

# Prospects and Challenges in Algal Biotechnology

Bhumi Nath Tripathi · Dhananjay Kumar  
Editors

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*Editors*

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*Dedicated to our teacher*  
*Professor J.P. Gaur*



# Preface

The last two decades have witnessed a great surge in the research on algal biotechnology. Significant advances have been made in areas relating to the use of microalgae in biofuel production, carbon dioxide sequestration, and environmental bioremediation. The culture of microalgae in photobioreactors, harvesting of algal biomass, mixotrophic growth including carbon recovery, and environmental remediation using microalgae, phototrophic biofilms, and mats are the major areas in which a good deal of information has been generated. The enormous potential of algae as the source of food, nutraceuticals, and pharmaceuticals has also been recognized. The present volume endeavors to present a critical account of some of the above-mentioned aspects of algal biotechnology.

The book is organized into 12 chapters. The first two chapters comprise the modeling and event-based control systems for the culturing of microalgae in industrial photobioreactors, while Chapters “[Generation and Harvesting of Microalgae Biomass for Biofuel Production](#)” and “[Microalgae-Based Biorefineries as a Promising Approach to Biofuel Production](#)” deal with the algal biomass generation, harvesting, and integrated use of microalgae in biorefinery and generation of biofuel feedstock. Chapter “[Microalgae Mixotrophic Growth: Opportunity for Stream Depuration and Carbon Recovery](#)” explores the possibility of employing microalgae, growing under the mixotrophic condition, in depuration of stream and recovery of carbon. The next four chapters (Chapters “[Sustainable Utilization of Marine Algae Biomass for Environmental Bioremediation](#)”–“[Wastewater Treatment Using Phototrophic-Heterotrophic Biofilms and Microbial Mats](#)”) are dedicated to discussing the use of microalgae, cyanobacteria, and phototrophic biofilms/mats in environmental bioremediation. The selective metal ion homeostasis in cyanobacteria has been elegantly described in Chapter “[Selective Metal Ion Homeostasis in Cyanobacteria](#)”. Chapters “[Algae as Source of Food and Nutraceuticals](#)”–“[Production of Primary and Secondary Metabolites Using Algae](#)” discuss the use of microalgae as the source of food, nutraceuticals, and pharmaceuticals.

We would like to take this opportunity to express gratitude to our teacher Prof. J.P. Gaur, who provided stimulating inspiration, valuable suggestions,

appurtenant criticism, and also showed a keen interest in shaping our career in algal biology. His breadth of vision and deep knowledge of the subject always enlightened our path, so that we could attain academic excellence. We fail to find adequate words to express our humble gratitude to him and dedicate this book to him as a token of our respect for him.

We are thankful to the authors of various chapters of this book for their kind cooperation in completing the task timely. We also appreciate the patience of each one of them for politely complying with various suggestions that we placed before them as the editors of this book. Dr. Madhurima Kahali and Ms. Sowndarya Kumaravel, Editorial Office, Springer, extended valuable help during the preparation and editing of the book. Our colleagues at Indira Gandhi National Tribal University, Amarkantak and H.N.B. Garhwal University, Srinagar–Garhwal, appropriately helped us in various ways. Our research scholars competently assisted us in the reading of the proofs of the various chapters.

BNT is thankful to UGC, CSIR, DST, and DBT for giving financial support through various research projects. DK acknowledges the University Grants Commission, New Delhi for providing financial support in the form of a start-up project.

At last, but not the least, we extend warm appreciation to our wives—Pratima and Gunjan—for their encouragement and patience during the course of the editing of this book.

Amarkantak, India  
Srinagar-Garhwal, India

Bhumi Nath Tripathi  
Dhananjay Kumar

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**Dr. Dhananjay Kumar** has obtained his Ph.D. from Banaras Hindu University. Currently, he is working at Department of Botany, H.N.B Garhwal University. His research work is focused on Algal Biology, especially use of algae/algal mat for the removal of metal contaminants. He is also the recipient of Dr. D.S. Kothari Post-Doctoral Fellowship and worked at Jawaharlal Nehru University. He has published several research papers in journals of international repute.