

Recent Advances in Biological Nitrogen Fixation

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Nitrogen is essential for the growth and functioning of all living organisms; however, only 2% of Earth's nitrogen is available for them [1]. It can mostly be found in the atmosphere as N_2 , which can be assimilated only by a small group of microorganisms called diazotrophs, which are able to reduce dinitrogen into NH_3 [2]. This process, referred to as biological nitrogen fixation, is most effective in symbiotic systems formed between soil saprophytic bacteria called rhizobia and legume plants, and can provide considerable amounts of reduced nitrogen for agricultural systems and uncultivated areas [3]. New discoveries and concepts related to biological nitrogen fixation often result in useful improvements in agronomy; therefore, new ideas focusing on enhancing or broadening its application still need to be developed.

The papers in this Special Issue include a review and original research articles covering different aspects of biological nitrogen fixation and organisms associated with this phenomenon. In their extensive review, Santos et al. [4] focused on the demand for environmentally friendly technologies based on microorganisms and their plant hosts that can be used instead of chemical fertilizers and pesticides. In this paper, (a) standards for inoculant production, (b) ways to deliver inoculants to the crop, (c) compatibility between inoculants and pesticides, and (d) detrimental effects of pesticides on inoculants were thoroughly discussed. Maitra et al. [5] proposed new nontoxic polymers that considerably enhance bacterial survival ability, which can be used in preparation of rhizobial liquid inoculants. This might be an interesting finding, since improvement of inoculant formulas are still needed to ensure longer storage with high viability of cells and better competitive properties of strains introduced as biofertilizers. Siczek et al. [6] and Helios [7] described solutions related to sustainable agriculture based on legume–rhizobia symbiotic systems. One of these studies focused on the dynamics of bacterial and fungal communities studied after enrichment of soil with different crop residues in a field trial, and showed that application of legumes as a forecrop not only increased the soil nutrient pool but also had a strong impact on fungal community, acting against phytopathogens, which may result in lower fungicide requirements in the following growing seasons [6]. The second paper presented the use of white clover as undersowing for basket willow (*Salix viminalis* L.), which resulted in reduced weed infestation of young plantations of willow, thus lowering the need for herbicide treatment [7]. As the growth of willow undersown with clover was comparable with plants fertilized with nitrogen, this practice can be assumed as a good alternative for mineral N fertilization of short-rotation woody crops. Radzka et al. [8] focused on maximization of profits of biological nitrogen fixation by plants and described how different sowing densities of soybean could affect the amount of nitrogen obtained from symbiotic reduction of atmospheric N_2 . Smytkiewicz et al. [9] described the effect of rhizobial metabolites called chitolipooligosaccharides on the growth, development, and yielding of peas, and demonstrated that such a preparation could be an efficient growth stimulator for legumes. Finally, Marzec-Grządziel et al. [10] described a symbiotic system emerging between ruddy clover (*Trifolium rubens* L.), an endemic species which is considered endangered in European countries) and their microsymbionts, and showed the perspective for development of an inoculant formulation for this valuable nectariferous plant.



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Recent Advances In Biological Nitrogen Fixation

Surajit de Mandal, Pankaj Bhatt



Recent Advances In Biological Nitrogen Fixation:

Recent Advances in Biological Nitrogen Fixation N. S. Subba Rao, 1980
Fixation Nanjappa Shamanna Subba Rao, 1980
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
Recent Advancement in Microbial Biotechnology Surajit de Mandal, Ajit Kumar Passari, 2021-08-14 The rapid increase in microbial resources along with the development of biotechnological methods has revolutionized the field of microbial biotechnology Genome characterization methods and metagenomic approaches further illustrate the role of microorganisms in various fields of research Recent Advancement in Microbial Biotechnology Agricultural and Industrial Approach provides an overview on the recent application of the microorganisms in agricultural and industrial improvements The purpose of this book is to integrate all these diverse areas of research in a common platform Recent advancement in Microbial Biotechnology targets researchers from both academia and industry professors and graduate students working in molecular biology microbiology and biotechnology Gives insight in the exploration of microbial functional diversity in different systems Highlights important microbes and their role in enhancing agricultural productivity Provides understanding to the basics with advance information of microbial biotechnology Explores the importance of microbial genomes studies in agricultural and industrial applications
The Nitrogen Fixation and its Research in China Guo-Fan Hong, 2013-03-09 Nitrogen Fixation by symbiotic organisms is considered an important contribution to the solution of food problems throughout the world For many years Chinese scientists have focused their research in this area Today more than half of the total nitrogen fertilizers applied are from biological fixation sources The editor is an international renowned scientist at the Chinese Academy of sciences He has brought together contributions from various research fields in China and Europe Together they present the state of the art in nitrogen fixation research The studies range from actino mycete fixation induced in various genera and species of plants mechanisms and chemical modeling of enzyme systems to genetic engineering of organisms
Recent Advances in Ecobiological Research M. P. Sinha, 1997 Contributed articles with reference to India commemoration volume for Prof P N Mehrotra
Recent Advancements in Microbial Diversity Surajit de Mandal, Pankaj Bhatt, 2020-06-02 Microorganisms are a major part of the Earth's biological diversity Although a lot of research has been done on microbial diversity most of it is fragmented This book creates the need for a unified text to be published full of information about microbial diversity from highly reputed and impactful sources Recent Advancements in Microbial Diversity brings a comprehensive understanding of the recent advances in microbial diversity research focused on different bodily systems such as the gut Recent Advancements in Microbial Diversity also discusses how the application of advanced sequencing technologies is used to reveal previously unseen microbial diversity and show off its function Gives insight into microbial diversity in different bodily systems Explains

novel approaches to studying microbial diversity Highlights the use of omics to analyze the microbial community and its functional attributes Discusses the techniques used to examine microbial diversity including their applications and respective strengths and weaknesses *Advances in Plant Physiology (Vol. 11)* A. Hemantaranjan, 2009-01-01 The configuration of Volume 11 of the International Treatise Series has been absolutely due to praiseworthy contributions from Scientists of global eminence This programme has been undertaken with a view to reinforce the indistinguishable efforts to recognize the outcome of scrupulous research in some of the very rational and stirring areas of Environmental and Molecular Physiology of Plants In order to sustain and further advance it is committed to maintain the originality and the introduction of novel ideas ensuring that the treatise welcomes the best science done across the full extent of modern plant biology in general and plant physiology in particular Indeed within the time span of twelve years this treatise has been duly recognized through Current Book Contents and other academic periodicals in the minds of distinguished readers and has beyond doubt achieved the international status It is reiterated that in spite of handiness of quick accessibility of vast literature from internet this treatise series in the field of life sciences has been realized over and above to be like a true guide friend and philosopher continually enlightening the most hidden perceptible nerves of an individual worker which is beyond the competence of mere internet web service It is glory to record that in Volume 11 with inventive applied research attempts have been made to bring together much needed fifteen review articles by Fifty eight contributors from Brazil China Egypt France Germany India Switzerland and Tunisia duly evaluated by Consulting Editors of international stature from India U K U S A Argentina Australia France Germany Japan Spain Portugal Israel and Morocco and rationally disseminated in Seven Sections Creditably in this volume over five important reviews belong to the field of Environmental Stresses besides covering significant areas of research In genuineness the treatise is an achievement for interdisciplinary exchange of information It would be extremely a significant book and a voluminous reference material for acquiring advanced knowledge by post graduate and Ph D scholars in response to the innovative courses in Plant Physiology Plant Biochemistry Plant Molecular Biology Plant Biotechnology Environmental Sciences Plant Pathology Microbiology Soil Science Agricultural Chemistry Agronomy Horticulture and Botany besides fulfilling needs for research teams and scientists engaged in various facets of research in Molecular Physiology and Biology of Plants in traditional and agricultural universities institutes and research laboratories throughout the world **Advances in Plant Physiology (Vol.13)** A. Hemantaranjan, 2012-08-01 The plant physiology and plant molecular biology research group has evidently endorsed the new directions taken by the treatise to attract the pre eminent scientists in plant biology plant sciences Certainly the preparation of Volume 13 of the International Treatise Series on Advances in Plant Physiology has been done entirely due to commendable contributions from Scientists of Eminence in unequivocal fields Unquestionably our objective is to publish innovative science of value across the broad disciplinary range of the treatise I restate that this plan has been undertaken with a view to strengthen the indistinguishable efforts to

recognize the outcome of meticulous research in some of the very sensible and stirring areas of Plant Physiology Plant Molecular Physiology Biology Plant Biochemistry for holistic development of the science of agriculture and crop production under changing climate I am ardent to keep on the exceptionality and the prologue of excellent new ideas ensuring that the treatise calls to the best science done across the full extent of modern plant biology in general and plant physiology in particular In Volume 13 with inventive applied research attempts have been made to bring together much needed eighteen review articles by forty eight contributors especially from premier institutions of India for this volume All the eighteen review articles have been grouped in five broad sections which on the whole highlight the necessity to find out evidence from the fields of plant nutriophysiology physiology of plant mineral nutrients and abiotic stresses under changing climate along with their control

Plant-Microbe Interaction - Recent Advances in Molecular and Biochemical Approaches Prashant Swapnil, Mukesh Meena, Harish, Avinash Marwal, Selvakumar Vijayalakshmi, Andleeb Zehra, 2023-04-17 Plant Microbe Interaction Recent Advances in Molecular and Biochemical Approaches Agricultural Aspects of Microbiome Leading to Plant Defence Volume Two continues the work of Volume One covering the role of these plant microbes and their interaction between plants and microbes These beneficial microbes such as bacteria and fungi are also known as plant growth promoting rhizobacteria PGPR through a biochemical reaction that may improve induced systemic resistance in the plant host via indirectly against phytopathogens or directly the solubilization of mineral nutrients by producing phytohormones and specific enzymes such as 1 aminocyclopropane 1 carboxylate deaminase The book covers biochemical processes such as physiological metabolic etc of plant and microbe interactions the biochemistry of biological systems the interaction of biological systems above ground or within the rhizosphere and the history of growth promoting microbiomes their roles in phytoremediation efficiency physiological and biochemical studies chemical communication and signaling mechanisms Covers agricultural aspects in which the biochemistry in between plants and microbes helps us understand interactions in the rhizosphere Helps readers understand the molecular and biochemical approaches of plant microbe interactions Enables an understanding of plant microbe interactions which will help to improve crop production

Advances In Plant Physiology (Vol. 4) A. Hemantaranjan, 2002-07-01 Researches have made tremendous progress in the area of Plant Physiology greatly increasing our understanding of living processes necessary for biotechnological research Different volumes of the treatise Advances in Plant Physiology covers the entire spectrum of Plant Physiology including the Plant Molecular Biology in order to encourage meaningful research in the coming twenty first century The true endeavor in this direction is the result of comprehensive authoritative and timely publication of this valuable treatise provides the reader with the most recent information views and references focused on individual topics through a rich collection of reviews contributed by pioneer workers and of those actively engaged in the studies of various specific areas in different parts of the world with extensive experience established record of eminence and noted authorities In fact this treatise is a treasure for interdisciplinary exchange of information and

the approach to topic ranges from theoretical to applied molecular to organismic and single to multivariable systems Apart from fulfilling the need of this treatise for research teams and scientists actively working in the areas of plant physiology biochemistry and plant molecular biology in universities institutes and research laboratories throughout the world it would be extremely a useful book and a voluminous reference material for acquiring advanced knowledge by students in response to innovative courses in Plant Physiology Plant Biochemistry Agronomy Genetics and Plant Breeding Genetic Engineering Microbiology Plant Biotechnology and Botany Over eighteen 18 chapters of Vol 1 extensively elucidate the needful topics of Biological Nitrogen Fixation Plant Cell and Tissue Culture Plant Metabolism certain rare Techniques in Plant Physiology Herbicides Physiology Plant Growth Regulators Physiology of Rooting Tree Physiology Stress Physiology in part and Growth and Development Hopefully Vol II will comprise other important topics *CRC Handbook of Plant Science in Agriculture* B.R. Christie, 2023-01-06 First published in 1987 this two volume set is an exhaustive compilation of the most recent data on economically important crops Volume I presents information on genetics botany and growth of crop plants while Volume II covers the production of Crops and their utilization Advances in Plant Physiology (Vol.15) A. Hemantaranjan, 2014-12-01 In view of changes in the global environment it is important to determine and developing technologies to ameliorate metabolic limitations by biological processes most sensitive to abiotic stress factors warning crop productivity It is reaffirmed that publishing the important Treatise Series has been undertaken with a view to identify the inadequacies under varied environments and to scientifically extend precise and meaningful research so that the significant outcomes including new technologies are judiciously applied for requisite productivity profitability and sustainability of agriculture Besides this meticulous research in some of the very sensible and stirring areas of Plant Physiology Plant Molecular Physiology are indispensably needed for holistic development of agriculture and crop production in different agro climatic zones Ardently this is also to focus upon excellent new ideas ensuring the best science done across the full extent of modern plant biology in general and plant physiology in particular In Volume 14 with inventive applied research attempts have been made to bring together much needed eighteen remarkable review articles distributed in three appropriate major sections of Nutriophysiology and Crop Productivity Plant Responses to Changing Environment and Environmental Stresses and Technological Innovations in Agriculture written by thirty four praiseworthy contributors of eminence in unequivocal fields mainly from premier institutions of India and abroad In reality the Volume 14 of the Treatise Series is wealth for interdisciplinary exchange of information particularly in the field of nutriophysiology and abiotic stresses for planning meaningful research and related education programmes in these thrust areas Apart from fulfilling the heightened need of this kind of select edition in different volumes for research teams and scientists engaged in various facets of research in Plant Physiology Plant Sciences in traditional and agricultural universities institutes and research laboratories throughout the world it would be tremendously a productive reference book for acquiring advanced knowledge by post graduate and Ph

D scholars in response to the innovative courses in Plant Physiology Plant Biochemistry Plant Molecular Biology Plant Biotechnology Environmental Sciences Plant Pathology Microbiology Soil Science Agricultural Chemistry Agronomy Horticulture and Botany Microbiology of Tropical Soils and Plant Productivity Y.R. Dommergues, G.H. Diem, 2012-12-06 It is an established fact that we must continually increase and improve agricultural production if we are to meet even the minimum requirements of a growing population for food shelter and fuel In recent years the introduction of new plant varieties and the extensive use of fertilizers have effectively increased crop yields but intensifying agricultural methods has often led to depleting soil fertility Two examples of the harmful consequences of intensive farming practices are the loss of up to 2.5 cm of topsoil every 15 years in the United States through erosion and the alarming rise in environmental pollution through widespread use of pesticides Countless other processes affecting the activity of soil microflora and the interactions between microorganisms and plants may pose an equal danger to soil equilibrium but their potential hazards are often overlooked because of an insufficient understanding of soil microbiology on the part of scientists In the first published study of its kind the authors of this book have attempted to address major aspects of the microbial activity of soil in the tropics Tropical conditions serve as an ideal context for a discussion of soil microbiology since biological processes in the soil are particularly active in tropical environments in comparison to other settings and in relation to physical and chemical processes Biological Nitrogen Fixation for the 21st Century Claudine Elmerich, Adam Kondorosi, William E. Newton, 1997-11-30 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 occurred at the end of 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 questions and concepts **Recent Advances in Biotechnology** F. Vardar-Sukan, S.S. Sukan, 2012-12-06 In last decades rapid scientific and engineering developments have been occurring within the context of Biotechnology If the World Economy is to benefit fully from the advances in biosciences and biochemical engineering it must be able to focus new knowledge on commercially appropriate targets Modern Biotechnology is a mixture of far reaching innovation superimposed on an industrial background and it represents a means of production with bright prospects challenging problems and stimulating competition This NATO Advanced Study Institute on RECENT ADVANCES IN INDUSTRIAL APPLICATIONS OF BIOTECHNOLOGY held between September 16-27 1991 in Ku Et-das was the first ASI on

Biotechnology In Turkey it was aiming to provide an updated overview of the fundamental principles novel application areas and impact of Biotechnology on international economy Recent developments in the field of Biotechnology have been thoroughly discussed concentrating on various interdisciplinary aspects The illain lectures presented at the Institute covered both scientific and commercial aspects of new developments in biotechnology and discussed the possible ways of meeting the challenges of the industry The main lectures were supplemented by Oral 2nd Poster Presentations Thus this volume is comprised of three sections Part I contains the invited lectures and Part II oral presentations Extended abstracts of poster presentations have been included in Part III to provide a more comprehensive coverage of the ASI

Applications of Genetic Engineering to Crop Improvement G.B. Collins, Joseph F. Petolino, 2012-12-06 The contributions of plant genetics to the production of higher yielding crops of superior quality are well documented These successes have been realized through the application of plant breeding techniques to a diverse array of genetically controlled traits Such highly effective breeding procedures will continue to be the primary method employed for the development of new crop cultivars however new techniques in cell and molecular biology will provide additional approaches for genetic modification There has been considerable speculation recently concerning the potential impact of new techniques in cell and molecular biology on plant improvement These genetic engineering techniques should offer unique opportunities to alter the genetic makeup of crops if applied to existing breeding procedures Many questions must be answered in order to identify specific applications of these new technologies This search for applications will require input from plant scientists working on various aspects of crop improvement This volume is intended to assess the interrelationships between conventional plant breeding and genetic engineering

Biological Nitrogen Fixation Nanjappa Shamanna Subba Rao, 1988

Biotechnology of Biofertilizers S. Kannaiyan, 2002 This volume is written with the objective of covering the basic issues in biological nitrogen fixation such as the physiology biochemistry and molecular genetics of nitrogen fixation and the role of signal molecules and host gene expression in nodulation and nitrogen fixation The book also details recent developments in biofertilizer technology such as the immobilization of cyanobacteria endophytic nitrogen fixation and solubilization and mobilization of nutrients by phosphobacteria and VA mycorrhiza and their role as bioinoculants

Foreign Assistance and Related Programs Appropriations for Fiscal Year 1981 United States. Congress. Senate. Committee on Appropriations. Subcommittee on Foreign Operations, 1980

Recent Advances In Biological Nitrogen Fixation Book Review: Unveiling the Magic of Language

In an electronic era where connections and knowledge reign supreme, the enchanting power of language has are more apparent than ever. Its ability to stir emotions, provoke thought, and instigate transformation is actually remarkable. This extraordinary book, aptly titled "**Recent Advances In Biological Nitrogen Fixation**," written by a highly acclaimed author, immerses readers in a captivating exploration of the significance of language and its profound effect on our existence. Throughout this critique, we shall delve in to the book is central themes, evaluate its unique writing style, and assess its overall influence on its readership.

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