

# BIOFERTILIZERS

THE ROLE IN SUSTAINABLE AGRICULTURE



# Biofertilizers For Sustainable Agriculture

**D. K. Maheshwari**



## **Biofertilizers For Sustainable Agriculture:**

**Biofertilizers for Sustainable Agriculture and Environment** Bhoopander Giri,Ram Prasad,Qiang-Sheng Wu,Ajit Varma,2019-08-09 This book provides a comprehensive overview of the benefits of biofertilizers as an alternative to chemical fertilizers and pesticides Agricultural production has increased massively over the last century due to increased use of chemical fertilizers and pesticides but these gains have come at a price The chemicals are not only expensive they also reduce microbial activity in agricultural soils and accumulate in the food chain with potentially harmful effects for humans Accordingly it is high time to explore alternatives and to find solutions to overcome our increasing dependence on these chemicals Biofertilizers which consist of plant remains organic matter and microorganisms might offer an alternative They are natural organic biodegradable eco friendly and cost effective Further the microbes present in the biofertilizers are important because they produce nutrients required for plant growth e g nitrogen phosphorus potassium as well as substances essential for plant growth and development e g auxins and cytokinins Biofertilizers also improve the physical properties fertility and productivity of soil reducing the need for chemical fertilizers while maintaining high crop yield This makes biofertilizers a powerful tool for sustainable agriculture and a sustainable environment The book covers the latest research on biofertilizers ranging from beneficial fungal bacterial and algal inoculants to microbes for bioremediation wastewater treatment and recycling of biodegradable municipal agricultural and industrial waste as well as biocontrol agents and bio pesticides As such it offers a valuable resource for researchers academics and students in the broad fields of microbiology and agriculture

**Biofertilizers for Sustainable Soil Management** Shah Fahad,Shah Saud,Fazli Wahid,Muhammad Adnan,2023-08-22 The alkaline calcareous nature high pH salinity heavy metals pollution and low organic matter content of soils in many parts of the world have diminished the soil fertility and made essential nutrients unavailable to crops To cope with the poor availability of soil nutrients improve soil health and feed the fast growing global population the farming community is using millions of tons of expensive chemical fertilizers in their fields to maintain an adequate level of nutrients for crop sustainability as well as to ensure food security In this scenario the exploitation of biofertilizers has become of paramount importance in the agricultural sector for their potential role in food safety and sustainable crop production Bearing in mind the key importance of biofertilizers this book examines the role of biofertilizers in sustainable management of soil and plant health under different conditions of the changing climate Finally it provides a platform for scientists and academicians all over the world to promote share and discuss various new issues developments and limitations in biofertilizers crops and beneficial microbes Salient Features Mainly focuses on the role of biofertilizers in managing soils for improving crop and vegetable yields as a substitute for chemical fertilizers Highlights the valuable information for the mechanism of action factors affecting and limitations of biofertilizers in the wider ecosystem Presents a diversity of techniques used across plant science Designed to cater to the needs of researchers technologists policy makers and

undergraduates and postgraduates studying in the fields of organic agriculture soil microbiology soil biology soil fertility and fertilizers Addresses plant responses to biofertilizers      **Microbiota and Biofertilizers** Khalid Rehman Hakeem, Gowhar Hamid Dar, Mohammad Aneesul Mehmood, Rouf Ahmad Bhat, 2020-12-07 An increasing population has put tremendous pressure on agricultural productivity to fulfill the demands of human consumption Numerous agricultural activities and techniques have been developed to raise annual crop production globally While agriculture has succeeded in enhancing the yearly crop productivity this achievement is at the cost of environmental degradation by applying synthetic persistent substances such as industrial fertilizers pesticides herbicides etc Chemical fertilizers are nearly as destructive as they are productive causing monocultures and consequences associated with elimination of diversity nutrient pollution as evidenced by algae blooms eutrophication water quality issues lower oxygen levels and dangers to fish stocks Therefore the scientific approach to maintain sustainable fertility in soil and plants is to switch over to biofertilisers Biofertilisers are compounds of organic matter that are applied to crops for growth and health Their constituent micro organisms interact in an ecofriendly manner with the soil root and seeds of plants promoting the growth of micro flora that enhances soil fertility They are known to play a number of vital roles in soil fertility crop productivity and production in agriculture Application of biofertilisers results in increased mineral and water uptake root development vegetative growth and nitrogen fixation They liberate growth promoting substances and vitamins and help to maintain soil fertility They act as antagonists and play a pivotal role in neutralising the soil borne plant pathogens thereby assisting in the bio control of diseases Application of biofertilisers in lieu of synthetic fertilizers could be the promising technique to raise agricultural productivity without degrading the environmental quality The present book focuses on the latest research approaches and updates from the microbiota ecosystem and their applications in agriculture industry It also highlights the great potential and possible future of action of microbiota in the development of sustainable agricultural systems      *Biotechnology of Biofertilizers* Sadasivam Kannaiyan, 2002-11-30 Table of contents      **Handbook of Microbial Biofertilizers** Mahendra Rai, 2006-02-28 Sharply focused up to date information on microbial biofertilizers including emerging options such as Piriformospora indica and Matsutake The Handbook of Microbial Biofertilizers provides in depth coverage of all major microbial biofertilizers rhizobia arbuscular mycorrhizal fungi and cyanobacteria as well as new and emerging growth promoters endophytes It examines the role of microbes in growth promotion bioprotectors and bioremediators and presents protocols and practical strategies for using microbes in sustainable agriculture An abundance of helpful charts tables and figures make complex information easy to access and understand In this first of its kind volume contributors from 11 countries and several continents address important issues surrounding microbial biofertilizers including the rhizobium host arbuscular mycorrhizal tripartite relationship mycorrhiza as a disease suppresser and stress reducer mycorrhiza helping bacteria the impact of functional groups of soil microorganisms on nutrient turnover PBPRs as biofertilizers and biopesticides the potential of wild legume

rhizobia for use as a biofertilizers the expanding role of blue green algae in sustainable agriculture the role of microbial fertilizers in sustainable plant production new and emerging endophytes the commercial potential of biofertilizers In this young century the use of biofertilizers is already growing rapidly It has been recognized that these environment friendly bioprotectors growth boosters and remediators are essential for soil plant health The Handbook of Microbial Biofertilizers is designed to fit the expanding information needs of current and future biotechnologists microbiologists botanists agronomists environmentalists and others whose work involves sustained agriculture Biofertilizers for Sustainable Agriculture Arun K. Sharma, 2002-01-01 *Microbial Biostimulants for Sustainable Agriculture and Environmental Bioremediation*

Inamuddin, Charles Oluwaseun Adetunji, Mohd Imran Ahamed, Tariq Altalhi, 2022-06-29 Today the agriculture industry is confronted with simultaneous issues of how to fully embrace mass production of safer food in terms of both quality and quantity Most industries are concerned with avoiding significant levels of soil pollution and environmental threats as a result of the excessive and harmful use of synthetic products on crops Therefore there is a need to adopt sustainable technological innovations that can ensure the sustainability of agricultural production systems *Microbial Biostimulants for Sustainable Agriculture and Environmental Bioremediation* discusses the benefits challenges and practical applications of eco friendly biotechnological techniques using biostimulants derived from beneficial microorganisms The chapters cover the use of these organisms to increase crop production enhance soil fertility and maintain soil health create crop and plant tolerance to different abiotic stressors release required nutrients to the soil increase resistance to plant pathogens pests improve nutrient use efficiency of crops and rejuvenate polluted environments **FEATURES** Explores the physiological morpho anatomical and biochemical molecular plant rejoinders involved in stimulating crop productivity Provides information on the physiological cellular and molecular modes of action underlying microbial biostimulant interfaces Summarizes methods and approaches for executing microbial stimulant technology Outlines numerous environmental management and remediation strategies This book is an ideal resource for researchers engineers and academics working in soil science crop science water remediation microbiology and biotechnology **Recent Advances in Biofertilizers and Biofungicides (PGPR) for Sustainable**

**Agriculture** Patricio S. Faylon, Rodolfo I. Ilao, M S Reddy, 2014-11-10 Global concern over the demerits of chemicals in agriculture has diverted the attention of researchers towards using the potential of PGPR in agriculture This book contains many useful and important research papers pertaining to the use of bio fertilizers and bio fungicides for sustainable agriculture This volume is presented in an easy to understand manner with well illustrated protocols on the production to commercialization of PGPR The chapters on commercial potential trade and regulatory issues among Asian countries are worthwhile additions As such this book will prove useful for students researchers teachers and entrepreneurs in the area of PGPR and its allied fields **Biofertilizers** Inamuddin, Mohd Imran Ahamed, Rajender Boddula, Mashallah

Rezakazemi, 2021-08-03 Great attention has been paid to reduce the use of conventional chemical fertilizers harming living

beings through food chain supplements from the soil environment Therefore it is necessary to develop alternative sustainable fertilizers to enhance soil sustainability and agriculture productivity Biofertilizers are the substance that contains microorganisms bacteria algae and fungi living or latent cells that can enrich the soil quality with nitrogen phosphorous potassium organic matter etc They are a cost effective biodegradable and renewable source of plant nutrients supplements to improve the soil health properties Biofertilizers emerge as an attractive alternative to chemical fertilizers and as a promising cost effective technology for eco friendly agriculture and a sustainable environment that holds microorganisms which enhance the soil nutrients solubility leading a raise in its fertility stimulates crop growth and healthy food safety This book provides in depth knowledge about history and fundamentals to advances biofertilizers including latest reviews challenges and future perspectives It covers fabrication approaches and various types of biofertilizers and their applications in agriculture environment forestry and industrial sectors Also organic farming quality control quality assurance food safety and case studies of biofertilizers are briefly discussed Biofertilizers physical properties affecting factors impact and industry profiles in the market are well addressed This book is an essential guide for farmers agrochemists environmental engineers scientists students and faculty who would like to understand the science behind the sustainable fertilizers soil chemistry and agroecology

**Biofertilizers and Biopesticides in Sustainable Agriculture** B. D. Kaushik,Deepak Kumar,Md.

Shamim,2019-10-23 This new volume Biofertilizers and Biopesticides in Sustainable Agriculture presents strategies for the management of soil and crop diseases Microbes have attracted worldwide attention due to their role in disease management and remediation of polluted soils Taking a sustainable approach this book explores the means of integrating various microbial management approaches to achieve the desired levels of crop yield under both conventional soils and neglected soils through the use of biopesticides and other botanicals as well as biomolecules This book also presents a broad and updated view of molecular nitrogen fixation and phosphate solubilizing and sulfur transforming microbes for nutrition of crops in relation to the role of metal tolerant microbes in providing protection to plants grown in metal contaminated soils The preparation and application of biofertilizers utilization of household waste materials and use of genetically modified microorganisms GMOs in plant growth and development are also well discussed in the volume

**Plant Microbiomes for Sustainable Agriculture**

Ajar Nath Yadav,Joginder Singh,Ali Asghar Rastegari,Neelam Yadav,2020-03-06 This book encompasses the current knowledge of plant microbiomes and their potential biotechnological application for plant growth crop yield and soil health for sustainable agriculture The plant microbiomes rhizospheric endophytic and epiphytic play an important role in plant growth development and soil health Plant and rhizospheric soil are a valuable natural resource harbouring hotspots of microbes and it plays critical roles in the maintenance of global nutrient balance and ecosystem function The diverse group of microbes is key components of soil plant systems where they are engaged in an intense network of interactions in the rhizosphere endophytic phyllospheric The rhizospheric microbial diversity present in rhizospheric zones has a sufficient

amount of nutrients release by plant root systems in form of root exudates for growth development and activities of microbes The endophytic microbes are referred to those microorganisms which colonize in the interior of the plant parts viz root stem or seeds without causing any harmful effect on host plant Endophytic microbes enter in host plants mainly through wounds naturally occurring as a result of plant growth or through root hairs and at epidermal junctions Endophytes may be transmitted either vertically directly from parent to offspring or horizontally among individuals The phyllosphere is a common niche for synergism between microbes and plant The leaf surface has been termed as phyllosphere and zone of leaves inhabited by microorganisms as phyllosphere The plant part especially leaves is exposed to dust and air currents resulting in the establishments of typical flora on their surface aided by the cuticles waxes and appendages which help in the anchorage of microorganisms The phyllospheric microbes may survive or proliferate on leaves depending on extent of influences of material in leaf diffuseness or exudates The leaf diffuseness contains the principal nutrients factors amino acids glucose fructose and sucrose and such specialized habitats may provide niche for nitrogen fixation and secretions of substances capable of promoting the growth of plants The microbes associated with plant as rhizospheric endophytic and epiphytic with plant growth promoting PGP attributes have emerged as an important and promising tool for sustainable agriculture PGP microbes promote plant growth directly or indirectly either by releasing plant growth regulators solubilization of phosphorus potassium and zinc biological nitrogen fixation or by producing siderophore ammonia HCN and other secondary metabolites which are antagonistic against pathogenic microbes The PGP microbes belong to different phylum of archaea Euryarchaeota bacteria Acidobacteria Actinobacteria Bacteroidetes Deinococcus Thermus Firmicutes and Proteobacteria and fungi Ascomycota and Basidiomycota which include different genera namely Achromobacter Arthrobacter Aspergillus Azospirillum Azotobacter Bacillus Beijerinckia Burkholderia Enterobacter Erwinia Flavobacterium Gluconoacetobacter Haloarcula Herbaspirillum Methylobacterium Paenibacillus Pantoea Penicillium Piriformospora Planomonospora Pseudomonas Rhizobium Serratia and Streptomyces These PGP microbes could be used as biofertilizers bioinoculants at place of chemical fertilizers for sustainable agriculture The aim of Plant Microbiomes for Sustainable Agriculture is to provide the current developments in the understanding of microbial diversity associated with plant systems in the form of rhizospheric endophytic and epiphytic The book is useful to scientist research and students related to microbiology biotechnology agriculture molecular biology environmental biology and related subjects     *Agriculturally Important Fungi for Sustainable Agriculture* Ajar Nath Yadav, Shashank Mishra, Divjot Kour, Neelam Yadav, Anil Kumar, 2020-06-25 Microbes are ubiquitous in nature Among microbes fungal communities play an important role in agriculture the environment and medicine Vast fungal diversity has been associated with plant systems namely epiphytic fungi endophytic fungi and rhizospheric fungi These fungi associated with plant systems play an important role in plant growth crop yield and soil health Rhizospheric fungi present in rhizospheric zones get their nutrients from root exudates

released by plant root systems which help with their growth development and microbe activity Endophytic fungi typically enter plant hosts through naturally occurring wounds that are the result of plant growth through root hairs or at epidermal conjunctions Phyllospheric fungi may survive or proliferate on leaves depending on material influences in leaf diffuseness or exudates The diverse nature of these fungal communities is a key component of soil plant systems where they are engaged in a network of interactions endophytically phyllospherically as well as in the rhizosphere and thus have emerged as a promising tool for sustainable agriculture These fungal communities promote plant growth directly and indirectly by using plant growth promoting PGP attributes These PGP fungi can be used as biofertilizers and biocontrol agents in place of chemical fertilizers and pesticides for a more eco friendly method of promoting sustainable agriculture and environments This first volume of a two volume set covers the biodiversity of plant associated fungal communities and their role in plant growth promotion the mitigation of abiotic stress and soil fertility for sustainable agriculture This book should be useful to those working in the biological sciences especially for microbiologists microbial biotechnologists biochemists and researchers and scientists of fungal biotechnology Agriculture Diversification A. K. Sharma, Seema Wahab, Rashmi Srivastava, 2010 Poverty continues to persist in many countries throughout the world despite improvements in the global trade regime and significant enhancement in agricultural productivity through the green revolution technologies To achieve the millennium goal of halving poverty by 2015 these people should be provided with alternative production opportunities that can generate new employment and enhance incomes Data from several countries reviewed in this study confirm that agricultural diversification can contribute to this In a scenario of shrinking land and depleting water resources the challenge of the new millennium is to increase biological yields to feed the ever growing population without destroying the ecological foundation It is thus important not to package this challenge as a demand or imposition on farmers for which they would bear the cost but as a necessity and methodology to also sustain their welfare This book deals with different practices in agriculture diversification Care has been taken to include applied aspects and present scenario of different practices necessary for agriculture to the diversification The book will be of use to the students researchers and progressive farmers

**Current Trends in Microbial Biotechnology for Sustainable Agriculture** Ajar Nath Yadav, Joginder Singh, Chhatarpal Singh, Neelam Yadav, 2020-11-10 Microbial biotechnology is an emerging field with applications in a broad range of sectors involving food security human nutrition plant protection and overall basic research in the agricultural sciences The environment has been sustaining the burden of mankind from time immemorial and our indiscriminate use of its resources has led to the degradation of the climate loss of soil fertility and the need for sustainable strategies The major focus in the coming decades will be on achieving a green and clean environment by utilizing soil and plant associated beneficial microbial communities Plant microbe interactions include the association of microbes with plant systems epiphytic endophytic and rhizospheric The microbes associated with plant ecosystems play an important role in plant growth



development and soil health Moreover soil and plant microbiomes help to promote plant growth either directly or indirectly by means of plant growth promoting mechanisms e g the release of plant growth regulators solubilization of phosphorus potassium and zinc biological nitrogen fixation or by producing siderophores ammonia HCN and other secondary metabolites These beneficial microbial communities represent a novel and promising solution for agro environmental sustainability by providing biofertilizers bioprotectants and biostimulants in addition to mitigating various types of abiotic stress in plants This book focuses on plant microbe interactions the biodiversity of soil and plant microbiomes and their role in plant growth and soil health Accordingly it will be immensely useful to readers working in the biological sciences especially microbiologists biochemists and microbial biotechnologists

Soils and Sustainable Agriculture Muhammad Shaaban, 2025-09-22 In Soil and Sustainable Agriculture delve into the intricate relationships between soil plant life water and our broader environmental systems and their collective impact on sustainable agricultural practices This essential read offers a comprehensive exploration of soil s pivotal role as both a resource and a living ecosystem vital for the health and productivity of agricultural landscapes Understand the dynamic interactions that govern soil quality water conservation and plant nutrition which are crucial for sustainable food production This book serves as a critical guide for farmers researchers and policymakers to cultivate methods that safeguard our soil and environment for future generations Discover how healthier soils lead to a healthier planet

**Potential Microorganisms for Sustainable Agriculture** D. K. Maheshwari, 2013-12-30 The number of potential microbes exploited commercially is scanty irrespective of their high number present in the diverse habitats In recent years they have shown successfulness in multifarious areas such as production of industrially viable products organic chemicals pharmaceuticals recovery of metals improvement and maintenance of environmental quality and insect and pest control The Twenty three articles included here fall under three broad categories namely agricultural microbiology industrial microbiology and bioremediation The psychrophiles hold many biological secrets such as biochemical limits to macromolecular stability and the blueprints for constructing the stable macromolecules Lactic acid bacteria are known for their role in the preparation of fermented dairy products Potential strains for production of lactic acid with emphasis on its fermentation economics and systematics have been dealt with in greater detail Biotechnological applications of pectinases in general and alkaline pectinases in particular play an important role in industry Production characteristics and applications of microbial alkaline pectinolytic enzymes have been elaborated Production of ergot alkaloids thrives a novel knowledge Now a days semi synthetic ergot alkaloids are widely used as a potential therapeutic agent Microbial production of glucans functional organization and their industrial significance have been systematically reviewed Bioactive exopolysaccharides from mushrooms have gained importance in recent years Production and characterization of exopolysaccharides and conversion of unsaturated fatty acids into value added hydroxyl fatty acids by using microorganisms are used in a wide range of industrial products Enhancing the microbial production of 1 3 propanidial and its application highlights the commercial

exploitation of potential microorganisms Aldehyde and organic acid production by using oxydases and their derivatives advantageous role in industry Some chapters are devoted to the potential entomopathogenic fungi for management of insect pests biotechnological applications of fusaria microbial metabolite mediated biocontrol of soil borne plant pathogens bioremediation of heavy metals organochlorine and organophosphate pesticides Bioinoculants apart from being eco friendly are being used but reviewers have emphasized the constraints in commercial bioinoculant production and their quality assurance All the articles of this volume depict the role of microorganisms in agricultural industries The exploitation of such beneficial microorganisms may improve agricultural systems with economically sound production of human food and animal feed This volume will certainly help the PG and research students of agricultural microbiology and biotechnology

*Sustainable Agriculture under Drought Stress* Hassan Etesami, Yinglong Chen, 2024-10-18 Sustainable Agriculture under Drought Stress Integrated Soil Water and Nutrient Management seamlessly blends cutting edge research with practical applications offering a unique perspective on tackling this urgent challenge Through a multidisciplinary lens this book provides a cohesive and comprehensive understanding of both the current landscape and future prospects Readers will find this book equips them with the knowledge and strategies required to manage soil nutrients and water effectively ensuring the health of both soil and plants especially in arid and semi arid regions where solutions are urgently needed This book offers actionable insights into mitigating the impacts of climate change on agricultural systems making it essential reading for anyone invested in sustainable land management and food security Clarifies mechanisms and proposes solutions for enhancing soil health and fertility irrigation management and crop production in drought stressed environments Presents a diverse array of options for responding to drought stress optimizing plant health and furthering sustainability Explores emerging cropping systems and opportunities

*Arbuscular Mycorrhizal Fungi as Plant Biostimulants for Sustainable Agriculture* Arvind Kumar Rai, Priyanka Chandra, Nirmalendu Basak, Parul Sundha, Rajender Kumar Yadav, 2025-06-05 Global agriculture production systems are confronted with difficulties due to increased food demand rising hunger and malnutrition negative climate change effects and overuse of natural resources According to the FAO s definition of sustainable food and agriculture agricultural strategies should support technologies that increase output without having a negative impact on biodiversity or natural resources while also boosting productivity A plant s biostimulants are natural products which stimulate a plant s nutrition and productivity through enhancing nutrient use efficiency tolerance to abiotic stress and quality traits The present book studies arbuscular mycorrhizal fungi AMF a plant biostimulant which forms symbiotic relations with plants having a significant impact on performance and nutrition particularly regarding plant mineral intake capacity AMF through several mechanisms in plants can boost immunity against biotic and abiotic stresses Exploitation of AMF to improve crop productivity will be the key for future sustainable agriculture

*Microbiota and Biofertilizers, Vol 2* Gowhar Hamid Dar, Rouf Ahmad Bhat, Mohammad Aneesul Mehmood, Khalid Rehman Hakeem, 2021-03-31 The dependence of present

farming on artificial input of chemical fertilizers has caused numerous ecological tribulations associated with global warming and soil contamination. Moreover, there is an essential requirement for realistic agricultural practices on a comprehensive level. Accordingly, biofertilizers including microbes have been recommended as feasible environmentally sound solutions for agricultural practices which not only are natural and cost effective but also preserve soil environs and important biota of agricultural land. In addition, it enhances the nutrient quantity of soils organically. Microbial biofertilizers promote plant growth by escalating proficient absorption of nutrients for the plants and by providing an excellent disease fighting mechanism. Agriculture, the backbone of human sustenance, has been put under tremendous pressure by the ever increasing human population. Although various modern agro techniques boosted agricultural production, the excessive use of synthetic fertilizers, pesticides, and herbicides have proven extremely detrimental to agriculture as well as to the environment in which it is carried out. Besides this, some faulty agricultural practices like monoculture and defective irrigation further complicate the scenario by eliminating biodiversity, increasing the efflux of nutrients into the water bodies, the formation of algal blooms, eutrophication, damaging the water quality, and lowering fish stocks. Biofertilizers are the organic compounds applied to crops for their sustainable growth and the sustainability of the environment as the microbiota associated with biofertilizers interact with the soil roots and seeds to enhance soil fertility. Application of biofertilizers results in the increased mineral and water uptake, root development, vegetative growth, and nitrogen fixation, besides liberating growth promoting substances and minerals that help the maintenance of soil fertility. They further act as antagonists and play a pivotal role in neutralising soil borne plant pathogens and thus help in the bio control of diseases. Application of biofertilizers instead of synthetic fertilizers could be a promising technique to raise agricultural productivity without degrading environmental quality. The present book focuses on the latest research approaches and updates from the microbiota and their applications in the agriculture industry. We believe this book addresses various challenges and sheds lights on the possible future of the sustainable agricultural system.

**Biofertilisers For Sustainable Agriculture** Vinod Kumar Jain, 2009. We live in an age wherein a growing need has been felt to grow food in sufficient amount to feed the ever growing world population without compromising on either nutritional quality or ecological balance. In such a scenario, sustainable agriculture, albeit fraught with various hurdles and challenges, presents a highly viable option. This book has been designed as an introductory manual which seeks to acquaint readers with the essentials of biofertiliser use in sustainable agriculture practice. The aim is to unravel what entails biofertilisers, their types, nutritional qualities, their use, and the methodology of producing them. In addition, the book takes care to incorporate critical perspectives which look into biofertiliser use as per its advantages, the challenges surrounding its use, and the future offered by it.

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### **Biofertilizers For Sustainable Agriculture Introduction**

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