# Recent Advances in Biological Nitrogen Fixation

Edited by N. S. Subba Rao



**Recent Advances In Biological Nitrogen Fixation** 

Claudine Elmerich,Adam Kondorosi,William E. Newton

#### **Recent Advances In Biological Nitrogen Fixation:**

Advances in Biology and Ecology of Nitrogen Fixation Takuji Ohyama, 2014-01-29 Biological nitrogen fixation has essential role in N cycle in global ecosystem Several types of nitrogen fixing bacteria are recognized the free living bacteria in soil or water symbiotic bacteria making root nodules in legumes or non legumes associative nitrogen fixing bacteria that resides outside the plant roots and provides fixed nitrogen to the plants endophytic nitrogen fixing bacteria living in the roots stems and leaves of plants In this book there are 11 chapters related to biological nitrogen fixation regulation of legume rhizobium symbiosis and agriculture and ecology of biological nitrogen fixation including new models for autoregulation of nodulation in legumes endophytic nitrogen fixation in sugarcane or forest trees etc Hopefully this book will contribute to biological ecological and agricultural sciences Current Developments in Biological Nitrogen Fixation N. S. Subba Rao, 1984 This volume discusses the most recent advances in biological nitrogen fixation with chapters written by experts on the ecology physiology biochemistry and genetics of biological nitrogen fixation **Biological Nitrogen Fixation** Frans J. de Bruijn, 2015-06-12 Nitrogen is arguably the most important nutrient required by plants However the availability of nitrogen is limited in many soils and although the earth s atmosphere consists of 78 1% nitrogen gas N2 plants are unable to use this form of nitrogen To compensate modern agriculture has been highly reliant on industrial nitrogen fertilizers to achieve maximum crop productivity However a great deal of fossil fuel is required for the production and delivery of nitrogen fertilizer Moreover carbon dioxide CO2 which is released during fossil fuel combustion contributes to the greenhouse effect and run off of nitrate leads to eutrophication of the waterways Biological nitrogen fixation is an alternative to nitrogen fertilizer It is carried out by prokaryotes using an enzyme complex called nitrogenase and results in atmospheric N2 being reduced into a form of nitrogen diazotrophic organisms and plants are able to use ammonia It is this process and its major players which will be discussed in this book Biological Nitrogen Fixation is a comprehensive two volume work bringing together both review and original research articles on key topics in nitrogen fixation Chapters across both volumes emphasize molecular techniques and advanced biochemical analysis approaches applicable to various aspects of biological nitrogen fixation Volume 1 explores the chemistry and biochemistry of nitrogenases nif gene regulation the taxonomy evolution and genomics of nitrogen fixing organisms as well as their physiology and metabolism Volume 2 covers the symbiotic interaction of nitrogen fixing organisms with their host plants including nodulation and symbiotic nitrogen fixation plant and microbial omics cyanobacteria diazotrophs and non legumes field studies and inoculum preparation as well as nitrogen fixation and cereals Covering the full breadth of current nitrogen fixation research and expanding it towards future advances in the field Biological Nitrogen Fixation will be a one stop reference for microbial ecologists and environmental microbiologists as well as plant and agricultural researchers working on crop sustainability **Recent Advances in Biological Nitrogen Fixation** N. S. Subba Rao, 1980 Recent Advances in Biological Nitrogen Fixation Nanjappa

Shamanna Subba Rao, 1980 Marine Nitrogen Fixation Jonathan P. Zehr, Douglas G. Capone, 2021-04-02 This book aims to serve as a centralized reference document for students and researchers interested in aspects of marine nitrogen fixation Although nitrogen is a critical element in both terrestrial and aquatic productivity and nitrogen fixation is a key process that balances losses due to denitrification in both environments most resources on the subject focuses on the biochemistry and microbiology of such processes and the organisms involved in the terrestrial environment on symbiosis in terrestrial systems or on largely ecological aspects in the marine environment This book is intended to provide an overview of N2 fixation research for marine researchers while providing a reference on marine research for researchers in other fields including terrestrial N2 fixation This book bridges this knowledge gap for both specialists and non experts and provides an in depth overview of the important aspects of nitrogen fixation as it relates to the marine environment This resource will be useful for researchers in the specialized field but also useful for scientists in other disciplines who are interested in the topic It would provide a possible text for upper division classes or graduate seminars Associative and Endophytic Nitrogen-fixing Bacteria and Cyanobacterial Associations Claudine Elmerich, William E. Newton, 2007-05-19 This self contained volume covers fundamental and applied aspects of nitrogen fixation research The book describes milestones in the discovery of the associative and endophytic nitrogen fixing bacteria found involved with cereal crops forage grasses and sugar cane It provides a comprehensive overview of their phylogeny physiology and genetics as well as of the biology of their association with their host plants including tools for in situ localization and population dynamics analysis Also included are chapters describing the functions required for a bacterium to be competent and competitive in the rhizosphere and analysis of associations of cyanobacteria with fungi diatoms bryophytes cycads Azolla and Gunnera Advances in Cvanobacterial Biology Prashant Kumar Singh, Ajay Kumar, Vipin Kumar Singh, Alok Kumar Shrivistava, 2020-02-19 Advances in Cyanobacterial Biology presents the novel practical and theoretical aspects of cyanobacteria providing a better understanding of basic and advanced biotechnological application in the field of sustainable agriculture Chapters have been designed to deal with the different aspects of cyanobacteria including their role in the evolution of life cyanobacterial diversity and classification isolation and characterization of cyanobacteria through biochemical and molecular approaches phylogeny and biogeography of cyanobacteria symbiosis Cyanobacterial photosynthesis morphological and physiological adaptation to abiotic stresses stress tolerant cyanobacterium biological nitrogen fixation Other topics include circadian rhythms genetics and molecular biology of abiotic stress responses application of cyanobacteria and cyanobacterial mats in wastewater treatments use as a source of novel stress responsive genes for development of stress tolerance and as a source of biofuels industrial application as biofertilizer cyanobacterial blooms use in Nano technology and nanomedicines as well as potential applications This book will be important for academics and researchers working in cyanobacteria cyanobacterial environmental biology cyanobacterial agriculture and cyanobacterial molecular biologists Symbiotic Nitrogen Fixation P.

Graham, Michael J. Sadowsky, Carroll P. Vance, 2012-12-06 During the past three decades there has been a large amount of research on biological nitrogen fixation in part stimulated by increasing world prices of nitrogen containing fertilizers and environmental concerns In the last several years research on plant microbe interactions and symbiotic and asymbiotic nitrogen fixation has become truly interdisciplinary in nature stimulated to some degree by the use of modern genetic techniques These methodologies have allowed us to make detailed analyses of plant and bacterial genes involved in symbiotic processes and to follow the growth and persistence of the root nodule bacteria and free living nitrogen fixing bacteria in soils Through the efforts of a large number of researchers we now have a better understanding of the ecology of rhizobia environmental parameters affecting the infection and nodulation process the nature of specificity the biochemistry of host plants and microsymbionts and chemical signalling between symbiotic partners This volume gives a summary of current research efforts and knowledge in the field of biological nitrogen fixation Since the research field is diverse in nature this book presents a collection of papers in the major research area of physiology and metabolism genetics evolution taxonomy ecology and international programs Nitrogen Fixation in Agriculture, Forestry, Ecology, and the Environment Dietrich Werner, William E. Newton, 2005-10-24 Sustainability has a major part to play in the global challenge of continued development of regions countries and continents all around the World and biological nitrogen fixation has a key role in this process This volume begins with chapters specifically addressing crops of major global importance such as soybeans rice and sugar cane It continues with a second important focus agroforestry and describes the use and promise of both legume trees with their rhizobial symbionts and other nitrogen fixing trees with their actinorhizal colonization An over arching theme of all chapters is the interaction of the plants and trees with microbes and this theme allows other aspects of soil microbiology such as interactions with arbuscular mycorrhizal fungi and the impact of soil stress factors on biological nitrogen fixation to be addressed Furthermore a link to basic science occurs through the inclusion of chapters describing the biogeochemically important nitrogen cycle and its key relationships among nitrogen fixation nitrification and denitrification The volume then provides an up to date view of the production of microbial inocula especially those for legume crops **Recent Advances in** Ecobiological Research M. P. Sinha, 1997 Contributed articles with reference to India commemoration volume for Prof P N Biological Nitrogen Fixation for the 21st Century Claudine Elmerich, Adam Kondorosi, William E. Mehrotra Newton, 2013-12-01 Nitrogen availability is one of the most critical factors that limits plant productivity The largest reservoir of nitrogen is the atmosphere but this gaseous molecular nitrogen only becomes available to plants through the biological nitrogen fixation process which only prokaryotic cells have developed The discovery that microbes were providing fixed nitrogen to legumes and the isolation of the first nitrogen fixing bacteria occured at the end the 19th Century in Louis Pasteur's time We are now building on more than 100 years of research in this field and looking towards the 21st Century The International Nitrogen Fixation Congress series Started more than 20 years ago The format of this Congress is designed

to gather scientists from very diverse origins backgrounds interests and scientific approaches and is a forum where fundamental knowledge is discussed alongside applied research This confluence of perspectives is we believe extremely beneficial in raising new ideas guestions and concepts Nitrogen in Agriculture Khan Amanullah, Shah Fahad, 2018-02-01 Nitrogen is the most yield restraining nutrient in crop production globally Efficient nitrogen management is one of the most important factor for improving nitrogen use efficiency field crops productivity and profitability Efficient use of nitrogen for crop production is therefore very important for increasing grain yield maximizing economic return and minimizing nitrous oxide N2O emission from the fields and nitrate NO3 leaching to ground water Integrated nitrogen management is a good strategy to improve plant growth increase yield and yield components grain quality and reduce environmental problems Integrated nitrogen management combined use of chemical organic bio fertilizers in field crop production is more resilient to climate change Methods in Soil Biology Franz Schinner, Richard Öhlinger, Ellen Kandeler, Rosa Margesin, 2012-12-06 In terrestrial ecosystems soil microorganisms and soil animals are essential for litter degradation soil formation and the availability of nutrients and trace elements The measurement of biological soil parameters allows a rapid evaluation of the effects of chemical and physical influences due to pollutants or soil management This book introduces a number of well proved methods for the analysis of carbon nitrogen phosphorus and sulfur cycles It focuses further on the determination of the number and biomass of microorganisms algae and animals in the soil Particular emphasis is placed on the comprehensible and complete description of the experimental procedures Nitrogen Economy in Tropical Soils N. Ahmad, 1996-10-31 Reports on recent research designed to help increase the productivity of scarce tropical farmland without damaging the environment by gaining a better understanding of the chemical biological and ecological aspects of relationships between the critical element nitrogen in plants and soils Describes the use of isotopically labeled nitrogen in experimentation the impact of the tropical environment on nitrogen transformation in the soil annual fluctuations of native available soil nitrogen the interaction of major fertilizers with different soils the role of micro flora in nitrogen availability the behavior of applied nitrogen in wet and submerged soils and advances in nitrogen fixing by Rhizobium legume symbiosis All but 10 of the 42 papers are reprinted from Fertilizer Research vol 42 nos 1 3 1995 No index Annotation copyrighted by Book News Inc Portland OR Biological nitrogen fixation in forest ecosystems: foundations and applications John C. Gordon, C.T. Wheeler, 2012-12-06 **Biological Nitrogen Fixation** John Raymond Postgate, 1972 **Biological Nitrogen** Fixation Nanjappa Shamanna Subba Rao,1988 The Prokaryotes Edward F. DeLong, Stephen Lory, Erko Stackebrandt, Fabiano Thompson, 2014-10-13 The Prokaryotes is a comprehensive multi authored peer reviewed reference work on Bacteria and Achaea This fourth edition of The Prokaryotes is organized to cover all taxonomic diversity using the family level to delineate chapters Different from other resources this new Springer product includes not only taxonomy but also prokaryotic biology and technology of taxa in a broad context Technological aspects highlight the usefulness of

prokaryotes in processes and products including biocontrol agents and as genetics tools The content of the expanded fourth edition is divided into two parts Part 1 contains review chapters dealing with the most important general concepts in molecular applied and general prokaryote biology Part 2 describes the known properties of specific taxonomic groups Two completely new sections have been added to Part 1 bacterial communities and human bacteriology The bacterial communities section reflects the growing realization that studies on pure cultures of bacteria have led to an incomplete picture of the microbial world for two fundamental reasons the vast majority of bacteria in soil water and associated with biological tissues are currently not culturable and that an understanding of microbial ecology requires knowledge on how different bacterial species interact with each other in their natural environment The new section on human microbiology deals with bacteria associated with healthy humans and bacterial pathogenesis Each of the major human diseases caused by bacteria is reviewed from identifying the pathogens by classical clinical and non culturing techniques to the biology of prokaryotes The following volumes are published consecutively within the 4th Edition Prokaryotic Biology and Symbiotic Associations Prokaryotic Communities and Ecophysiology Prokaryotic Physiology and Biochemistry Applied Bacteriology and Biotechnology Human Microbiology Actinobacteria Firmicutes Alphaproteobacteria and Betaproteobacteria

<u>Nitrogen Fixation</u> John Postgate,1998-10-15 The fixation of nitrogen the conversion of atmospheric nitrogen to a form that plants can use is fundamental to the productivity of the biosphere and therefore to the ability of the expanding human population to feed itself Although the existence and importance of the process of biological nitrogen fixation has been recognized for more than a century scientific advances over the past few decades have radically altered our understanding of its nature and mechanisms This book provides an introductory level survey of biological nitrogen fixation covering the role of the process in the global nitrogen cycle as well as its biochemistry physiology genetics ecology general biology and prospects for its future exploitation This new edition has been fully updated to include the most recent developments in the field providing an up to date and accessible account of this key biological process Embark on a breathtaking journey through nature and adventure with Explore with is mesmerizing ebook, Witness the Wonders in **Recent Advances In Biological Nitrogen Fixation**. This immersive experience, available for download in a PDF format ( Download in PDF: \*), transports you to the heart of natural marvels and thrilling escapades. Download now and let the adventure begin!

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