

Bioresource Technology

Concept, Tools and Experiences

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Bioresource Technology: Concept, Tools and Experiences

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About the Book

The book provides up-to-date information on three significant aspects viz., food, energy and environment that are important and challenging issues that need to be addressed. The book consists of three sections about the role of bioresource technology in food, energy and the environment. The first section covers the recent advances in technology in the functional food industry to overcome future food challenges. The second section provides the latest research and development in the green energy sector to cater to the people's energy demand, reduce greenhouse gases (GHG), and the reliance on fossil fuels. The book's third section provides an in-depth understanding of the recent advances in bioresource technologies and management for a sustainable environment.

Foreword

Bioresource technology incorporates techniques using living organisms, parts of organisms, enzymes, proteins, and few others, which are either naturally occurring or are derived from such living systems. These techniques can be used to create or modify products, improve plant or animal productivity or develop microorganisms for special use. Emerging bioresource technology uses recombinant DNA, cell fusion and embryo manipulation among others. This technology has the potential to transform the living conditions of people through its impact on agriculture, animal husbandry, health, environmental protection, material transformation and other areas. From our increasingly deeper understanding of the intricate biochemical interactions at cellular and molecular levels, new paradigms in healthcare have emerged. We have moved from “preventive” (vaccines) and “curative” (antibiotics) medicines to “predictive and corrective” ones. The credit goes to the unraveling of the mystery of the human genome.

In the agricultural sector, new bioresource technology promises to find a solution to the problem of producing more from less, for example, more food from less arable land, use of less water per capita, and implementing less polluting energy sources. This could be attained by creating high-yield, disease- and drought-resistant crops. Due to the advent of the state-of-the art technologies in the field of bioresource technology, much progress has been achieved during the last decade. High throughput technologies are being extensively used to address various issues pertaining to sustainability. Recent advances in these technologies have revolutionized the understanding of plant responses to biotic/abiotic stress, and strategic application of this revolutionary technology will eventually lead toward attaining better environmental sustainability. Indeed, it will lead us toward a truly bio-future during the twentieth-first century.

The book entitled “Bioresource Technology: Concept, Tools and Experiences,” edited by a group of four promising young editorial board, is aimed toward this direction. The chapters in this book have been contributed by eminent researchers in the broader area of sustainable bioresource management. It comprises information on the current status of the application of bioresource technology in the food, energy and environmental sectors, together with several other important topics related to nanobiotechnology and its sustainable utilization.

Looking at the topics covered this edited volume carries great weight in this field. I think it will have wider acceptance and open up avenues for scientists to engage in

consistent dialogue with the policy-makers at different levels – state, local, national and global. It can also lead to a new alliance between scientific, governmental and commercial forces and find effective ways for lobbying, advocacy and innovative actions in sustainable bioresource management.

The primary audience who will benefit from this book will be the research and teaching professionals, practitioners, policy-makers, farmers and farmer representatives like NGO professionals, who work in the area of sustainable agricultural and rural development. This kind of publication will be highly useful for the planners and practitioners in the area of bioresource for climate adaptation as well. The contributors in the fields of environment, food and industrial sectors are highly promising.

In the context of overall importance of bioresource technology in the current era, the editors have attempted to provide the state of knowledge on technological innovations and their potential for commercial exploitation and creating value from bioresources.



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Preface

Bioresources are important components for progress and economic activities of a nation. It is considered as the largest source of potential wealth, which remains grossly underexplored. One of the reasons for the under-utilization is the dearth of trained manpower. The current generation of biologists is largely divided into field-oriented taxonomists and ecologists on the one hand and the lab-oriented functional and molecular biologists on the other. This divide has become a limiting factor in the study of bioresources. The present book intends to bridge the gap by inculcating excellence in field and laboratory biology simultaneously. This capacity building exercise will help to generate wealth through a prudent and sustainable use of a country's bioresources. Bioresources management and utilization for human welfare is very important for the optimum utilization of bioresources. Awareness of the importance and implications of bioresources, among common people as well as elite educated citizens, for safeguarding and protecting the optimum and balanced way of using those bioresources needs critical studies to focus their wealth for the benefit of not only the present generation but for future generations for their better, healthy and peaceful living on the earth. The problem faced at present is the over exploitation of bioresources which not only has a negative impact on the environment but also sometimes totally destroys and erodes the important bioresources which are available at local, regional and national levels. Therefore, handling bioresources in a proper manner and in an appropriate way is important for optimum use without over exploitation of our bioresources wealth.

Sustainable management of the ecosystems and the rich life within them remains one of the key natural resource management challenges. The conservation and sustainable use of bioresource are of critical importance for meeting the needs of food, fodder, fiber, health, water and other needs of the growing world population, for which purpose of, access to, and sharing of both genetic resources and technologies are essential. Here we are trying to document together the various aspects of bioresources with a view to make it available for the judicious utilization by mankind. Gradual emergence of new technologies for large-scale conversions of renewable raw materials of biological origin to various industrial and energy markets has further widened the scope of bioresource technology.

Eighteen chapters are covered in this book, describing the application of bioresource technology in three sections – food, energy and environmental sectors. The first section, pertaining to the application of bioresource technology in the functional food sector

comprises of seven chapters, the second section, pertaining to bioresource and future energy security comprises three chapters and the third section, pertaining to bioresource technology: solution to sustainable environment and management policies comprises eight chapters.

The editors and contributing authors hope that one result of publishing this book will be to provide a wide range of useful experimental data derived from global applications of bioresource technology. Hopefully, this book can also provide new insights about the emerging applications and sustainable management of the bioresource technology.

This book is unique and would be an ideal source of scientific information to post-graduate students, research scholars, faculty and scientists involved in agriculture, plant sciences, environmental sciences, bioenergy and biofuels, molecular biology, microbiology, biochemistry, biotechnology and food technology.

We are highly grateful to all our contributors for readily accepting our invitation for not only sharing their knowledge and research, but for venerably integrating their expertise in dispersed information from diverse fields in composing the chapters and enduring editorial suggestions to finally produce this venture.

We extend our appreciation to John Wiley & Sons for their exceptional kind support, which made our efforts successful.

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Part I

The Application of Bioresource Technology in the Functional Food Sector

1

Millet: Robust Entrants to Functional Food Sector

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