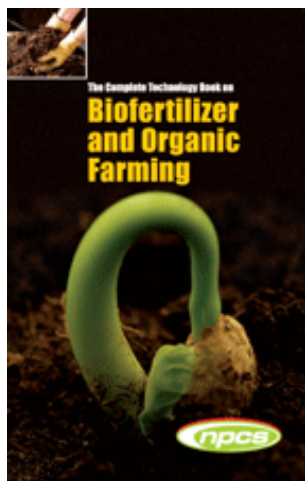


The Complete Technology Book on Biofertilizer and Organic Farming (2nd Revised Edition)



Author: NIIR Board

Format: Paperback

ISBN: 9789381039076

Code: NI115

Pages: 608

Price: Rs. 1,400.00 **US\$** 150.00

Publisher: NIIR PROJECT CONSULTANCY SERVICES

Usually ships within **5** days

Biofertilizers are seen as an important alternative technology, since the negative externalities of chemical fertilizers have become well known. The use of the latter has led to considerable environmental cost. Biofertilizers do not pollute the soil and do not disrupt the ecological balance, and hence are environment friendly. An increasing number of farmers are using biofertilizers, and the numbers of biofertilizer manufacturing units have also grown considerably. Organic farming system in India is not new and is being followed from ancient time. It is a method of farming system which primarily aimed at cultivating the land and raising crops in such a way, as to keep the soil alive and in good health by use of organic wastes (crop, animal and farm wastes, aquatic wastes) and other biological materials along with beneficial microbes (biofertilizers) to release nutrients to crops for increased sustainable production in an eco friendly pollution free environment. Organic farming has emerged as an important priority area globally in view of the growing demand for safe and healthy food and long term sustainability and concerns on environmental pollution associated with indiscriminate use of agrochemicals.

Going organic may be a clear way of getting back to basics and getting away from the havoc chemicals can wreak on our health and our environment but the basics themselves may not be so clear. This book provides the view of immense potential of biofertilizers as a supplementary nutrient source for the crops and covers all major types of bacterial fertilizers.

The major contents of this book is crop response to biofertilizers, nitrogen fixation, phosphate solubilising microorganisms, application and evaluation techniques, Bio Gas production, pest and disease management system in agriculture, production, promotion, quality control, marketing, future research planning, photographs and details of machineries, list of manufacturers and suppliers of biofertilizers and organic farming in directory section.

This book will be of use and interest to consultants, researchers, libraries, entrepreneurs, manufacturers of biofertilizer and for those who wants to venture in to this field.

Contents

1. INTRODUCTION TO BIOFERTILIZERS

- Concept of IPNM
- Integrated Plant Nutrient Management (IPNM)
- Biofertilizer Development
- Materials of Biological Origin
- Biofertilizers
- Classification
- Potential of Biofertilizers in Crop Production in Indian Agriculture
- Chemically fixed Nitrogen versus Biologically fixed Nitrogen
- Synergistic interaction between Biofertilizing Agents
- Biofertilizing agents and Plant Disease Control
- Brief account of beneficial Microorganisms
- Rhizobium
- Azotobacter and Azospirillum
- Phosphate Solubilizing Microorganisms
- Vesicular Arbuscular Mycorrhizae (VAM)
- Azolla
- Blue Green Algae
- Plant Growth Promoting Rhizobacteria (PGPR)
- Status of Biofertilizer in India
- Thrust in Research and Development

2. NITROGEN FIXATION

- Biochemistry
- Historical Review
- Molecular Properties of Nitrogenase
- Dinitrogenase
- FeMo cofactor
- Dinitrogenase Reductase
- Substrates
- Energy Requirements
- Electron Donors
- Catalytic Mechanism
- Inhibitors
- Classical Inhibitors
- Regulatory Inhibitors
- Ammonia Assimilation
- Genetics
- Introduction
- Approaches and Techniques Available
- nif Genes in *Klebsiella pneumoniae*
- Regulation of nif
- Azotobacter Species
- Cyanobacteria
- Photosynthetic Bacteria
- Rhizobium Species
- Fast growing Species
- Slow growing Species
- Regulation

Applications
Physiology of Organisms
Aerobes
Facultative anaerobes
Anaerobes
Symbionts
Agronomic Applications
Rhizobium
Azospirillum
Cyanobacteria
Cyanobacterial Associations
Photosynthetic Bacteria
New Associations
Industrial Applications
Chemical Catalysts
Ammonia Production
Hydrogen Production
Biomass Conversion
Timber Production
Phytochemical Production

3. NITROGEN FIXING MICRO-ORGANISMS : SYMBIOTIC

Biological Nitrogen Fixation
Types of Biological Nitrogen Fixation
Factors Affecting Nitrogen Fixation
Genus : Rhizobium
Rhizobia
Rhizobium/legume Symbiosis
Methods for study of legume root nodulation
Isolation
Differentiation of Rhizobium from its common associate
Agrobacterium
Tests for nodulation
Infection test
Tissue and cell cultures
Acetylene reduction assays
Use of ^{15}N to measure Biological Nitrogen Fixation
Multiplication of rhizobia : Root hair curling
Formation of infection threads
Nodule formation
Cross Inoculation Group
Fungicide Enhancement of Nitrogen Fixation
Stem Nodules
Genus : Frankia
Biofertiliser Role
Genus - Azolla
Introduction
Morphology and taxonomy
Role of Azolla
Inoculum Production of Azolla
Factors Affecting Successful Azolla Production
Azolla Nursery
Constraints

Conclusions and Future Outlook
Integrated Approach for Increasing Microbial Inputs
Economics of Biofertiliser Use

4. NITROGEN FIXING MICRO-ORGANISMS : ASYMBIOTIC

Genus : Azospirillum

Introduction

Taxonomy

Isolation, Maintenance and Cultivation

Physiology

Genus Azotobacter

Introduction

Distribution

Classification

Morphology and Taxonomy

Isolation

Crop Responses

Blue Green Algae

Introduction

Morphology

Constraints

5. PHOSPHATE SOLUBILIZING MICROORGANISMS : FUNGI AND BACTERIA

Problems in Phosphorus Uptake

Phosphate Fixation in Different Soils

Historical Developments

Phosphate Solubilization

Factors Affecting Phosphate Solubilization

Isolation

Mechanisms of Action

Role of acids

Other Mechanisms

Effect on Crop Yield

6. PHOSPHATE SOLUBILIZING MICRO-ORGANISM :

MYCORRHIZAE

Comparison of Ectotrophic and Vesicular-Arbuscular Mycorrhizae

Ectomycorrhizae

Systematics of Ectomycorrhizal Fungi and their Hosts

Morphology and Development of Ectomycorrhizae

Sources of Ectomycorrhizal Inoculum

Natural airborne spore inoculum

Soil already colonized by an EM fungus or fungi

The introduction of seedling with established mycorrhizae

The deliberate introduction of spores, sporocarps or sclerotia

Mycelial inoculum derived from pure cultures of known mycobionts

Evaluation and Selection of Ectomycorrhizal Fungi

Rapidity and extent of mycorrhization

Host response

Inorganic nutrient uptake

Water relations

Temperature tolerance

pH tolerance

Tolerance to soil toxicity
Stability of the partnership
Disease resistance
Strand formation
Ease of pure culture formation
Ease and rapidity of production
Edibility of the fruit bodies
Natural inoculum: airborne spores
Soil colonized by EM fungi
Seedlings colonized by EM fungi
Fungal sporomata or sclerotia
Mycelial inoculum
Endomycorrhizae (Vesicular-Arbuscular Mycorrhizae)
Systematics of Vesicular-Arbuscular Mycorrhizal Fungi and their Host
Morphology and Development of Vesicular-Arbuscular Mycorrhizae
Sources of VAM Inoculum
Evaluation and Selection of VAM fungi
Laboratory experiments
Greenhouse crops
Field-sown crops
Prospects

7. APPLICATION AND EVALUATION TECHNIQUES

Different Methods for Biofertilizer Inoculation
Seed inoculation
Top dressing of Biofertilizers
Granular biofertilizers:
Solarisation of FYM/Compost
Granular biofertilizer mixed with seed
Broadcasting of granular biofertilizers
Frequency of inoculation
Liquid inoculation of Biofertilizers
Methods of application of liquid inoculation
Drenching by Sprayers
Application in root zone
Culture pellet
Methods of Application of Other Biofertilizers
Blue Green Algae
Azolla
As green manuring
Azolla dual cropping
Azotobacter
Preparation and use of Azotobacter inoculant
Application
Azospirillum
Mycorrhizae
Endomycorrhizae
Ectomycorrhizae
Techniques for Isolation of Vesicular Arbuscular Mycorrhizal Fungi (VAMF) from soil in Laboratory :
Method for examination of mycorrhizal infection in root samples :
Foliar Biofertilizer
Humar

Humic Acid

Intorduction

Application

Soil

Foliar

Seed treatment

Soil Benefit

Root

Seeds

Plants

Precautions

Different Media Used to Study Biofertilizer

I. Growth Media for Rhizobium

1. Yeast Extract Mannitol Agar

2. Congo-red Medium

3. Hoferâ€™s Alkaline Medium

4. Glucose peptone Agar

5. Bergersenâ€™s Synthetic Medium

Media for Testing Nodulating Ability of Rhizobium

II. Isolation of Frankia

Media Used

III. Selective Media for Blue Green Alage

IV. Selective Media for Azotobacter

V. Selective Media for Azospirillum

VI Selective Media for Phosphate Solubilizing Organisms

VII Selective Medium for isolation of Pseudomonas fluorescens, a biocontrol agent

VIII Selective medium for isolation of Trichoderma an antagonistic fungus

Precautions in handling

8. CROP RESPONSE TO BIOFERTILIZERS

Symbiotic Nitrogen Fixation:

Rhizobium

Irrigated Crops

Dry land Crops

Dryland Legumes

Fodder Crops

Azolla

Irrigated crop

Nonsymbiotic Nitrogen Fixation

Blue Green Algae (BGA)

Irrigated Crops

Azotobacter

Irrigated Crops

Dry land crops

Azospirillum

Irrigated Crops

Dryland Crops

Fodder Crops

Phosphate Solubilizers and Fixers

Mycorrhiza

Irrigated Crops

Dryland Crops

Fodder Crops

Phosphate Solubilizing Microorganisms
Irrigated Crops
Factors Affecting Crop Response to Biofertilizers
Interaction effect of microbial strains
Effect of nutrient interactions
Dryland Crops
Fodder Crops
Methods of Inoculation
Other Factors
Host Response to Biofertilizers
Interaction of Inoculants with other Nutrients
Multi-Microbial Inoculation
Compatibility Between Biofertilizers and Chemical Fertilizers
Adaptive Trials

9. SIMPLIFIED ANAEROBIC DIGESTERS FOR BIOFERTILIZER

Abstract
Foreword
Batch Digester Plant
Results
Plug Flow Digester Plant
Results
Covered Lagoon Biogas System
Results
Continuous Expansion Digester
Tests on a Small Electric Generator set Fuelled by Biogas
Results
An Economic Evaluation of the Plants
Conclusions

10. MODIFIED ANAEROBIC FERMENTER FOR BIOFERTILIZER

Abstract
Introduction
Apparatus
Choice of a Laboratory Fermenter
The Proposed Impeller Design
Three-phase Fluidized Bed
Experimental Technique
Results and Discussions
Effect of using the 3-phase Fluidisation Technique
Effect of the Modified Paddle Mixer
Effect of Type and Duration of Mixing
Effect of Temperature
Conclusions and Recommendations

11. OPERATING CONDITIONS FOR ANAEROBIC DIGESTION OF BIOFERTILIZER

Abstract
Introduction
Design of the Experiment
Results and Discussion
1. Effect of the initial total solids (TS) concentration on
A. TVS reduction
B. Biogas and methane

2. Effect of hydraulic retention time (0) on
 - A. TVS reduction
 - B. Biogas and methane
3. Effect of temperature on:
 - A. TVS reduction
 - B. Biogas and methane
4. Effect of mode of operation on:
 - A. TVS reduction
 - B. Biogas and methane

12. BIOGAS PRODUCTION FROM ORGANIC BIOFERTILIZER

Abstract

Introduction

Materials and Methods

Organic Wastes

Starter

Digestion Apparatus

Analytical procedures

Experimental

Results and Discussion

Biogas Production from Geranium Flour (GF)

Biogas Production from Akalona (AK)

Biogas Production from Watermelon Residue (WR)

13. BIOGAS FROM LIQUID BIOFERTILIZER DERIVED FROM BANANA AND COFFEE PROCESSING

Abstract

Introduction

Results

14. ORGANIC FARMING

Pollution Problems with Fertilizers

Water Pollution

Atmospheric pollution

Damage to crops and soils

Heavy Metal Contamination

Environment Restoration with Fertiliser

Organic Matter

Chemical nature of organic matter

Organic Manures

Organic residues

Cow dung manure

Live stock wastes

Green Manure

Importance of green manure

Green manure crops

Turning of green manure crops

Biological cont

CONTENTS INTRODUCTION TO BIOFERTILIZERS Concept of IPNM Integrated Plant Nutrient Management (IPNM) Biofertilizer Development Materials of Biological Origin Biofertilizers Classification Potential of Biofertilizers in Crop Production in Indian Agriculture Chemically fixed Nitrogen versus Biologically fixed Nitrogen Synergistic interaction between Biofertilizing Agents Biofertilizing agents and Plant Disease Control Brief account of beneficial MicROORGANISMS RHizobium Azotobacter and Azospirillum Phosphate Solubilizing Microorganisms Vesicular Arbuscular Mycorrhizae (VAM) Azolla Blue Green Algae Plant Growth Promoting Rhizobacteria (PGPR) Status of Biofertilizer in India Thrust in Research

and Development Nitrogen Fixation Biochemistry Historical Review Molecular Properties of Nitrogenase
Dinitrogenase FeMo cofactor Dinitrogenase Reductase Substrates Energy Requirements Electron Donors
Catalytic Mechanism Inhibitors Classical Inhibitors

17. PEST AND DISEASE MANAGEMENT SYSTEM IN AGRICULTURE Pesticide Usage Trend

Harmful Effects

Integrated Pest and Disease Management System (IPDMS)

Definition

Specific Objectives

Philosophy or Concepts of IPDMS

Component of IPDMS

Cultural Control

Mechanical and physical control

Biological Control

Conservation of Natural enemies

Release of Parasites

Use of Microbial Agents

Use of Predators

Cultivated crops

Varietal resistance

Pest Surveillance Methodology

Forecasting Pest Attack

Use of Selective Pesticide

Need-based Application of pesticides

Other pest Control Methods

Limitations of IPDMS

Demonstrations

Role of government and private sectors in the promotion of IPDMS

18. BIOPESTICIDES

Discovery

Development

Registration

Biological Control of Insect

Fungal Insecticides

Bacterial Insecticides

Bacillus thuringiensis (BT)

Mode of action

The question of resistance

Commercial Prospects

Improvements in BT through genetic engineering

The BT protein and the efforts on recombinant DNA in this area

Limitations of BT

Safety

Viral Insecticides

Nuclear Polyhedrosis Virus

Protozoan Insecticides

Possibilities of field application

Botanical Pesticides

Pheromone trap

Trichocards

Biological control of plant diseases

Soilborne diseases

Methods for biocontrol

Biological Seed Treatment
Foliar Diseases
Introduction
Selection of biocontrol agents
Formulation and delivery system
Improved efficacy
Commercialization
Nematodes as Biological Control Agents
Production and Formulation
Biological Control of Nematodes
Biological Control of Weeds
Role of genetic engineering

19. SUSTAINABLE AGRICULTURE

Definition
Dimensions
Perceptions
Components
Crop Diversification
Crop Rotation
Biological Nitrogen Fixation
Mixed Cropping
Soil Micorbes on Crops
Genetic Diversity
Integrated Nurient Management (INM)
Integrated Pest Management (IPM)
Sustainable Water Management
Post Harvest Technology
Extension Programmes
Sustainable Agriculture for India
Maintaining quality of the land resource
Indigenous Water Management
Conserving crop diversity
Stable farming systems
Judicious use of inputs
Role of biotechnology
Government support to farmers
Conclusion

20. PRODUCTION : PROMOTION : QUALITY CONTROL AND MARKETING

Diversification
Need for Basic Facilities
Availability of High Standard Raw Materials
Efficient strain
High grade carrier
Suitable nutrient broth
Reliable packing material
Good quality of adhesive
Application of Updated Technology
Conventional method of production
Production of freeze dried culture
Improvement on technological procedures
Production System

Sterile carrier system
Improvement in sterillisation procedure
Fermentation technology
Latest Technology on Inoculant production
Bag and carrier
Rhizobium broth
Quality Control
Isolation and Identification of bacterial strains
Screening of the pure isolated strains
In Vitro
In vivo
Fermentation
Finished Product
Production Constraints
Raw material
Bacterial strain
Economic viability
Production process
Shelf life
Production Technology (Proposed)
Establishment of efficient Culture Bank
Research and Development (R & D)
Mass Production
Promotion
Field Experiments on R & D Farm
Trials on farms
Demonstration on Farmers'™ Fields
Marketing
Constraints
Pricing policy and packing
Lack of awareness
Inadequate shelf-life
ISI Mark
Outlook

21. FUTURE RESEARCH PLANNINGS

Production
Raw materials
Economics of production
Production of biofertilisers
Miscellaneous
Biological
Technical
Ecological
Inoculum
Establishment
Biological stresses
Abiotic stress
Pesticides
Agronomic
Rainfall
Soil Type
Soil Moisture and temperature

Survival of Rhizobial Populations
Field Level
Method of Application
Marketing
Governments Future Planning for Promotion of Biofertilisers
Future

DIRECTORY SECTION
MANUFACTURERS OF BIO-FERTILISERS AND ORGANIC FARMING

About NIIR

NIIR PROJECT CONSULTANCY SERVICES (NPCS) is a reliable name in the industrial world for offering integrated technical consultancy services. NPCS is manned by engineers, planners, specialists, financial experts, economic analysts and design specialists with extensive experience in the related industries.

Our various services are: Detailed Project Report, Business Plan for Manufacturing Plant, Start-up Ideas, Business Ideas for Entrepreneurs, Start up Business Opportunities, entrepreneurship projects, Successful Business Plan, Industry Trends, Market Research, Manufacturing Process, Machinery, Raw Materials, project report, Cost and Revenue, Pre-feasibility study for Profitable Manufacturing Business, Project Identification, Project Feasibility and Market Study, Identification of Profitable Industrial Project Opportunities, Business Opportunities, Investment Opportunities for Most Profitable Business in India, Manufacturing Business Ideas, Preparation of Project Profile, Pre-Investment and Pre-Feasibility Study, Market Research Study, Preparation of Techno-Economic Feasibility Report, Identification and Section of Plant, Process, Equipment, General Guidance, Startup Help, Technical and Commercial Counseling for setting up new industrial project and Most Profitable Small Scale Business.

NPCS also publishes various process technology, technical, reference, self employment and startup books, directory, business and industry database, bankable detailed project report, market research report on various industries, small scale industry and profit making business. Besides being used by manufacturers, industrialists and entrepreneurs, our publications are also used by professionals including project engineers, information services bureau, consultants and project consultancy firms as one of the input in their research.

NIIR PROJECT CONSULTANCY SERVICES , 106-E, Kamla Nagar, New Delhi-110007, India. **Email:** npcs.india@gmail.com **Website:** NIIR.org

Thu, 14 Dec 2017 14:06:08 +0530