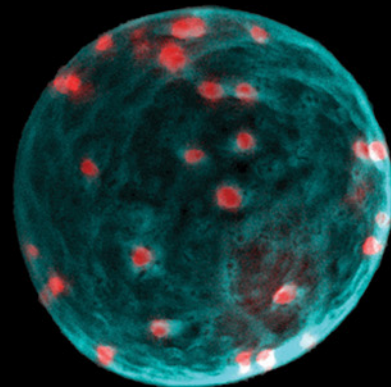
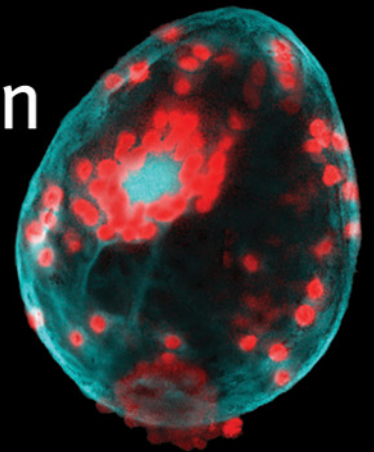
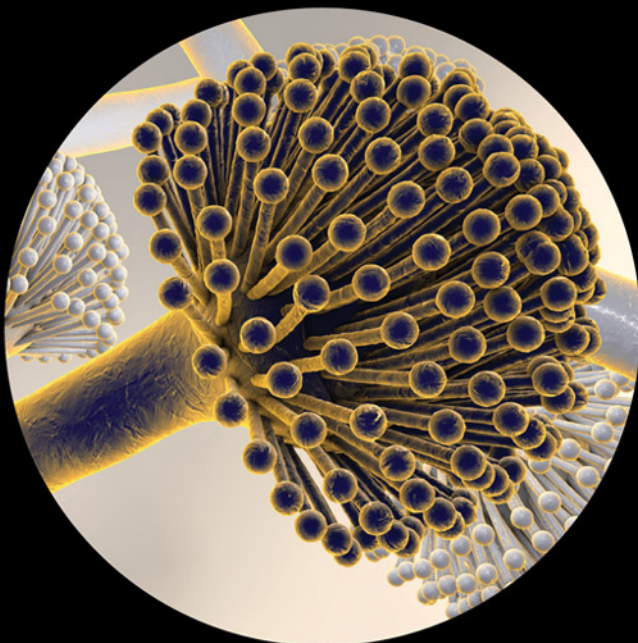


New and Future Developments in Microbial Biotechnology and Bioengineering

Aspergillus System Properties and Applications



Edited by
Vijai Kumar Gupta

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Contents

List of Contributors	xi	Morphological Characters	31
		Molecular Methods for the Characterization of <i>Aspergillus</i> Species	31
Section I		Conclusion	36
Biology and Biodiversity		References	37
1. Biodiversity of the Genus <i>Aspergillus</i> in Different Habitats		3. Molecular Evolution of <i>Aspergillus</i>	
<i>A.M. Abdel-Azeem, F.M. Salem, M.A. Abdel-Azeem, N.A. Nafady, M.T. Mohesien and E.A. Soliman</i>		<i>A.C. Flores-Gallegos, F. Veana-Hernandez, M. Michel-Michel, F. Lara-Victoriano and R. Rodríguez-Herrera</i>	
Introduction	3	<i>Aspergillus</i> Generalities	41
Methodology of Studying <i>Aspergillus</i> Biodiversity	3	<i>Aspergillus</i> Role in Nature	41
Phenotypic Studies	3	<i>Aspergillus</i> as Pathogen	42
Secondary Metabolite Profiling and Chemotaxonomy	4	<i>Aspergillus</i> Usefulness for Humankind	42
Evolution of the Approach: Polyphasic Taxonomy of <i>Aspergillus</i>	5	<i>Aspergillus</i> Diversity	42
<i>Aspergillus</i> Diversity in Different Habitats	6	<i>Aspergillus niger</i>	43
Desert	6	Genome Sequencing of <i>Aspergillus</i> Species	45
Salterns	8	Genetic Sequences for Phylogeny	46
Agricultural	9	Evolution of Secondary Metabolite Production Pathways	47
Polar	11	Horizontal Gene Transfer	48
Water-Related	11	Future Trends	48
Mangrove	11	References	49
Living Plants, Lichens, and Animals	12		
Air and Settled Dust	14	Section II	
Decaying Wood and Mummies	14	Secretion and Protein Production	
Stones	15		
Human	16	4. Heterologous Expression of Proteins in <i>Aspergillus</i>	
Fossils	16	<i>S. Gómez, F.J. Fernández and M.C. Vega</i>	
Conclusions	16	Historical Context	55
References	18	Biosafety	55
2. Understanding the Diversity of <i>Aspergillus</i> by Next-Generation Sequencing		Fermentation Systems for Protein Production in <i>Aspergillus</i>: Scale-Up	56
<i>Md. Shamim, M. Kumar, Ravi Ranjan Kumar, P. Pandey, D. Srivastava, D. Kumar, N.A. Khan, Ranjeet Ranjan Kumar and K.N. Singh</i>		Homologous Protein Production for Industrial Application	58
Introduction	29	Enhancing Heterologous Protein Expression	59
Methods for the Diversity Assessments of Different <i>Aspergillus</i> Species	31	Transformation Efficiency	59
		Vector Design: Promoter, Selectable Markers, and Signal Peptide Optimization	60

Gene Targeting Approach: Functional Loss of Target Gene Conferring Toxicity	121
Functional Gene Analysis	121
Homologous Versus Nonhomologous Recombination	122
Promoter Analysis	122
Application of RNA Interference	122
Desired Gene Fusion with a Strongly Expressed Genes	122
Site-Directed Insertional Mutagenesis	122
Signaling Pathways	122
Inherent Function-Candidate Genes	123
Transposon-Mediated Insertional Mutagenesis	123
Conclusions	123
References	123

Section V Applications

9. Enzyme System from *Aspergillus* in Current Industrial Uses and Future Applications in the Production of Second-Generation Ethanol

M.L.T.M. Polizeli, A.C. Vici, A.S.A. Scarcella, M. Cereia and M.G. Pereira

Introduction	127
Biodiversity and Bioprospecting	128
The Genus <i>Aspergillus</i>	128
Enzyme System from <i>Aspergillus</i> Applied in Current Industrial Uses and Second-Generation Ethanol	129
Lignocellulosic Biomasses Depolymerization for Second-Generation Ethanol Production	129
Perspectives and Concluding Remarks	133
Acknowledgments	137
References	137

10. Advances in Cultivation Strategies of *Aspergillus* for Production of Enzymes Involved in the Saccharification of Lignocellulosic Feedstocks

C.S. Farinas

Introduction	141
Enzymes Involved in the Saccharification of Lignocellulosic Feedstocks	142
Cultivation of <i>Aspergillus</i> Under SmF	143
Medium Selection	143
Temperature and pH	145
Mixing and Aeration	145
Type of SmF Bioreactor	146

Cultivation of <i>Aspergillus</i> Under SSF	147
Temperature	147
Moisture Content	149
Aeration	150
Type of SSF Bioreactor	150
Novel Approaches for (Hemi)Cellulolytic Enzyme Production by <i>Aspergillus</i>	151
Concluding Remarks	152
References	152

11. β -Glucosidase From *Aspergillus*

G. Molina, F.J. Contesini, R.R. de Melo, H.H. Sato and G.M. Pastore

Introduction	155
<i>Aspergillus</i> as Enzyme Producers	155
Production of β -Glucosidase using <i>Aspergillus</i> Strains	156
Purification and Characterization of β -Glucosidases	158
Engineering of <i>Aspergillus</i> Strains and β -Glucosidase from <i>Aspergillus</i>	160
Applications of β -Glucosidase from <i>Aspergillus</i>	161
Food Industry	161
Pharmaceutical Industry	162
Biofuels Industry	162
Chemical Industry	163
Immobilization of β -Glucosidases from <i>Aspergillus</i> sp.	164
Physical Adsorption	164
Entrapment or Encapsulation	165
Covalent Binding	165
Conclusions	165
References	166

12. Regulation and Heterologous Expression of Lignocellulosic Enzymes in *Aspergillus*

M. Dimarogona and E. Topakas

Introduction	171
Structure of Plant Cell Wall	172
The Lignocellulolytic System	173
Cellulases	173
Hemicellulases	174
Regulation of Lignocellulolytic Enzymes in <i>Aspergillus</i> Species	176
Regulation of the Cellulolytic System	177
Regulation of the Hemicellulolytic System	177
Carbon Catabolite Repressor CreA	178
Heterologous Expression in <i>Aspergillus</i>	178
<i>Aspergillus</i> Strains Commonly Used as Heterologous Hosts	178

Genetic Manipulation and Improvement of Expression Strategies	179	16. <i>Aspergillus</i> Enzymes for Food Industries	
Heterologous Expression of Lignocellulose- Degrading Enzymes in <i>Aspergillus</i>	180	<i>K.D. Mojsov</i>	
Conclusions	185	Introduction	215
References	185	Fungus of Industrial Interest	215
13. <i>Aspergillus</i> Enzymes for Textile Industry		<i>Aspergillus</i> Enzymes for Industries	216
<i>S. Singh</i>		Pectinases	216
Textile Industry: A Major Industrial Sector		Amylases	217
Worldwide	191	Cellulases	218
Microbial Enzymes for the Textile Industry: Revolutionary Step in the Industrial World	191	β -Glucanases	218
Fungal Enzymes for Textile Industry	191	Proteases	218
<i>Aspergillus</i> Species	192	Lipases	219
<i>Aspergillus</i> sp. for Industrial Applications	193	Perspectives for Microbial Production of Enzymes by <i>Aspergillus</i>	219
Future Scope	193	References	220
References	196	17. Applications of <i>Aspergillus</i> in Plant Growth Promotion	
14. Biosynthesis of Nanoparticles by <i>Aspergillus</i> and Its Medical Applications		<i>R. Hung and S. Lee Rutgers</i>	
<i>A.G. Rodrigues</i>		Introduction	223
Introduction	199	Phosphorous Solubilization/Mineralization	224
Metal Nanoparticles	199	Secondary Metabolites	225
Methods Employed for NP Synthesis	200	Phytohormone	225
Medical Use and Importance	201	Conclusion	226
Diagnostics	202	References	226
Antimicrobial Properties	202	18. <i>Aspergillus</i> in Biomedical Research	
Hyperthermia	202	<i>K. Mikawlawng</i>	
Drug Delivery	203	Introduction	229
Toxicity	203	<i>Aspergillus</i> as a Source of Important Therapeutic Enzymes	229
Final Remarks and Perspectives	204	<i>Aspergillus</i> as a Source of Therapeutic Compounds	231
Acknowledgments	204	Future Prospects of Using <i>Aspergillus</i> in Biomedical Research	237
References	204	References	238
15. Role of <i>Aspergillus</i> in Bioremediation Process		19. <i>Aspergillus</i> Applications in Cancer Research	
<i>A. Mukherjee</i>		<i>V.K. Nadumane, P. Venkatachalam and B. Gajaraj</i>	
Introduction	209	Introduction	243
A Brief Scenario of Soil and Water Pollution and the Adverse Effects	209	Different Classes of Compounds with Anticancer Activities	243
Bioremediation: Its Necessity	210	Anticancer Compounds from <i>Aspergillus</i> <i>fumigatus</i>	243
HM Bioremediation by <i>Aspergillus</i>	210	<i>Aspergillus terreus</i> as the Source	245
Mechanism of HM Tolerance by <i>Aspergillus</i>	211	<i>Aspergillus ochraceous</i> , <i>Aspergillus sydowii</i> , <i>Aspergillus ustus</i> and <i>Aspergillus japonicus</i> as Sources of Anticancer Alkaloids	247
Bioremediation of Hydrocarbons by <i>Aspergillus</i>	212	<i>Aspergillus niger</i> as the Source of Anticancer Compounds	248
Role of <i>Aspergillus</i> sp. in Textile Wastewater Cleaning	212		
Conclusion	212		
References	213		

<i>Aspergillus tubingensis</i>	249	21. Bioremediation of Arsenic Using an <i>Aspergillus</i> System	
<i>Aspergillus versicolor</i>	250	<i>S.-I. Choe and D.C. Sheppard</i>	
<i>Aspergillus nidulans</i>	250	Arsenic Contamination: A Societal Issue	267
<i>Aspergillus clavatus</i> and <i>Aspergillus flavipes</i> as Sources of Cytotoxic Cytochalasins	250	Environmental Contamination	267
<i>Aspergillus wentii</i>	251	Health Effects of Arsenic	268
<i>Aspergillus candidus</i> as a Source	251	Bioremediation: Potential Solution	268
<i>Aspergillus parasiticus</i>	251	Use of Filamentous Fungi as Bioremediation Agents	269
<i>Aspergillus glaucus</i>	251	Use of <i>Aspergillus</i> as an Arsenic Biosensor	271
Unidentified Strains of <i>Aspergilli</i> as Sources of Anticancer Compounds	251	Conclusions	272
Conclusions and Future Perspectives	252	References	272
References	252		
20. Protein Production: Quality Control and Secretion Stress Response		22. Secondary Metabolite Diversity of the Genus <i>Aspergillus</i>: Recent Advances	
<i>S. Siddiqui</i>		<i>J. Soltani</i>	
Introduction	257	Introduction	275
Genetic Strategies	257	Secondary Metabolites of Fungi	275
Gene Fusion Strategy	257	Secondary Metabolites of <i>Aspergillus</i> Species	276
Introducing Multicopies of Protein Gene for Higher Yields	259	Bioinformatic Tools for Genome Mining of Secondary Metabolites in <i>Aspergillus</i>	285
Using a Protease-Deficient Host Strain	259	Proteomics Approaches to Secondary Metabolite Discovery	285
Engineering of the Glycosylation Pathway	260	Fungal Gene Regulation and Methods for Activating the Silent SM Genes/Clusters	285
Induction of UPR	261	Acknowledgments	286
Using Strong Promoters and Efficient Secretion Signals	261	References	286
Introducing Multiple Copies of Protein-Binding Sequence (CCAAT) to the Promoter	262		
Bioprocessing Strategies	262	Index	293
Fungal Morphology	262		
Fungal Mycelia Immobilization	263		
Fermentation pH Effects	263		
Cultivation Medium	263		
Agitation Intensity and Dissolved Oxygen Tension	263		
Conclusion	264		
References	264		

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List of Contributors

- A.M. Abdel-Azeem** University of Suez Canal, Ismailia, Egypt
- M.A. Abdel-Azeem** University of Sinai, North Sinai, Egypt
- H.S. AL-Maliki** The State University of New Jersey, New Brunswick, NJ, United States
- J.W. Bennett** The State University of New Jersey, New Brunswick, NJ, United States
- M. Cereia** Universidade de São Paulo, Ribeirão Preto, SP, Brazil
- S.-I. Choe** McGill University, Montréal, Québec, Canada
- F.J. Contesini** University of Campinas, Campinas, São Paulo, Brazil
- R.R. de Melo** University of Campinas, Campinas, São Paulo, Brazil
- M. Dimarogona** National Technical University of Athens, Athens, Greece
- C.S. Farinas** Embrapa Instrumentation, São Carlos, SP, Brazil; Federal University of São Carlos, São Carlos, SP, Brazil
- F.J. Fernández** Spanish National Science Council (CIB-CSIC), Madrid, Spain
- A.C. Flores-Gallegos** Universidad Autónoma de Coahuila, Saltillo, Coahuila, México
- B. Gajaraj** Jain University, Bengaluru, India
- Bharath Ganesan** K.S. Rangasamy College of Technology, Erode, Tamil Nadu, India
- S. Gómez** Spanish National Science Council (CIB-CSIC), Madrid, Spain
- R. Hung** The State University of New Jersey, New Brunswick, NJ, United States
- N.A. Khan** N.D. University of Agriculture and Technology, Faizabad, UP, India
- D. Kumar** N.D. University of Agriculture and Technology, Faizabad, UP, India
- M. Kumar** Bihar Agricultural University, Sabour Bhagalpur, Bihar, India; Amity University, Noida, Uttar Pradesh, India
- Ravi Ranjan Kumar** Bihar Agricultural University, Sabour Bhagalpur, Bihar, India
- Ranjeet Ranjan Kumar** Division of Biochemistry, Indian Agricultural Research Institute, New Delhi, India
- V. Kumar** Amity University, Noida, Uttar Pradesh, India
- F. Lara-Victoriano** Universidad Autónoma de Coahuila, Saltillo, Coahuila, México
- S. Lee** The State University of New Jersey, New Brunswick, NJ, United States
- S. Lee Rutgers** The State University of New Jersey, New Brunswick, NJ, United States
- M. Michel-Michel** Universidad Autónoma de Coahuila, Saltillo, Coahuila, México
- K. Mikawlawng** University of Delhi, Delhi, India
- M.T. Mohesien** University of Damietta, New Damietta, Egypt
- G. Molina** University of Campinas, Campinas, São Paulo, Brazil; Universidade Federal dos Vales do Jequitinhonha e Mucuri, Diamantina, Minas Gerais, Brazil
- K.D. Mojsov** Faculty of Technology, “Goce Delcev” University, Stip, Republic of Macedonia
- A. Mukherjee** Special Centre for Molecular Medicine, Jawaharlal Nehru University, New Delhi, India
- V.K. Nadumane** Jain University, Bengaluru, India
- N.A. Nafady** Assuit University, Assiut, Egypt
- P. Pandey** N.D. University of Agriculture and Technology, Faizabad, UP, India
- G.M. Pastore** University of Campinas, Campinas, São Paulo, Brazil
- K.K. Pennerman** The State University of New Jersey, New Brunswick, NJ, United States
- M.G. Pereira** Universidade de São Paulo, Ribeirão Preto, SP, Brazil
- M.L.T.M. Polizeli** Universidade de São Paulo, Ribeirão Preto, SP, Brazil

- A.G. Rodrigues** Martin-Luther University Halle-Wittenberg, Halle, Germany
- R. Rodríguez-Herrera** Universidad Autónoma de Coahuila, Saltillo, Coahuila, México
- F.M. Salem** University of Suez Canal, Ismailia, Egypt
- H.H. Sato** University of Campinas, Campinas, São Paulo, Brazil
- A.S.A. Scarcella** Universidade de São Paulo, Ribeirão Preto, SP, Brazil
- Md. Shamim** N.D. University of Agriculture and Technology, Faizabad, UP, India; Bihar Agricultural University, Sabour Bhagalpur, Bihar, India
- D.C. Sheppard** McGill University, Montréal, Québec, Canada
- S. Siddiqui** Integral University, Lucknow, Uttar Pradesh, India
- K.N. Singh** N.D. University of Agriculture and Technology, Faizabad, UP, India
- S. Singh** Lovely Professional University, Phagwara, Punjab, India
- E.A. Soliman** University of Suez Canal, Ismailia, Egypt
- J. Soltani** Bu-Ali Sina University, Hamedan, Iran
- D. Srivastava** N.D. University of Agriculture and Technology, Faizabad, UP, India
- P. Teotia** Chaudhary Charan Singh University, Meerut, Uttar Pradesh, India
- E. Topakas** National Technical University of Athens, Athens, Greece
- A. Varma** Amity University, Noida, Uttar Pradesh, India
- F. Veana-Hernandez** Universidad Autónoma de Coahuila, Saltillo, Coahuila, México
- M.C. Vega** Spanish National Science Council (CIB-CSIC), Madrid, Spain
- P. Venkatachalam** Jain University, Bengaluru, India
- A.C. Vici** Universidade de São Paulo, Ribeirão Preto, SP, Brazil

Aspergillus Enzymes for Food Industries

K.D. Mojsov

Faculty of Technology, "Goce Delcev" University, Stip, Republic of Macedonia

INTRODUCTION

Nature uses microorganisms to carry out fermentation processes, and for thousands of years mankind has used yeasts, molds, and bacteria to make food products such as bread, beer, wine, vinegar, yogurt, and cheese, as well as fermented fish, meat, and vegetables. Microorganisms are widely used in the food industry to produce various types of foods that are both nutritious and preserved from spoilage. The first realization that microorganisms were involved in food production processes was in 1837, when scientists discovered the role of yeast in an alcoholic fermentation. Fermentation is one of the oldest transformation and preservation techniques for food. The fermentation bioprocess is the major biotechnological application in food processing. Fermentation bioprocessing makes use of microbial inoculants for enhancing properties such as the taste, aroma, shelf-life, safety, texture, and nutritional value of foods. A well-conducted fermentation will favor useful flora, to the detriment of undesirable flora, in order to prevent spoilage and promote taste and texture.

Biotechnology in the food-processing sector makes use of microorganisms for the preservation of food and for the production of a range of value-added products such as enzymes, flavor compounds, vitamins, microbial cultures, and food ingredients. Biotechnology applications in the food-processing sector, therefore, target the selection and manipulation of microorganisms with the objective of improving process control, product quality, safety, consistency, and yield, while increasing process efficiency. Biotechnological processes applicable to the improvement of microbial cultures for use in food-processing applications include traditional methods of genetic improvement such as classical mutagenesis and conjugation (Pai, 2003).

Industrial microbiology includes the use of microorganisms to manufacture food or industrial products in large quantities. Numerous microorganisms are used within industrial microbiology. Types of microorganisms that are utilized by industry include various species of *Aspergillus*. This genus includes several hundred types of mold. *Aspergillus* has

become a key component in industrial microbiology, where it is used in the production of alcoholic beverages and pharmaceutical development. Microbes produce some important amino acids such as glutamic acid and lysine. Citric acid is produced mainly from *Aspergillus niger*, and is used in the preservation of food. The enzyme industry is the result of rapid development of biotechnology. Since ancient times, enzymes found in nature have been used in the production of food products such as cheese, beer, wine, and vinegar (Kirk et al., 2002).

Enzymes which decompose complex molecules into smaller units, such as carbohydrates into sugars, are natural substances involved in all biochemical processes. Microbial sources of enzymes are more advantageous than their equivalents from animal or vegetable sources. The advantages are: lower production costs, possibility of large-scale production in industrial fermenters, possibility of genetic manipulation, and rapid culture development (Hasan et al., 2006).

Microbial enzymes are generally extracellular and marketed in crude form. Pectinases are used in clarifying fruit juices, amylases in the starch hydrolysates, which in turn is used in various product formulations such as beer, vinegar, etc. In this chapter are described the properties, production, and applications of *Aspergillus* enzymes in the food industry.

FUNGUS OF INDUSTRIAL INTEREST

Aspergillus is the name used for a genus of molds that reproduce only by asexual means and it is one of the oldest named genera of fungi. *Aspergillus* is a filamentous, cosmopolitan, and ubiquitous fungus found in nature. It is commonly isolated from soil, plant debris, and indoor air environments. By 1926, *Aspergillus* had become one of the best-known and most studied mold groups. Their prevalence in the natural environment, their ease of cultivation on laboratory media, and the economic importance of several of its species ensured that many mycologists and industrial microbiologists were attracted to their study. *Aspergillus*