

REVIEW ARTICLE

Organic Agriculture: Biofertilizer - A Review

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Received 24 Jun 2015; Revised 28 Sep 2015; Accepted 09 Oct 2015

ABSTRACT

Fertilizers supply essential plant nutrients, mainly nitrogen (N), potassium (K), phosphorus (P). These fertilizers increase the yield of the crop but they cause several health hazards. Due to these health hazards consumer's preferences are shifting towards organic farming, organic manure and organic fertilizers. In recent years biofertilizers have emerged as a major component of the biological nitrogen fixation. They offer an economically attractive and ecologically sound route of providing nutrients to the plants. Biofertilizers are low cost renewable source of nutrients that supplements the chemical fertilizer. Biofertilizers gained importance due to its low cost amongst small and marginal farmers.

Key words: Biofertilizer, Rhizobium, Mass Production.

INTRODUCTION

Biofertilizer is a substance which contains living microorganisms which, when applied to the seed, plant surfaces or soil colonizes the rhizosphere or the interior of the plant and promotes growth by increasing the supply or availability of primary nutrients to the host plant. Bio-fertilizers add nutrients through the natural processes of nitrogen fixation, G.S Naganandha, Arijitdas, Sourav Bhattacharta and T.Kalpana) solubilizing phosphorus, and stimulating plant growth through the synthesis of growth-promoting substances. Bio-fertilizers can be expected to reduce the use of chemical fertilizers and pesticides. Bio-fertilizers provide eco-friendly organic agro-input and are more cost-effective than chemical fertilizers. The microorganisms used for the biofertilizer are bacteria of *Bacillus*, *Pseudomonas*, *Lactobacillus*, photosynthetic bacteria, nitrogen fixing bacteria, fungi of *Trichoderma* and yeast. Since a bio-fertilizer is technically living, it can symbiotically associate with plant roots. Involved microorganisms could readily and safely convert complex organic material in simple compounds, so that plants are easily taken up. It maintains the natural habitat of the soil. It increases crop yield by 20-30%, replaces chemical nitrogen and phosphorus by 25%, and stimulates plant growth. It can also provide protection against drought and some soil-borne diseases (Nilabja Ghosh, 2007). Biofertilizers are ready to use and used as a live

formulation of beneficial microorganisms, when it amended to seed, root or soil, it mobilizes the availability and utility of the microorganisms and thus improves the soil health. Bio-fertilizers are used in live formulation of beneficial microorganisms which on application to seed, root or soil, mobilize the availability of nutrients particularly by their biological activity and help to build up the lost microflora and in turn improve the soil health in general (Ismail *et al.*, 2014). For easy application, biofertilizers are packed in suitable carrier such as lignite or peat. Carrier also plays an important role in maintaining sufficient shelf life (Singh *et al.*, 1999).

Rhizobium is the most studied and important genera of nitrogen fixing bacteria (Odame, 1997). *Azospirillum* spp. contribute to increased yields of cereal and forage grasses by improving root development in properly colonized roots, increasing the rate of water and mineral uptake from the soil, and by biological nitrogen fixation (Okon, 1985). Biofertilizers have shown great potential as supplementary, renewable and environmental friendly sources of plant nutrients and are an important component of Integrated Nutrient Management and Integrated Plant Nutrition System (Raghawanshi, 2012). Naturally grown biofertilizers not only give a better yield, but are also harmless to humans and lead to better

Recent Research Paper On Biofertilizers

Thomas Griffiths



Recent Research Paper On Biofertilizers:

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, 2021-08-02 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 to 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**

Technology S. Kannaiyan, K. Kumar, K. Govindarajan, 2010-04-01 Rice based cropping system is the major cropping system practised in India which includes the rotation of crops involving rice, pulses, oil seeds, cotton, sugar cane, green manures, etc. The rice based cropping system offers lot of scope for the effective utilization of a wide range of biofertilizers such as Azolla, BGA, Azospirillum, Rhizobium, Gluconacetobacter diazotrophicus, and other heterotrophic N₂ fixing bacteria which help to increase the yield by reducing the cost of cultivation. It thus has dual advantages of being sustainable without endangering the environment and being highly cost-effective. This book, Biofertilizer Technology for Rice Based Cropping System, deals with the current developments in the basic and applied aspects of biofertilizers used in the rice based cropping, including the

novel endophytic diazotrophs viz Azorhizobium caulinodans Gluconacetobacter diazotrophicus Pink Pigmented Facultative Methylophiles PPFM etc The role of P Zn and Si solubilizers in the nutrient dynamics of the rice ecosystem has also been covered The strategies for production and distribution of quality inoculants for rice based cropping system has been given due importance with a focus on the molecular approaches for rapid and reliable quality control of biofertilizers This book can be considered as a monograph on the usage of biofertilizers in rice based cropping system It will be very useful for the scientists researchers students and extension workers involved in the management of crops in rice based cropping system

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

Metabolomics, Proteomics and Gene Editing Approaches in Biofertilizer Industry Sukhminderjit Kaur, Vagish Dwivedi, Pramod Kumar Sahu, 2024-06-26 Biofertilizer refers to the live or latent microbial inoculants capable of enhancing plant growth through direct and indirect mechanisms This book covers strategies for harnessing the integrated technologies omics proteomics and metabolomics for the development of potential novel biofertilizers Modern techniques for enhancing the efficacy and quality of biofertilizers has been discussed in detail Increasing crop productivity poses a great challenge due to increasing global population and researchers are looking for solutions to this using sustainable approaches Biofertilizers play an imperative role in enhancing yield production in crops and this book covers detailed account of biofertilizers on a single platform It also provides guidance on sustainable ways of increasing crop production and helps in generating ideas to formulate collaboration between public and private sectors for

future innovation in the field of biofertilizers This book is especially designed for the research graduates young researchers and scholars who are directly involved in the research related activities of the biofertilizers It can also be useful to professors lecturers biotechnologists biofertilizer production specialists and other stakeholders associated with strain improvement for biofertilizer development Biofertilizers Amitava Rakshit,Vijay Singh Meena,Manoj Parihar,H.B. Singh,A.K.

Singh,2021-03-24 Biofertilizers Volume One Advances in Bio inoculants provides state of the art descriptions of various approaches techniques and basic fundamentals of BI used in crop fertilization practices The book presents research within a relevant theoretical framework to improve our understanding of core issues as applied to natural resource management Authored by renowned scientists actively working on bio inoculant biofertilizer and bio stimulant sciences the book addresses the scope of inexpensive and energy neutral bio inoculant technologies and the impact regulation has on biofertilizer utilization This book is a valuable reference for agricultural environmental scientists in academic and corporate environments graduate and post graduate students regulators and policymakers Informs researchers on how to develop innovative products and technologies that increase crop yields and quality while decreasing agricultural carbon footprints Focuses on production protocols and developments in the processing of bio inoculants bio stimulants and bio fertilizers Summarizes the biologically active compounds and examines current research areas **New and Future Developments in**

Microbial Biotechnology and Bioengineering Harikesh Bahadur Singh,Anukool Vaishnav,2022-07-01 Sustainable Agriculture Revisiting Green Chemicals discusses green technologies that help us to understand new green chemicals to reduce plant pathogens and induce plant growth as well as soil health The most used green chemicals are antioxidants osmoprotectants and phytohormones This book brings together the most relevant information on how we can use microbial resources to develop new formulations for these types of chemicals and technologies for field application The book offers reference material to chemical engineers biochemists agrochemists industrialists researchers and scientists working on sustainable agriculture Highlights the latest developments in green technology in agriculture Overviews applied aspects of different green chemicals for crop production Identifies the importance and potential of green chemicals in manifold prospects Phyconanotechnology: Current Research, Challenges, and Prospects Lakhan Kumar,Navneeta Bharadvaja,Sunil

Khare,Raksha Anand,2025-06-13 This book explores the scientific development in the field of algal based nanomaterials synthesis production methods and commercial and utilization aspects of phyconanomaterials to address a range of problems of humanity Nanomaterials have been recently explored for and employed in environmental remediation biomedical applications agriculture food industries energy sectors cosmetics biolabeling and space due to their versatility and wide range of applicability owing to their peculiar material characteristics and other attributes Their conventional synthesis approaches are replacing green methods as the latter is comparatively economical energy efficient and eco friendly Biological entities and derived materials based nanomaterials synthesis is such a green approach Using natural systems to

synthesize nanomaterials does not leave behind any toxic compounds generally produced as by products when physical or chemical methods are employed Phyconanotechnology a green way of synthesizing nanomaterials can be used to overcome this issue In the proposed book algal diversity based nanomaterials synthesis and their applications will be presented to the readers **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 **Biotechnology of Biofertilizers** Sadasivam

Kannaiyan,2002-11-30 Table of contents **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 *The Complete Technology Book On Bio-Fertilizer And Organic Farming* Niir Board,2004-10-01 Bio

Fertilizers are natural fertilizers which are microbial inoculants of bacteria algae fungi alone or in combination and they augment the availability of nutrients to the plants The use of bio fertilizers in preference to chemical fertilizers offers economic and ecological benefits by way of soil health and fertility to farmers In view of the immense potential of bio fertilizer technology covers all major types of bacterial fertilizers This book will be of use and interest to consultants researchers libraries entrepreneurs manufacturers of bio fertilizer and for those who wants to venture in to this field

Plant Pathology, Fungal Diversity, and Biotechnological Advances in Agriculture Oumaima Jamal Eddine,Lamia Daghor,Mounir Tilaoui,Hicham Chatoui,2025-11-01 This book brings together recent scientific contributions exploring the intersections of plant health natural bioactive compounds sustainable innovations in agricultural systems and resource valorization Divided into two focused sections Phytochemicals and Essential Oils Exploring Bioactivity in Plant Pathology and Fungal Diversity and Biotechnological Advances in Agriculture and Resource Valorization this book presents original scientific articles that detail practical approaches and findings from recent research Seamlessly integrating traditional

knowledge with recent advances in phytochemistry microbiology and biotechnology this book is a valuable resource for teachers researchers agronomists and students within academic and research institutions Addressing key topics such as essential oils with antimicrobial potential plant disease management phytoplankton dynamics and the valorization of agricultural and natural resources it offers practical insights that contribute meaningfully to scientific knowledge and sustainable agricultural innovation

Grand Challenges in Fungal Biotechnology Helena Nevalainen, 2020-01-08 This volume provides a comprehensive overview of the major applications and potential of fungal biotechnology The respective chapters report on the latest advances and opportunities in each topic area proposing new and sustainable solutions to some of the major challenges faced by modern society Aimed at researchers and biotechnologists in academia and industry it represents essential reading for anyone interested in fungal biotechnology as well as those working within the broader area of microbial biotechnology Written in an accessible language the book also offers a valuable reference resource for decision makers in government and at non governmental organizations who are involved in the development of cleaner technologies and the global bioeconomy The 21st century is characterized by a number of critical challenges in terms of human health developing a sustainable bioeconomy facilitating agricultural production and establishing practices that support a cleaner environment While there are chemical solutions to some of these challenges developing bio based approaches is becoming increasingly important Filamentous fungi the forgotten kingdom are a group of unique organisms whose full potential has yet to be revealed Some key properties such as their exceptional capacity to secrete proteins into the external environment have already been successfully harnessed for the production of industrial enzymes and cellulosic biofuels Many further aspects discussed here such as feeding the hungry with fungal protein and the potential applications of the various small molecules produced by fungi warrant further exploration In turn the book covers the use of fungal cell factories to produce foreign molecules e g for therapeutics Strategies including molecular approaches to strain improvement and recent advances in high throughput technologies which are key to finding better products and producers are also addressed Lastly the book discusses the advent of synthetic biology which is destined to greatly expand the scope of fungal biotechnology The chapter Fungal Biotechnology in Space Why and How is available open access under a Creative Commons Attribution 4.0 International License at link.springer.com

Fungal Bioremediation Araceli Tomasini Campocoso, Hector Hugo Leon Santiesteban, 2019-03-04 This book highlights the role fungi play in bioremediation as well as the mechanisms and enzymes involved in this process It covers the application of bioremediation with fungi in polluted sites and gives a wide overview of the main applications of remediation such as degradation of xenobiotics gaseous pollutants and metal reduction The book explains the degradation of emergent pollutants and radioactive compounds by fungi which is relevant to the current pollution problems that have been studied over the last few decades The book also describes the most advanced techniques and tools that are currently used in this field of study

Biofertilizer And Organic Farming Dr. Nalimela Venu

Mahday,2022-05-14 Useful for undergraduate student s universities like Satavahana University for fulfil their degree to appear semester exam It is also very much required to give an idea regarding use of manure and bio fertilizers in agricultural farming Current situation in India every farmer need agricultural practices without creating pollution *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 shed lights on the possible future of the sustainable agricultural system *Agricultural Microbiology Based Entrepreneurship* Natarajan Amaresan,Dhanasekaran Dharumadurai,Olubukola Oluranti Babalola,2022-11-29 This book is first part of the 3 volume set focusing on basic and advanced methods for using microbiology as an entrepreneurial venture This volume explains the entrepreneurship skills for production cost benefit analysis and marketing of bio fertilizers bio pesticides bio insecticides seaweed liquid biofertilizer and phosphate solubilizers Chapters cover the applications of microorganisms in small and large scale production to achieve a sustainable output The book provides essential knowledge and working

business protocols from all related disciplines in agribusiness organic farming and economic integration This book is useful to graduate students research scholars and postdoctoral fellows and teachers who belong to different disciplines via Botany Agriculture Environmental Microbiology and Biotechnology Plant Pathology and Horticulture Next two volumes are focused on food and industrial microbiology **Microbial Bioprocessing of Agri-food Wastes** Gustavo Molina,Minaxi

Sharma,Rachid Benhida,Vijai Kumar Gupta,Ramesh Chander Kuhad,2023-04-28 Microbes are widely used in large scale industrial processes due to their versatility easy growing cultivation kinetic potential and the ability to generate metabolites with a wide range of potential applications to various commercial sectors such as the food pharmaceutical and cosmetic industries in addition to the potential for agriculture biomedical and several others Among the metabolites of greatest commercial interest and many obtained on an industrial scale the wide range of enzymes biofuels organic acids amino acids vitamins biopolymers and many other classes of metabolites This book is intended for Bioengineers Biologist Biochemist Biotechnologists microbiologist food technologist enzymologist and related Professionals researchers Explores recent advances in the valorization of agri food waste Provides technical concepts on the production of various bio products of commercial interest Discusses the main process conditions to overcome the difficulties of using waste as alternative raw materials Introduces technical economic details on the advantages and disadvantages of exploring the waste recovery chain Explores the main technological advances in the recovery of residues in functional products *Advances in Agronomy* ,2025-02-19 *Advances in Agronomy* Volume 190 the latest release in this leading reference on agronomy contains a variety of updates and highlights new advances in the field each written by an international board of authors Includes numerous timely state of the art reviews on the latest advancements in agronomy Features distinguished well recognized authors from around the world Builds upon this venerable and iconic review series Covers the extensive variety and breadth of subject matter in the crop and soil sciences

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