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EMERGING TRENDS IN BIOTECHNOLOGY

Emerging Trends in Biotechnology

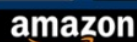


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Emerging Trends in Biotechnology

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Preface

Biotechnology stands at the forefront of scientific innovation, transforming the way we understand and interact with living systems. From advancements in genetic engineering and molecular diagnostics to breakthroughs in sustainable agriculture, environmental management, and personalized medicine, the field continues to evolve at an unprecedented pace. The present volume, *Emerging Trends in Biotechnology*, thoughtfully edited by Dr. Imran Hussain and Dr. Sujeet Pratap Singh, brings together diverse perspectives and cutting-edge developments that reflect the dynamic nature of this discipline.

This book offers a comprehensive overview of contemporary research areas, including synthetic biology, bioinformatics, nanobiotechnology, and translational research. It highlights not only the scientific progress achieved in recent years but also the practical applications that address global challenges such as food security, climate change, and human health. By integrating theoretical insights with real-world applications, this volume serves as a valuable resource for students, researchers, and professionals alike.

Dr. Imran Hussain has meticulously curated contributions that emphasize interdisciplinary approaches and innovation-driven research. The chapters presented in this book underscore the

importance of collaboration between academia, industry, and policy frameworks in advancing biotechnology for societal benefit. Moreover, the inclusion of emerging tools such as artificial intelligence and omics technologies reflects the future direction of the field.

I am confident that this book will inspire readers to explore new ideas, foster critical thinking, and contribute to the advancement of biotechnology. It is a timely and significant contribution that will undoubtedly serve as a reference for years to come. I congratulate Dr. Imran Hussain for his dedicated efforts in bringing together this important work and extend my best wishes for its success.

Editors:
Dr. Imran Hussain &
Dr. Sujeet Pratap Singh

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Essential Oils from *Cymbopogon Flexuosus*: Biosynthesis, Extraction, Phytochemistry, Applications, And Cultivation

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Abstract

Cymbopogon flexuosus, commonly known as lemongrass, is an aromatic plant widely appreciated for its diverse therapeutic, culinary, and industrial applications. Belonging to the Poaceae family, this herb is a rich source of essential oils (EOs), primarily citral, which is extensively used in perfumery, pharmaceuticals, and the flavor industry. Historically used in traditional medicine, lemongrass exhibits a broad spectrum of bioactivities including antimicrobial, anti-inflammatory, antioxidant, and insect-repellent properties. Its cultivation spans tropical and subtropical regions worldwide, with India being a major producer and exporter. Recent research emphasizes the potential of its EOs as a natural alternative to synthetic additives in both human and animal health. This chapter highlights the biosynthesis, extraction and impact of plant growth retardants on the production of essential oil. It also explores the taxonomy, morphology, phytochemical composition, cultivation practices, pharmacological relevance, and global economic importance of *C. flexuosus*, advocating its role in sustainable agriculture and natural product development.

Keywords: *Cymbopogon flexuosus*, essential oil, bioactivity, extraction, biosynthesis, plant growth retardants