

# MICROBIAL BIOTECHNOLOGY

## Progress and Trends



Edited by  
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# Microbial Biotechnology Progress And Trends

**Debabrata Das, Debayan Das**



## **Microbial Biotechnology Progress And Trends:**

**Microbial Biotechnology** Farshad Darvishi Harzevili, Hongzhang Chen, 2018-10-08 Incorporates the Experiences of World Class Researchers Microbial Biotechnology Progress and Trends offers a theoretical take on topics that relate to microbial biotechnology The text uses the novel experimental experiences of various contributors from around the world designed as case studies to highlight relevant topics issues and recent developments surrounding this highly interdisciplinary field It factors in metagenomics and microbial biofuels production and incorporates major contributions from a wide range of disciplines that include microbiology biochemistry genetics molecular biology chemistry biochemical engineering and bioprocess engineering In addition it also provides a variety of photos diagrams and tables to help illustrate the material The book consists of 15 chapters and contains subject matter that addresses Microbial biotechnology from its historical roots to its different processes Some of the new developments in upstream processes Solid state fermentation as an interesting field in modern fermentation processes Recent developments in the production of valuable microbial products such as biofuels organic acids amino acids probiotics healthcare products and edible biomass Important microbial activities such as biofertilizer biocontrol biodegradation and bioremediation Students scientists and researchers can benefit from Microbial Biotechnology Progress and Trends a resource that addresses biotechnology applied microbiology bioprocess fermentation technology healthcare pharmaceutical products food innovations food processing plant agriculture crop improvement energy and environment management and all disciplines related to microbial biotechnology Advances in Plant Microbiome and Sustainable Agriculture Ajar Nath Yadav, Ali Asghar Rastegari, Neelam Yadav, Divjot Kour, 2020-07-31 Microbes are ubiquitous in nature and plant microbe interactions are a key strategy for colonizing diverse habitats The plant microbiome epiphytic endophytic and rhizospheric plays an important role in plant growth and development and soil health Further rhizospheric soil is a valuable natural resource hosting hotspots of microbes and is vital in the maintenance of global nutrient balance and ecosystem function The term endophytic microbes refers to those microorganisms that colonize the interior the plants The phyllosphere is a common niche for synergism between microbes and plants and includes the leaf surface The diverse group of microbes are key components of soil plant systems and where they are engaged in an extensive network of interactions in the rhizosphere endophytic phyllospheric they have emerged as an important and promising tool for sustainable agriculture Plant microbiomes help to directly or indirectly promote plant growth using plant growth promoting attributes and could potentially be used as biofertilizers bioinoculants in place of chemical fertilizers This book allows readers to gain an understanding of microbial diversity associated with plant systems and their role in plant growth and soil health Offering an overview of the state of the art in plant microbiomes and their potential biotechnological applications in agriculture and allied sectors it is a valuable resource for scientists researchers and students in the field of microbiology biotechnology agriculture molecular biology environmental biology and related subjects Microbial Cell Factories Engineering for

Production of Biomolecules Vijai Singh, 2021-02-13 Microbial Cell Factories Engineering for Production of Biomolecules presents a compilation of chapters written by eminent scientists worldwide. Sections cover major tools and technologies for DNA synthesis, design of biosynthetic pathways, synthetic biology tools, biosensors, cell-free systems, computer-aided design, OMICS tools, CRISPR-Cas systems, and many more. Although it is not easy to find relevant information collated in a single volume, the book covers the production of a wide range of biomolecules from several MCFs including *Escherichia coli*, *Bacillus subtilis*, *Pseudomonas putida*, *Streptomyces*, *Corynebacterium*, *Cyanobacteria*, *Saccharomyces cerevisiae*, *Pichia pastoris*, and *Yarrowia lipolytica*, among many others. This will be an excellent platform from which scientific knowledge can grow and widen in MCF engineering research for the production of biomolecules. Needless to say, the book is a valuable source of information not only for researchers designing cell factories but also for students, metabolic engineers, synthetic biologists, genome engineers, industrialists, stakeholders, and policymakers interested in harnessing the potential of MCFs in several fields. Offers basic understanding and a clear picture of various MCFs. Explains several tools and technologies including DNA synthesis, synthetic biology tools, genome editing, biosensors, computer-aided design, and OMICS tools among others. Harnesses the potential of engineered MCFs to produce a wide range of biomolecules for industrial, therapeutic, pharmaceutical, nutraceutical, and biotechnological applications. Highlights the advances, challenges, and future opportunities in designing MCFs.

**Microbial Nutraceuticals** Sudhir Pratap Singh, Santosh Kumar Upadhyay, 2025-09-29 An exploration of the latest advances in the application of microbial nutraceuticals in healthcare, food production, and agriculture. In *Microbial Nutraceuticals: Products and Processes*, a team of distinguished researchers delivers an up-to-date and authoritative discussion of the recent advances in the application of microbial nutraceuticals and their implementation in the health, food, and agriculture sectors. The book begins with an overview of microbial nutraceuticals before moving on to discussions of more specific topics, including microbial cell factories for the production of essential amino acids, microbial production of dietary short-chain fatty acids, and microbial sources for bioactive peptides conferring health benefits. Readers will also find a thorough introduction to symbiotic products with nutraceutical impact, comprehensive explorations of postbiotic supplements with nutraceutical significance, practical discussions of microbial production of carotenoids, complete treatments of microbial engineering for multivitamin production. This book is intended for academics, scientists, and researchers working in the field of microbial nutraceuticals. Additionally, it will benefit professionals working in the agri-biotech industries as well as graduate and postgraduate students with an interest in the subject.

*Microbial Biotechnology: Principles And Applications* Yuan Kun Lee, Azlinda Anwar, 2003-09-15 Life science research and industry is developing rapidly all over the world. Microbial biotechnology is increasingly being regarded as a core subject in most university and polytechnic life science courses. There already exist a number of excellent general textbooks on microbiology and biotechnology that deal with the basic principles of the field. To complement them, this book focuses on the various applications of microbial biotechnological principles. A

teaching based format is adopted whereby working problems as well as answers to frequently asked questions supplement the main text The book also includes real life examples of how the application of microbial biotechnological principles has achieved breakthroughs in both research and industrial production Although Microbial Biotechnology has been written for polytechnic students and undergraduates it contains sufficient information to be used as a reference for postgraduate students and lecturers It may also serve as a resource book for corporate planners managers and applied research personnel

Advances in Microbial Biotechnology Pradeep Kumar, PhD., Jayanta Kumar Patra, Pranjal Chandra, 2018-10-03 Over the last few decades the rapid and vast development of advanced microbial bioresources and metagenomics techniques has completely transformed the field of microbial biotechnology Our understanding of microbial diversity evolutionary biology and microbial interaction with their animal and plant hosts at molecular level has been revolutionized with an abundance of new research This new volume Advances in Microbial Biotechnology Current Trends and Future Prospect focuses on the application of microorganisms for several purposes for plant protection and improvement for environmental remediation purposes and for the improvement of human health Various applications of microorganisms are covered broadly and have been appropriately reflected in depth in different chapters The book is divided into four major sections applied microbiology in agriculture microbes in the environment microbes in human health microbes in nanotechnology The book provides insight into the diverse microorganisms that have been explored and exploited in the development of various applications for agricultural improvements The book also looks at the application of microbes for the removal of pollutants and the recovery of metals and oils Also discussed is the detection and exploitation of microorganisms in the diagnosis of human diseases providing possible holistic approaches to health This new volume will provide a wealth of information on new research on the application of microbial biotechnology today

Microbiomes and Plant Health Manoj Kumar Solanki, Prem Lal Kashyap, Rizwan Ali Ansari, Baby Kumari, 2020-08-28 Microbiomes and Plant Health Panoply and Their Applications includes the most recent advances in phytobiome research The book emphasizes the use of modern molecular tools such as smart delivery systems for microbial inoculation next generation sequencing and genome mapping Chapters discuss a variety of applications and examples including the sugarcane microbiome rhizoengineering nutrient recycling sustainable agricultural practices and bio potential of herbal medicinal plants Written by a range of experts with real world practical insights this title is sure to be an essential read for plant and soil microbiologists phytopathologists agronomists and researchers interested in sustainable forestry and agriculture practices Offers readers a one stop resource on the topic of plant and soil microbiome and their applications in plant disease sustainable agriculture soil health and medicinal plants Addresses the role of phytobiome to combat biotic and abiotic factors Emphasizes the use of modern molecular tools such as smart delivery systems for microbial inoculation next generation sequencing and genome mapping

Advances in Microbial Physiology, 2023-03-20 Advances in Microbial Physiology Volume 82 in this serial that highlights new advances in the field presents

interesting chapters on a variety of topics including Protein secretion via the Type I secretion system Purine utilization by enterobacteria Microbiology of Algae Growth of enteric bacteria in the intestine on C4DCs Governance of C4DC transporters in metabolic adaptation and genetic control Biological functions of bacterial lysophospholipids and much more Provides the authority and expertise of leading contributors from an international board of authors Presents the latest release in the Advances in Microbial Physiology series      **Biochemical Engineering** Debabrata Das, Debayan Das, 2019-07-15 All

engineering disciplines have been developed from the basic sciences Science gives us the information on the reasoning behind new product development whereas engineering is the application of science to manufacture the product at the commercial level Biological processes involve various biomolecules which come from living sources It is now possible to manipulate DNA to get the desired changes in biochemical processes This book provides students the knowledge that will enable them to contribute in various professional fields including bioprocess development modeling and simulation and environmental engineering It includes the analysis of different upstream and downstream processes The chapters are organized in broad engineering subdisciplines such as mass and energy balances reaction theory using both chemical and enzymatic reactions microbial cell growth kinetics transport phenomena different control systems used in the fermentation industry and case studies of some industrial fermentation processes Each chapter begins with a fundamental explanation for general readers and ends with in depth scientific details suitable for expert readers The book also includes the solutions to about 100 problems      *Plant-Microbe Interactions in Agro-Ecological Perspectives* Dhananjaya Pratap Singh, Harikesh

Bahadur Singh, Ratna Prabha, 2017-09-27 This book presents an updated compilation on fundamental interaction mechanisms of microbial communities with the plant roots and rhizosphere belowground and leaves and aerial parts aboveground Plant rhizosphere recruits its own microbial composition that survive there and help plants grow and develop better under biotic and abiotic conditions Similar is the case with the beneficial microorganisms which are applied as inoculants with characteristic functions The mechanism of plant microbe interactions is an interesting phenomenon in biological perspectives with numerous implications in the fields The First volume focuses on the basic and fundamental mechanisms that have been worked out by the scientific communities taking into account different plant microbe systems This includes methods that decipher mechanisms at cellular physiological biochemical and molecular levels and the functions that are the final outcome of any beneficial or non beneficial interactions in crop plants and microbes Recent advances in this research area is covered in different book chapters that reflect the impact of microbial interactions on soil and plant health dynamics of rhizosphere microbial communities interaction mechanisms of microbes with multiple functional attributes microbiome of contrasting crop production systems organic vs conventional mechanisms behind symbiotic and pathogenic interactions endophytic bacterial and fungal interaction and benefits rhizoplane and endosphere associations signalling cascades and determinants in rhizosphere quorum sensing in bacteria and impact on interaction mycorrhizal interaction mechanisms

induced disease resistance and plant immunization interaction mechanisms that suppress disease and belowground microbial crosstalk with plant rhizosphere Methods based on multiphasic and multi omics approaches were discussed in detail by the authors Content wise the book offers an advanced account on various aspects of plant microbe interactions and valuable implications in agro ecological perspectives      **Microbial Biotechnology** Pratyosh Shukla,2016-12-01 Microbial Biotechnology An Interdisciplinary Approach covers all aspects of microbial biotechnology whilst bringing the field of functional foods and microbial bioremediation to the fore Recounting the interdisciplinary scope of biotechnology and its discoveries this text presents innovative ideas in the field of emerging biotechnology providing the scientific community with a much needed new resource Acting as an important means of information for researchers working in interdisciplinary areas of research this text Envisages the recent ideas of novel findings in microbiology Provides insight into the various interdisciplinary research avenues Uniquely covers a diverse range of topics Presents groundbreaking new findings in key areas of modern biotechnology Enhanced and straight forward descriptions cater to the needs of researchers working in areas of bacterial exopolysaccharides microalgal proteomics applications of Microbial L asparaginases novel aspects of bioremediation Probiotics and their impact on society and microbial community analysis in waste water treatment techniques It will also prove crucial reading for senior undergraduate and graduate students and professionals working in areas of modern biotechnology      **Plant Biotechnology: Progress in Genomic Era** S. M. Paul Khurana,Rajarshi Kumar Gaur,2019-11-14 Refinement in sequencing technologies and potential of genomic research resulted in meteoric growth of biological information such as sequences of DNA RNA and protein requiring databases for efficient storage management and retrieval of the biological information Also computational algorithms for analysis of these colossal data became a vital aspect of biological sciences The work aims to show the process of turning bioscience innovation into companies and products covering the basic science the translation of science into technology Due to rapid developments there seems to be no basic difference between the pharmaceutical industry and the biotechnological industry However approved products in the pipeline and renewed public confidence make it one of the most promising areas of economic growth in the near future India offers a huge market for the products as well as cheap manufacturing base for export The book is a sincere work of compilation of new and recent advances in the topic of concern through various innovative researches and scientific opinion therefrom The book is dedicated to the readers who will definitely find it interesting and knowledgeable in carrying out their respective researches in different aspects of applied microbiology and biotechnology      **Microbial Biotechnology for Bioenergy** Naga Raju Maddela,Sesan Abiodun Aransiola,Chizoba I. Ezugwu,Lizziane Kretli Winkelstroter Eller,Laura Scalvenzi,Fangang Meng,2024-03-08 Microbial Biotechnology for Bioenergy presents the new and emerging biotechnological and microbiological approaches in bioenergy and their economic social and environmental implications Using the latest global data and statistics it analyses how bioenergy technology improves quality of life by reducing air and water pollution

and mitigates energy dependence by creating renewable resources in local communities The book is formed of three sections Section 1 addresses the Sources Challenges and Environmental Views of Bioenergy and includes an overview of bioenergy global statistics and projections for future bioenergy development the role of biotechnology and bioprocesses in bioenergy feedstock sources challenges decarbonisation and emerging innovations and technologies Section 2 Yesterday Today and Tomorrow Innovations of Bioenergy examines the vast topics of biotechnology and microbiology for bioenergy reviewing both the present day state of the art and future potential Readers will find dedicated chapters on bioconversion of biomass energy and biological residues the role of microbes the potential of organic waste to provide bioenergy the biotechnology of biofuels such as bioethanol biodiesel and biohydrogen the sustainability of cellulosic ethanol energy and artificial photosynthesis Power to X and integrating energy storage innovations and the sustainability of microbial fuel cells Finally Section 3 explores the policies and environmental aspects of bioenergy providing a global perspective on the current and future impact of bioenergy including global projections based on present day global statistics Microbial Biotechnology for Bioenergy is a valuable reference for biotechnologists environmental engineers and microbiologists interested in bioenergy and includes explanations of the fundamentals and key concepts to ensure it is accessible to students as well as researchers and professionals Critically reviews past present and future bioenergy technologies including global statistics policies and emerging approaches Highlights opportunities to improve quality of life and mitigate energy dependence reducing air water pollution and creating renewable resources in local communities Explores environmental benefits of incorporating microbial remediation into bioenergy production

**From Genes to Species: Novel Insights from Metagenomics** Eamonn P. Culligan, Roy D. Sleator, 2016-10-07 The majority of microbes in many environments are considered as yet uncultured and were traditionally considered inaccessible for study through the microbiological gold standard of pure culture The emergence of metagenomic approaches has allowed researchers to access and study these microbes in a culture independent manner through DNA sequencing and functional expression of metagenomic DNA in a heterologous host Metagenomics has revealed an extraordinary degree of diversity and novelty not only among microbial communities themselves but also within the genomes of these microbes This Research Topic aims to showcase the utility of metagenomics to gain insights on the microbial and genomic diversity in different environments by revealing the breadth of novelty that was in the past largely untapped

*Microbial Surfactants* R.Z. Sayyed, Hesham Ali El-Enshasy, 2022-03-10 Biosurfactants are surface active biomolecules produced by a wide variety of microorganisms They can be produced from renewable sources and possess high surface activity high specificity low toxicity tolerance to pH temperature and ionic strength biodegradability excellent emulsifying and demulsifying ability and antimicrobial activity Biosurfactants have found applications in several industries including organic chemicals petrochemicals mining metallurgy mainly bioleaching agrochemicals fertilizers foods beverages cosmetics pharmaceuticals and many others The main aim of this volume is to highlight concepts classifications production



and applications of microbial surfactants in food and agriculture The book provides a comprehensive coverage of fermentation recovery genomics and metagenomics of biosurfactant production It is presented in an easy to understand manner and includes protocols figures and recent data on the industrial demand market and economics and the production of biosurfactants from novel substrates are particularly worthwhile additions The volume will be useful for students researchers teachers and entrepreneurs in the area of microbial biosurfactants and their applications in food and agriculture

*Microbial Biotechnology* Rajesh Arora,2012 Human actions across the past few centuries have led to a depletion of the world s natural energy sources as well as large scale environmental degradation In the context of these current global issues this book covers the latest research on the application and use of microbes in topical areas such as bioremediation and biofuels With chapters covering environmental clean up microbial fuel cells and biohydrogen it provides a comprehensive discussion of the latest developments in the field of microbe utilization **The Global Governance of Genetic Resources**

Florian Rabitz,2017-04-28 How is access to genetic resources and the equitable sharing of the benefits arising out of their use to be guaranteed Exploring the subject comparatively with regard to intellectual property rights food and agriculture health and access to oceans this book creates a new theory of change in multilevel global governance **Microstructure**

**and Properties of Micro- and Nanoscale Materials, Films, and Coatings (NAP 2019)** Alexander D.

Pogrebniak,Oleksandr Bondar,2020-01-28 This book presents the findings of experimental and theoretical including first principles molecular dynamics simulation studies of nanostructured and nanocomposite metal based materials and nanoscale multilayer coatings fabricated by physical or chemical vapor deposition magnetron sputtering electrospray alloying ionic layer absorption contact melting and high current electron beam irradiation It also discusses novel methods of nanocomposite formation as well as the structure of the deposited films coatings and other nanoscale materials their elemental and phase composition and their physical mechanical tribological magnetic and electrical properties Lastly it explores the influence of a various surface modification methods such as thermal annealing pulsed laser modification and thermomechanical and ultrasonic treatment as well as different properties of nanostructured films Recent Developments

on Genus Chaetomium Ahmed M. Abdel-Azeem,2019-12-27 Chaetomium genus was established by Gustav Kunze in 1817

According to Index Fungorum Partnership there are 273 Chaetomium species accepted till now Members of the genus Chaetomium are capable of colonizing various substrates and are well known for their ability to degrade cellulose and to produce a variety of bioactive metabolites More than 200 compounds have been reported from this genus A huge number of new and bioactive secondary metabolites associated with unique and diverse structural types such as chaetoglobosins epipolythiodioxopiperazines azaphilones depsidones xanthones anthraquinones chromones and steroids have been isolated and identified Many of the compounds have been reported to possess significant biological activities such as antitumor antimalarial cytotoxic enzyme inhibitory antimicrobial phytotoxic antirheumatoid and other activities Chaetomium taxa are

frequently reported to be cellulase and ligninase producers with the ability to degrade cellulosic and woody materials This is the first comprehensive volume covering Chaetomium genus in detail It includes the latest research methods and applications and was written by scholars working directly in the field The book also contains informative illustrations and is fully referenced for further reading      **Single Cell Protein Production from Lignocellulosic Biomass** Pratima

Bajpai,2017-07-28 This book focuses on bioconversion of lignocellulosic residues into single cell protein which offers an alternative to conventional proteins such as soybean meal egg protein or meat protein in animal feed that is not affected by the climate It provides an overview of the general uses of lignocellulosic residues and their bioconversion into single cell protein using microorganisms as well as the recovery of the valuable by products It also explores the benefits and potential drawbacks of single cell protein with an emphasis on the economic advantages of such processes Given its multidisciplinary scope the book represents a valuable resource for academics and industry practitioners interested in the production of single cell protein from lignocellulosic residues

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