

MICROBIAL ENZYMES: PRODUCTION, PURIFICATION, AND ISOLATION

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I. INTRODUCTION

All forms of life live by enzymes and also produce enzymes. As a result, enzymes can be obtained from three different sources: plants, animals, and microorganisms.

Some commercial enzymes such as papain, bromelain (bromelin) ficin, and malt diastase are derived from plant sources. In the animal body, the highest accumulation of enzymes is in the glands. Stomach, spleen, pancreas, and stomach mucus are rich in several important enzymes. Some widely used enzymes such as pepsin, trypsin, α -chymotrypsin, lipase, catalase, rennin, and pancreatic enzymes are currently obtained from animal sources.

Microorganisms are becoming a favored source of industrial enzymes since the number of enzymes which can be recovered economically from plants and animals is limited. Animal enzymes, e.g., are supplied by the meat-packing industry and the size of the slaughter limits the total enzyme supply. Plants may be grown in any desired quantity if the enzyme market is precisely estimated well ahead of time. However, except in a few special cases, plants are generally utilized for other purposes rather than for enzyme production, and their growth is dependent upon geography, soil conditions, and climate. Some plant and animal enzymes of industrial importance are listed in Table I.¹

While certain plant enzymes (e.g., papain) and animal enzymes (pepsin, trypsin) will continue to have important applications, microbial enzyme production based on improving biotechnology is making significant advances.

II. SOURCES OF MICROBIAL ENZYMES

The development of fermentation methods for the production of microbial enzymes has assured an unlimited supply. For the production of industrial enzymes, microbial cells are selected from the groups of fungi, bacteria, or yeasts. Four enzymes are now produced on a large scale: protease, glucamylase, alpha-amylase, and glucose isomerase.

Microorganisms used in the production of industrial enzymes must have good biological activity. Most of microorganisms used for industrial enzyme production are aerobic strains, i.e., they require oxygen for their metabolism. The number of known

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Arti Gupta,Pankaj Kumar



Microbial Enzymes Production Purification And Isolation:

High Throughput Screening John P. Devlin,1997-05-06 Furnishing the latest interdisciplinary information on the most important and frequently the only investigational system available for discovery programs that address the effects of small molecules on newly discovered enzyme and receptor targets emanating from molecular biology this timely resource facilitates the transition from classical to high throughput screening HTS systems and provides a solid foundation for the implementation and development of HTS in bio based industries and associated academic environments Microbial Xylanolytic Enzymes Pratima Bajpai,2022-05-29 Microbial Xylanolytic Enzymes describes the enzyme structure and its interaction with plant cell walls the properties and production of different enzymes and their applications and the knowledge gathered on the hydrolysis mechanism of hemicellulose The knowledge gathered about the hydrolysis mechanism of the hemicelluloses especially xylans has greatly promoted the rapid application of these enzymes in new areas In recent years there has been a spurt of interest in xylan degrading enzymes due to their applications in several industrial processes including paper and pulp industries food and feed industries biofuel industry textile industry chemical and pharmaceutical industry brewing industry and more Xylan is the principal type of hemicellulose An enzymatic complex is responsible for the hydrolysis of xylan but the main enzymes involved are enzymes produced by fungi bacteria yeast algae protozoans and more Gives up to date authoritative information and cites pertinent research on the synergistic action of xylanolytic enzymes Includes studies on xylanase regulation and synergistic action between multiple forms of xylanase Covers in great depth all aspects of Xylanolytic enzymes Includes detailed descriptions on Xylanolytic enzymes as a supplement in animal feed for the manufacture of bread food and drinks textile industry pulp and paper industry biofuel industry and production of pharmaceuticals and important chemicals and waste management etc Challenges future trends in the commercial production and application of xylanases **Microbial Enzymes: Roles and Applications in Industries** Naveen Kumar Arora,Jitendra Mishra,Vaibhav Mishra,2020-04-28 Microbial Enzymes Roles and applications in industry offers an essential update on the field of microbial biotechnology and presents the latest information on a range of microbial enzymes such as fructosyltransferase laccases amylases lipase and cholesterol oxidase as well as their potential applications in various industries Production and optimisation technologies for several industrially relevant microbial enzymes are also addressed In recent years genetic engineering has opened up new possibilities for redesigning microbial enzymes that are useful in multiple industries an aspect that the book explores In addition it demonstrates how some of the emerging issues in the fields of agriculture environment and human health can be resolved with the aid of green technologies based on microbial enzymes The topics covered here will not only provide a better understanding of the commercial applications of microbial enzymes but also outline futuristic approaches to use microbial enzymes as driver of industrial sustainability Lastly the book is intended to provide readers with an overview of recent applications of microbial enzymes in various industrial sectors and to pique

researchers interest in the development of novel microbial enzyme technologies to meet the changing needs of industry

Microbial Enzymes as Potential Biotherapeutics in Human Healthcare Dileep Francis, Sabu

Abdulhameed, Jayachandran K, 2025-08-04 This book comprehensively reviews the diverse potential of microbial enzymes with therapeutic applications covering their production purification and utilization It examines their roles in combating various diseases including inflammation bacterial infections cardiovascular conditions and thrombotic disorders The book highlights their pharmaceutical applications in drug formulation and bioactive compound production with the aim of enhancing drug bioavailability stability and efficacy Furthermore the book explores the potential of microbial fibrinolytic enzymes to revolutionize treatments for thrombotic disorders It also outlines the applications of microbial enzymes in targeting cancer cells emphasizing their pivotal role in innovative treatment modalities Additionally the book presents the therapeutic applications of microbial lipases from their use in lipid lowering medications to the creation of lipase based pharmaceuticals The chapters discuss the potential of microbial uricases in managing uric acid related disorders and the contribution of microbial enzymes in enhancing digestion and alleviating digestive disorders Finally the book delves into the vital role of regulatory authorities and intellectual property rights IPR in the commercialization of therapeutic microbial enzymes As such this book serves as a valuable resource for researchers professionals and students of microbiology biotechnology and pharmaceutical sciences

Key Features Reviews the therapeutic potential of microbial enzymes and their production and purification Examines the roles of microbial enzymes in combating a wide range of diseases including inflammation bacterial infections cardiovascular conditions and thrombotic disorders Highlights the pharmaceutical applications of microbial enzymes focusing on drug formulation and the production of bioactive compounds to enhance drug bioavailability stability and efficacy Explores the therapeutic applications of microbial lipases from lipid lowering medications to the creation of lipase based pharmaceuticals Presents the vital role of regulatory authorities and intellectual property rights IPR in the commercialization of therapeutic microbial enzymes

Microbial Enzyme Technology in Food

Applications Ramesh C. Ray, Cristina M. Rosell, 2017-03-27 The aim of food processing is to produce food that is palatable and tastes good extend its shelf life increase the variety and maintain the nutritional and healthcare quality of food To achieve favorable processing conditions and for the safety of the food to be consumed use of food grade microbial enzymes or microbes being the natural biocatalysts is imperative This book discusses the uses of enzymes in conventional and non conventional food and beverage processing as well as in dairy processing brewing bakery and wine making Apart from conventional uses the development of bioprocessing tools and techniques have significantly expanded the potential for extensive application of enzymes such as in production of bioactive peptides oligosaccharides and lipids flavor and colorants Some of these developments include extended use of the biocatalysts as immobilized encapsulated enzymes microbes both natural and genetically modified as sources for bulk enzymes solid state fermentation technology for enzyme production

Extremophiles and marine microorganisms are another source of food grade enzymes The book throws light on potential applications of microbial enzymes to expand the base of food processing industries

New and Future Developments in Microbial Biotechnology and Bioengineering Vijai Kumar Gupta, 2016-10-27 New and Future Developments in Microbial Biotechnology and Bioengineering Aspergillus System Properties and Applications provides information on emerging issues related to recent advancements in aspergillus research and its applications in bioprocess technology chemical engineering genome biology molecular taxonomy secondary and metabolite production industrial process and biofuels bioenergy research and alternative fuel development The book covers the various novel enzymes secreted by these fungi and their specific use in the food textile pulp and paper biocellulosic ethanol production and other industries The book describes research and experimentation on aspergillus activity and directly connects them to their use in bioprocess technology chemical engineering bioremediation process secondary metabolite production pharmaceutical processes protein production industrial process biofuels bioenergy research and alternative fuel development Readers will find this book to be an indispensable resource for biotechnologists biochemical engineers biochemists microbiologists bioinformatics researchers and other biologists who are interested in learning about the potential applications of these fungi Compiles available up to date information on recent developments made in the study of aspergillus system properties Contains global content from pioneering international authors Presents current research efforts and links them to various applications including uses in foods textiles pulp and paper and in biocellulosic ethanol production Provides an indispensable resource for biologists who are interested in learning about the potential applications of the fungi aspergillus

Enzyme Technology Ashok Pandey, 2006-04-28 Publisher Description Isolation, identification and characterization of psychrophilic microorganisms and screening for their cold-active hydrolytic enzymes Tatiana Grudieva, 2003-03-05

Microbial Bioreactors for Industrial Molecules Sudhir Pratap Singh, Santosh Kumar Upadhyay, 2023-06-12 Microbial Bioreactors for Industrial Molecules Harness the planet s most numerous resources with this comprehensive guide Microorganisms constitute the invisible majority of all living creatures on Earth They are found virtually everywhere on the planet including in environments too extreme for any larger organisms to exist They form a hugely significant resource whose potential value for human society cannot be overlooked The creation of microorganism based bioreactors for the industrial production of valuable biomolecules has the potential to revolutionize a range of industries and fields Microbial Bioreactors for Industrial Molecules provides a comprehensive introduction to these bioresources It covers all potential approaches to the use of microbial technology and the production of high value biomolecules for the pharmaceutical cosmetic and agricultural industries among others The book s rigorous detail and global holistic approach to harnessing the power of the planetary microbiome make it an invaluable introduction to this growing area of research and production Readers will also find Detailed coverage of basic applied biosynthetic and translational approaches to the use of microbial technology Discussion of industrially produced

microbe borne enzymes including invertase lipase keratinase protease and more Approaches for using microbial bioreactors to generate biofuels Microbial Bioreactors for Industrial Molecules is essential for scientists and researchers in microbiology and biotechnology as well as for professionals in the biotech industries and graduate students studying the applications of the life sciences **Microbial Oxidative Enzymes** Arti Gupta,Pankaj Kumar,2023-12-31 Microbial oxidative enzymes are in need of today and in the future also Several microbial oxidative enzymes are being used by various sectors like food agriculture medicine detergents leather paper etc Microbial oxidative enzymes are a natural product hence the application of these enzymes is eco friendly Oxidative enzymes from microbes like bacteria and fungi will be helpful in numerous applications including plant soil health management and waste treatments This book will be more informative as well as useful for related industries and end users and will be of great value to those interested in present day research on oxidation reduction enzymes In the coming years this book will be a game changer for the field of oxidative enzyme development and its applications **The Bioprospecting Potentials of Microorganisms for the Synthesis of Bioactive Molecules** Bi Bi Zainab Mazhari,Dayanand Agsar,Mohammed H Saiem Aldahr,Mohammed Asad Sheikh,2024-11-20 This book provides fascinating insights into the isolation and identification of actinomycetes as well as the synthesis of bioactive molecules like extracellular tyrosinase and nanoparticles by actinomycetes It shows that microorganisms constitute a huge and almost unexplained reservoir of resources likely to provide innovative and useful applications The fact that bacteria have survived ever since the origin of life on the earth reveals that this group of organisms is a storehouse for changes that have occurred over millions of years of evolution in response to changing environmental conditions They are the most abundant and highly diverse group among all organisms living today and should thus be explored for their synthesis of bioactive molecules like antibiotics enzymes and nanoparticles **Effect of High-Pressure Technologies on Enzymes** Bruno Ricardo de Castro Leite Júnior,Alline Artigiani Lima Tribst,2023-02-06 Effect of High Pressure Technologies on Enzyme Science and Applications provides a deep practical discussion of high pressure processing HPP and high pressure homogenization HPH technologies and biochemical approaches applied across research and industry with applications ranging from food to pharmaceuticals and commercial enzyme production Early chapters discuss foundational aspects of HPP and HPH approaches the science of enzyme modification and basic aspects of enzyme activity stability and structure as studied in biochemical processes Later chapters consider the effect of HPP and HPH technologies and their mechanisms of controlling enzyme modification to improve enzyme performance for chosen applications Special attention is paid to the application of HPP and HPH technologies and enzyme modifications in food processing microbial enzyme modification drug discovery and production of other commercial enzymes as well as the challenges of undesirable enzyme inactivation The final chapter discusses future directions of the field and technologies and expanded applications Offers a broad overview of HPP and HPH approaches and technologies applied in enzyme modification Introduces fundamental aspects of enzyme activity stability and

structure as studied in biochemical processes and applications Discusses applications of HPP and HPH based enzyme modifications in food processing microbial enzyme modification drug discovery and production of other commercial enzymes Includes chapter contributions from international leaders in the field across research and industry Xylanolytic Enzymes Pratima Bajpai,2014-02-03 Xylanolytic Enzymes describes the enzyme structure and its interaction with plant cell walls the properties and production of different enzymes and their application and the knowledge gathered on the hydrolysis mechanism of hemicellulose The knowledge gathered about the hydrolysis mechanism of the hemicelluloses especially xylans has greatly promoted the rapid application of these enzymes in new areas Recently there has been much industrial interest in xylan and its hydrolytic enzymatic complex as a supplement and for the manufacturing of food drinks textiles pulps and paper and ethanol and in xylitol production as a fermentation substrate for the production of enzymes This book describes xylan as a major component of plant hemicelluloses Presents a thorough overview of all aspects of xylanolytic enzymes Gives up to date authoritative information and cites pertinent research Includes studies on xylanase regulation and synergistic action between multiple forms of xylanase **Recent Advances in Microbial Degradation** . Inamuddin,Mohd Imran Ahamed,Ram Prasad,2021-07-07 Microbes play a major role in the degradation of various pollutants Therefore microbes find potential application in the area of energy and environmental technology The book provides in depth literature on the topics of environmental and industrial importance It is compiled to explore the application of microbe used in the degradation of aflatoxin polymers biomass into fuel disinfectants food products xenobiotic compounds lipids steroids organic pollutants proteins oil waste and wastewater pollutants This book will be of interest to teachers researchers scientists and capacity builders Also the book serves as additional reading material for undergraduate and graduate students of microbiology and environmental sciences National and international remediation and restoration scientists policymakers will also find this to be a useful read Microorganisms for Sustainable Environment and Health Pankaj Chowdhary,Abhay Raj,Digvijay Verma,Yusuf Akhter,2020-07-21 Microorganisms for Sustainable Environment and Health covers hazardous pollutants released from natural as well as anthropogenic activities and implications on environmental and human health This book serves as a valuable source of basic knowledge and recent developments in the clean technologies and pollution associated diseases and abnormalities in the context of microorganisms Focused on current solutions to various environmental problems in the field of bioremediation it provides a detailed knowledge on the various types of toxic environmental pollutants discharged from different sources their toxicological effects in environments humans animals and plants as well as their biodegradation and bioremediation approaches This book helps environmental scientists and microbiologists learn about existing environmental problems and suggests ways to control or contain their effects by employing various treatment approaches Provides information on waste treatment approaches using microbes Includes applications in biofuel and bioenergy production Covers green belt development hydroponics phytoremediation wetland treatment technology and

common effluent treatment plants CETPs Discusses dissemination of antibiotic resistance among pathogenic microbes and strategies to combat multi drug resistance MDR *Enzyme Biotechnology for Environmental Sustainability* Praveen Dahiya,Joginder Singh Panwar,Ajay Kumar,2024-07-13 Enzyme Biotechnology for Environmental Sustainability discusses recent applications of enzyme biotechnology in various industrial sectors and state of the art information on novel microbial enzyme technologies for a sustainable environment The book describes in detail the latest developments and modern methods in microbial enzyme biotechnology for wider application in bioremediation cleaner technology for industries and waste management green chemistry and pharmaceutical biotechnology sustainable textiles food production and biodegradation and other industries The chapters cover topics such as genetic engineering protein engineering nanotechnological advances of microbial enzymes computational tools for engineering enzymes and health risk assessment of enzymes in different sectors With contributors from an array of experts in the field Enzyme Biotechnology for Environmental Sustainability is an informative reference for researchers biotechnologists microbiologists environmental scientists graduate and post graduate students working in the area of enzyme technology and their biomedical environmental and industrial applications Includes new methods and up to date information on modern methods with respect to its application in pharmaceuticals textiles food fermentation and many other related fields Provides in depth information about the recent applications of enzyme biotechnology in different industrial sectors Focuses on the rapid developments and biotechnological advances in microbial enzymology to enhance industrial and environmental sustainability **Lignocellulose**

Biotechnology Ramesh Chander Kuhad,Ajay Singh,2007 The agricultural and forestry processing wastes lignocellulosics are an important material resource and energy source However if untreated they can pose a danger to the environment and potentially valuable resources Microorganisms contribute significantly to solving the problem of biomass degradation its recycling and conservation In the recent years an increasing interest shown by the textile food feed pulp and paper industries in the microbial and enzymatic processes has triggered in depth studies of lignocellulolytic microorganisms and their enzymes Moreover the advent of recombinant DNA technology in the late 1970s further paved the way for developing technologies based on lignocellulolytic microbes and enzymes Lignocellulose Biotechnology presents a comprehensive review of the research directed towards environmentally friendly agricultural and forest by products The book comprises 22 chapters divided in four sections It deals with a wide range of topics including biodiversity of lignocellulose degrading microorganisms and their enzymes molecular biology of biodegradation of lignin characterization of lignocellulolytic enzymes bioconversion of plant biomass to produce enzymes animal feed bioethanol and industrial applications of lignocellulolytic enzymes The chapters dealing with industrial applications also address current biotechnological approaches in lignocellulose bioconversion to value added products This book is essential for students researchers scientists and engineers working in the fields of environmental microbiology environmental biotechnology life sciences waste management and biomaterials

Isolation, Modification, and Characterization of the Constituents (Cellulose, Hemicellulose, Lignin, et al.) in Biomass and Their Bio-based Applications Caoxing Huang, Chunlin Xu, Xianzhi Meng, Lei Wang, Xin Zhou, 2022-05-31 *Solar Energy Update*, 1983-12 Waste Management, Processing and Valorisation Abu Zahrim Yaser, Husnul Azan Tajarudin, Asha Embrandiri, 2021-12-01 This book highlights current efforts and research on waste management processing and valorization particularly in Asia Africa countries Chapters 1 2 highlight the overview of plastic waste management and the production of waste plastic oil WPO Chapters 3 5 discuss the landfill characterization and application of incineration and composting for waste processing A new achievement in adsorbent production is highlighted in Chapters 6 and 7 while Chapters 10 and 11 focus on sewage characteristic and its utilization using microalgae Enzyme production using waste is covered by Chapters 10 12 Chapter 13 14 dedicated to the advances in production of bioenergy The book concludes with a discussion on life cycle analysis for solid waste management Chapter 15

Decoding **Microbial Enzymes Production Purification And Isolation**: Revealing the Captivating Potential of Verbal Expression

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