

## Preface

In a time where the intersection of chemistry and biology is rapidly evolving, the pursuit of sustainability has become a cornerstone of scientific research. This book "*Sustainable Chemical Insight in Biological Exploration*" embarks on a journey through the intricate relationship between chemical innovation and biological systems, emphasizing the importance of environmentally conscious approaches. The book explores into sustainable chemical practices that drive advancements in biological exploration, offering a comprehensive view of the principles of green chemistry integrated into biological research. By fostering a deeper understanding of these intersections, this book aims to inspire researchers, educators, and students to embrace sustainable methodologies that not only advance scientific knowledge but also contribute to the preservation of our planet.

Some species pollinators of order Hymenoptera have played an important role to cause pollination in most abundant spice plant like coriander in India. Their activity in the coriander field is very important to facilitate the production of seeds as per demand. A detail study done by Biswanath Bhowmik explores some information related to the interaction between coriander plant and *Apis* bees.

Nanomaterials (NMs) possess unique properties due to their nanoscale dimensions and high surface areas, impacting fields from physics to biotechnology. The 2<sup>nd</sup> article explores the synthesis of NMs, focusing on eco-friendly and cost-effective bio-assisted methods. This chapter studies the living organisms, biomolecules, and plant extracts in the synthesis of nanomaterials. Innovative methods are emerging that are shaping the future of nanotechnology.

Another study entitled "Fish Species Diversity of the Lower Stretch of River Damodar with References to Pollution Effect" documents the fish diversity in the Damodar River confluence area, highlighting the impact of anthropogenic changes, such as flow diversion. The investigation identified 28 fish species, including brackish water species influenced by tidal changes. With favorable water quality and evidence of spawning and migration, the findings underscore the significance of the confluence for both fish conservation and aquatic habitat health.

Ants are essential for ecosystems, but some invasive species can harm crops, pollinate, and destroy pollen grains. Author Damayanti Bakra discusses the distribution of invasive ant species across various locations in and around the Indian Sunderbans. Invasive species disrupt native species, leading to habitat loss, competition, hybridization, fragmentation, and foraging behavior. It was found that seven invasive species are threatening the Indian Sunderbans, which is the world's largest mangrove ecosystem.

A total of 11 types of organisms belonging to 8 orders were found in the pitfall catches in a litter rich habitat. In his research, Sobhana Palit (Paul) discusses the diversity of soil arthropod fauna in pitfall catches in habitats rich in litter. The main dominant fauna in all the pitfall samples was spider (order Araneae). The other main orders included Collembola, Hymenoptera and Orthoptera. However different types of plantations did not exert any effect on the soil faunal composition of the area under study.

The paper entitled "Synthesis, Characterization and Biological activity of Schiff Base Metal (II) Binuclear Complexes with Alkali metal salt of *o*-Nitrophenol" by Chandan Kumar explores the synthesis of binuclear complexes derived from the Schiff base of 1,2-phenylenediamine and 2-hydroxy-1-naphthaldehyde. The structure and bonding of the heterobinuclear complexes has been discussed based on analytical, spectral and magnetic results. The complexes are non-electrolytic, square planar geometry and have dative bonding between transition metal chelate and alkali metal. The antimicrobial activity against *E. coli*, *S. aureus*, and *C. albicans* demonstrate significant results.

In the face of rapid urbanization and industrial growth, effective waste management has become crucial. This chapter, "Innovations in Waste Management: A Review," examines recent advancements in recycling, waste-to-energy conversion, landfill management, and hazardous waste handling. Highlighting innovative technologies and strategies, it addresses the environmental and economic impacts of waste. Overcoming ongoing challenges requires a unified effort to ensure sustainable and efficient waste management for a healthier planet.

Solvent polarity plays a pivotal role in the Sonogashira coupling reaction, influencing both reaction rates and selectivity. "Effects of Solvent Polarity in the Sonogashira Coupling: A Brief Overview" chapter explores different solvents and their impact on the efficiency of coupling reactions, highlighting key experimental findings. Understanding these effects aids in optimizing reaction conditions for improved yields and product purity in organic synthesis.

Human serum proteins such as albumin and transferrin can act as carriers for flavonoid ligands, transporting them to target sites. Anamika Basu and coauthors explored the binding affinity between mango pulp flavonoids and human serum albumin through molecular interaction studies. Their in-silico molecular docking analysis revealed that, alongside hydrogen bonds, non-covalent interactions like Pi-alkyl, Pi-Pi T-shaped, and Van der Waals interactions significantly contribute to the binding process.

The Jhora fishery, a traditional practice in Darjeeling utilizing Himalayan stream systems, exemplifies sustainable fish farming. Author Priyankar Sanphui explores its evolution, current status, and the need for effective management to address challenges such as water pollution and climate change. By integrating data from various sources and local

insights, the study highlights Jhora fishery's role in biodiversity, food security, and local economies, advocating for policies to ensure its continued sustainability.

Apurba Biswas in his chapter offers a thorough overview of metal-organic frameworks (MOFs), highlighting their synthesis methods, including solvothermal, microwave-assisted, and emerging techniques like ionothermal and microfluidic synthesis. It explores the use of various solvents and the role of aromatic ligands and metal ions, emphasizing advancements in environmentally friendly MOF production.

In his paper, Rupankar Paira explores the transformational effect of rhodium chemistry on the activation of carbon-hydrogen bonds in aza-heterocycles with five-membered rings. By examining recent advancements and applications, particularly in pyridine and oxazole derivatives, the paper aims to inspire further research and collaboration, showcasing chemistry's potential to address future challenges.

Recently, there has been a paradigm shift towards 'greener' processes/products, with emphasis being placed on sustainability. Therefore, this book "*Sustainable Chemical Insight in Biological Exploration*" will serve as a vital resource that bridges the gap between sustainable chemistry and biological research. By integrating innovative approaches and progressive methodologies, this book aims to inspire future scientific advancements that prioritize sustainability while advancing our understanding of complex biological systems. As we delve into the chapters ahead, This compilation is expected to initiate new ideas and contribute to a more sustainable and enlightened scientific community.

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