

Preface

Cyanobacteria are a unique group of gram-negative prokaryotes having oxygenic photosynthesis and have the distinction of being the oldest known fossils, more than 3.5 billion years old. Many of them also carry out N_2 fixation. They are considered as the Earth's architect because their oxygen evolving property has led to the formation of oxygen atmosphere on this planet. They are thought to be the ancestors of plant chloroplast with the help of which plants make food for themselves. Despite being prokaryotic in nature, cyanobacteria exhibit a number of similarities with eukaryotic algae, hence are often called "blue-green algae." These organisms have been tremendously important in shaping the course of evolution and ecological change throughout the Earth's history. They occur as free-living forms as well as in a wide range of symbioses with plants ranging from algae to angiosperms. The role of N_2 -fixing cyanobacteria as natural biofertilizers, particularly in rice fields, as well as their application in reclamation of alkaline usar soils are well documented. Cyanobacteria are able to coordinate and synchronize different bioenergetic and metabolic processes using temporal and spatial separations as a strategy within and between their extremely small sized cells. Cyanobacteria also have been found to be an important source of various bioactive compounds having pharmacological, industrial, and biotechnological applications. Cyanobacteria are frequently used as bioremediation agents for the removal of toxic pollutants from the environment because they inhabit a number of polluted sites and exhibit increased tolerance against those toxicants.

Considering these interesting aspects of their biology and their spectacular contributions to the environment as well as human welfare, we have compiled this book which covers various important facts about cyanobacteria starting from diversity, taxonomy, and distribution to their metabolic regulation and applications. This book logically explores different topics related to cyanobacteria in well documented and profusely illustrated 24 individual chapters contributed by nationally and internationally recognized authors having excellence in teaching and research in the field of cyanobacteria and plant science. The book comprises details of cyanobacterial diversity, molecular taxonomy, the molecular basis underlying the development and function of specialized structures such as heterocytes and akinetes, biochemical and physiological background of nitrogen fixation and hydrogen production, occurrence of cyanobacteria as symbionts and their ecophysiology in extreme polar habitats. Moreover, the book is also enriched by skillful description about cyanobacterial photosynthesis, photomorphogenesis, and photoprotection mechanisms along with siderophore dependent and independent strategies of iron homeostasis. Besides, a significant portion of the book is dedicated to elucidate the cellular mechanisms of cyanobacteria to cope up with various environmental stresses (such as metal and pesticide toxicity), their plant growth promoting properties, their secretion systems, commercial importance of their exopolysaccharides and phycobiliproteins, their potential as bioenergy and biofuel resources, and their biotechnological applications. Monitoring ecotoxicity of antibiotics in fresh water using cyanobacteria and the inside story of cyanobacterial toxins are also catalogued in this book.

We hope that this edited volume will serve as a valuable resource to the undergraduate and postgraduate students as well as researchers working on cyanobacteria. Using this book, teaching institutions should find it helpful in framing up to date syllabi on cyanobacteria.

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