainability

Building a culture of sustainability at MRU involves instilling sustainable values in students and staff. To foster a responsible mindset, MRU focuses on education, advocacy, and participatory activities.

- **Educational Programs and Workshops**: Regular seminars and workshops on sustainable living, waste management, and eco-friendly practices are organized. These events encourage students to adopt responsible consumption behaviors in their personal lives and communities.
- **SDG Ambassador Program**: Under this program, students are designated as SDG Ambassadors, actively promoting SDG 12 and leading initiatives such as recycling drives, tree-planting, and sustainability campaigns. This responsibility empowers students to drive change and influence their peers positively.

- **Awareness Campaigns**: Awareness campaigns on social media and around campus highlight the importance of sustainable consumption. Events like 'Sustainability Week' feature guest speakers, informational booths, and hands-on activities that showcase the importance of responsible consumption and production.

- **Incorporating Sustainability in Curriculum**: Courses across disciplines incorporate topics related to sustainable practices and environmental ethics, ensuring students understand the impact of their choices on global resources.



5. Research Publications

I. Development of Functional Guar Gum-Based Highly Water Absorbent and Investigation of Reaction Parameters

The research paper delves into the development of a sustainable and eco-friendly superabsorbent polymer derived from guar gum, a natural polysaccharide. This innovation aligns with SDG 12: Responsible Consumption and Production, which emphasizes the importance of sustainable resource management and efficient production processes.

The synthesized superabsorbent polymer demonstrates exceptional water absorption capacity, making it a promising material for various applications, such as water retention in agriculture, personal care products, and environmental remediation. By utilizing a natural, renewable resource like guar gum, this research contributes to reducing reliance on petroleum-based materials and promoting sustainable practices.

Furthermore, the study investigates the impact of different reaction parameters on the polymer's properties, optimizing the

synthesis process for maximum efficiency and minimal environmental impact. This focus on optimizing resource utilization and reducing waste aligns with the principles of sustainable production and consumption.

II. Cefuroxime: A potential corrosion inhibitor for mild steel in sulphuric acid medium

The research paper explores the potential of cefuroxime, an expired antibiotic drug, as a corrosion inhibitor for mild steel in acidic environments. This innovative approach aligns with SDG 12: Responsible Consumption and Production by promoting sustainable practices and reducing waste.

By repurposing an expired pharmaceutical product, the researchers contribute to circular economy principles and minimize environmental impact. Additionally, the study highlights the potential of utilizing waste materials as effective corrosion inhibitors, offering a cost-effective and eco-friendly solution to a significant industrial problem.

III. Experimental investigation of sustainable Corrosion Inhibitor Albumin on low-carbon steel in 1N HCl and 1N H_2SO_4

This research investigates albumin, a protein readily available from egg whites, as a potential corrosion inhibitor for low-carbon steel. Albumin is considered a sustainable alternative to traditional inhibitors because it's environmentally friendly, biodegradable, and free of harmful chemicals.

The study explores the effectiveness of albumin extract in protecting steel from corrosion in acidic environments (1N hydrochloric acid and sulfuric acid). They employed various techniques like weight loss measurement and electrochemical methods to assess its inhibition efficiency.

Results indicate that albumin acts as an excellent inhibitor, achieving a maximum efficiency of over 92% in hydrochloric acid and 79% in sulfuric acid. The type of inhibition appears to differ between the two acids, with anodic inhibition (blocking metal dissolution) dominant in hydrochloric acid and mixed-type inhibition (affecting both metal dissolution and cathodic reactions) prevailing in sulfuric acid.

Furthermore, the study suggests that albumin forms a protective film on the steel surface through a Langmuir adsorption process.

This film formation is further supported by additional analyses using atomic force microscopy and Fourier-transform infrared spectroscopy. Overall, the research demonstrates the potential of albumin extract as a promising and eco-friendly corrosion inhibitor for low-carbon steel.

IV. Electrochemical and surface study of an antibiotic drug as sustainable corrosion inhibitor on mild steel in 0.5 M H2SO4

The research paper investigates the potential of Ethambutol Hydrochloride, an antibiotic drug, as a sustainable corrosion inhibitor for mild steel in acidic environments. The study employed various techniques, including weight loss measurements and electrochemical methods, to assess the inhibitor's performance.

The results revealed that Ethambutol Hydrochloride exhibited significant corrosion inhibition efficiency, with a maximum of 92.78% observed at a concentration of 1000 ppm and a temperature of 313 K. The inhibition efficiency decreased with increasing temperature. Electrochemical studies indicated a mixed-type inhibition mechanism, suggesting that the drug

inhibits both the anodic and cathodic reactions. Additionally, surface analysis using FT-IR confirmed the presence of functional groups in the drug molecule that likely interact with the metal surface, forming a protective film.

The study concludes that Ethambutol Hydrochloride is a promising eco-friendly corrosion inhibitor for mild steel in acidic solutions, offering a sustainable alternative to traditional inhibitors.

V. Experimental and Computational Studies of a Novel Metal Oxide Nanoparticle/Conducting Polymer Nanocomposite (TiO2/PVP) as a Corrosion Inhibitor on Low-Carbon Steel in Diprotic Acidic Medium

The research paper investigates the effectiveness of a novel nanocomposite material, titanium dioxide/poly(vinylpyrrolidone) (TiO2/PVP), as a corrosion inhibitor for low-carbon steel in sulfuric acid. The nanocomposite was synthesized through a simple and eco-friendly in situ polymerization method.

The study employed various techniques, including gravimetric analysis, potentiodynamic polarization, electrochemical

impedance spectroscopy, and surface analysis techniques like AFM and FT-IR, to evaluate the corrosion inhibition performance of the nanocomposite.

The results demonstrated that the TiO2/PVP nanocomposite exhibited excellent corrosion inhibition properties, significantly reducing the corrosion rate of low-carbon steel in sulfuric acid. The nanocomposite formed a protective film on the metal surface, preventing corrosive attack.

The study concludes that the TiO2/PVP nanocomposite is a promising and sustainable corrosion inhibitor for low-carbon steel, offering a potential solution to the challenges of metal corrosion in acidic environments.

VI. Thermodynamic and electrochemical investigation of inhibition efficiency of green corrosion inhibitor and its comparison with synthetic dyes on MS in acidic medium

The research paper explores the potential of natural and synthetic compounds as corrosion inhibitors for mild steel in acidic environments. The study focuses on black pepper extract

as a natural inhibitor and two synthetic dyes, Thoron and Phenosafranin.

Various techniques, including weight loss measurements, electrochemical impedance spectroscopy, and potentiodynamic polarization, were employed to assess the corrosion inhibition efficiency of these compounds. The results revealed that black pepper extract exhibited the highest inhibition efficiency, reaching 97% in 1 M hydrochloric acid.

The study also examined the adsorption behavior of the inhibitors on the metal surface. Both natural and synthetic inhibitors followed Langmuir and Temkin adsorption isotherms, indicating the formation of a protective film. Additionally, atomic force microscopy (AFM) confirmed the formation of this protective layer.

The findings suggest that black pepper extract, a natural and sustainable alternative, offers superior corrosion inhibition compared to the synthetic dyes. This research highlights the potential of natural products in addressing corrosion challenges and promoting environmentally friendly solutions.

VII. Chemical and electrochemical approach to find out the effect of soluble sulfonated polystyrene polymer inhibitor with 0.5 M HCl mixtures on the interface of low carbon steel surface

The research paper investigates the effectiveness of soluble sulfonated polystyrene (SPS) as a corrosion inhibitor for mild steel in hydrochloric acid. The study employs various techniques, including weight loss measurements, electrochemical impedance spectroscopy, and potentiodynamic polarization, to assess the inhibitor's performance.

The results indicate that SPS exhibits excellent corrosion inhibition properties, significantly reducing the corrosion rate of mild steel in acidic environments. The inhibitor is believed to form a protective film on the metal surface, preventing corrosive attack.

Atomic force microscopy (AFM) analysis further confirms the formation of this protective film, revealing a smoother surface on the steel samples treated with SPS compared to untreated samples.

The study concludes that SPS is a promising corrosion inhibitor for mild steel in hydrochloric acid, offering a potential solution to the challenges of metal corrosion in acidic environments.

VIII. Corrosion inhibition activity of cefixime on mild steel surface in aqueous sulphuric acid

The research paper delves into the potential of Cefixime, an expired cephalosporin antibiotic, as a sustainable and eco-friendly corrosion inhibitor for mild steel in sulfuric acid solutions. The study utilizes a combination of gravimetric analysis and electrochemical techniques, including polarization studies and electrochemical impedance spectroscopy, to evaluate the inhibitor's performance.

The results demonstrate that Cefixime exhibits remarkable corrosion inhibition efficiency, reaching up to 96% at optimal concentrations. The inhibitor is found to physically adsorb onto the metal surface, forming a protective film that hinders the corrosive attack. This adsorption mechanism is further supported by thermodynamic studies, which indicate physical adsorption as the dominant mode of interaction.

The study concludes that Cefixime offers a promising and eco-friendly alternative to traditional corrosion inhibitors. By repurposing expired pharmaceutical products, this research contributes to sustainable practices and minimizes environmental impact.

6. Books / Book Chapters

Utility of nanomedicine and nanocarriers for non-infectious disease treatment

Nanotechnology has emerged as a promising field with the potential to revolutionize the treatment of non-communicable diseases. Traditional medications often face limitations in terms of efficacy, safety, and side effects. Nanomedicine and nanocarriers offer a solution by providing targeted drug delivery, enhanced drug efficacy, and multifunctional capabilities.

Nanoparticles can be designed to target specific cells or tissues, minimizing damage to healthy cells and reducing side effects. Additionally, nanocarriers can protect drugs from degradation and improve their bioavailability, allowing for lower dosages.

Moreover, multifunctional nanoparticles can combine diagnostic and therapeutic functions, enabling simultaneous disease detection and treatment.

Despite the significant potential of nanomedicine, challenges remain, including potential toxicity and the need for further research to understand their pharmacokinetics and pharmacodynamics. Nevertheless, the future of nanomedicine in treating non-infectious diseases appears promising, and continued research and development are essential to unlock its full potential.

7. Other

- **Eco Blend Webinar- Learning how to grow microgreens at home**

On November 25, 2023, the Manav Rachna Centre for Peace and Sustainability hosted an online webinar focused on promoting sustainable living and healthy eating habits. The event, attended by 60 participants, featured a hands-on demonstration by Ms. Wirra Creado, an expert in sustainable agriculture.

The webinar aligned with Sustainable Development Goals 13 (Climate Action) and 15 (Life on Land). By guiding participants through the process of cultivating microgreens at home, the session aimed to empower individuals to adopt environmentally friendly practices. The interactive nature of the online platform allowed for real-time engagement, with participants asking questions and receiving immediate guidance.

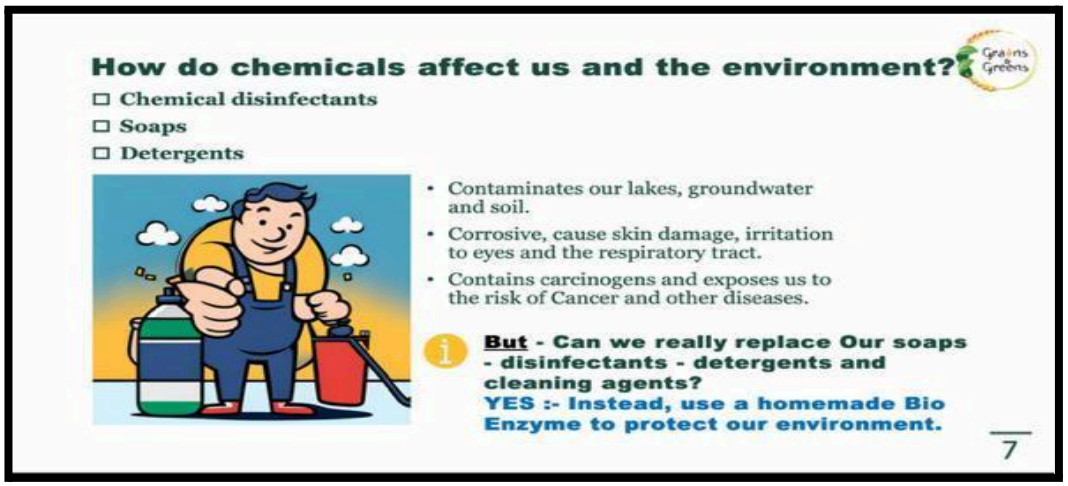
This initiative not only provided practical knowledge but also encouraged participants to reflect on the environmental impact of their food choices. By promoting microgreen cultivation, the webinar fostered a sense of community and responsibility towards sustainable living.

- **KALAKRITI Art Exhibition of MRCPS**

The "KALAKRITI Art Exhibition of MRCPS" was a successful event held on November 2, 2023, at Manav Rachna University's Art Gallery G Block. Organized by MRCPS in collaboration with Felicia, the exhibition showcased a diverse range of artwork,

from paintings to sculptures, that celebrated the theme of "Harmony Through Art: A Sustainable Vision."

The exhibition aimed to inspire environmental consciousness and promote sustainable practices. Participants were encouraged to create art using waste materials, demonstrating the potential of art to address environmental challenges. The event also fostered a sense of community and teamwork among the participants, with the "CLAN POINTS FOR ALL" initiative encouraging collaboration and friendly competition. Ultimately, the "KALAKRITI" exhibition was a testament to the power of art to inspire positive change. It highlighted the creativity and talent of the participating students while promoting a sustainable and harmonious future.




- **Solid Waste Management Workshop**

  On August 18, 2023, Manav Rachna University students and faculty visited Chainsa Village, Faridabad, as part of the Unnat Bharat Abhiyan initiative. The visit aimed to raise awareness about the importance of solid waste management and cleanliness.

  A workshop on "Awareness towards - Mission Life, Say no to Plastic" was conducted to educate the villagers, especially the girl students of Government Girls Senior Secondary School, Chainsa. The volunteers engaged in various cleanliness activities, emphasizing the negative impact of irresponsible waste disposal on the environment. This initiative aligns with the university's commitment to holistic education and social responsibility. It

provided students with valuable learning experiences while empowering the village community to adopt sustainable practices.


Cleanliness Drive
Organized by
Manav Rachna University
in collaboration with the
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