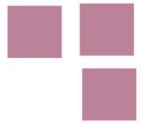


Text Book For Degree Course Students of Botany
as per U.G.C. Choice Based Credit System (CBCS)



Mushroom Cultivation Techniques and Applications



**Parimal Mandal
Zerald Tiru
Monalisha Pal Sarkar
Arka Pratim Chakraborty
Ayon Pal**

Kripa Drishti Publications, Pune.

MUSHROOM CULTIVATION TECHNIQUES AND APPLICATIONS

Parimal Mandal

Zerald Tiru

Monalisha Pal Sarkar

Arka Pratim Chakraborty

Ayon Pal

Kripa-Drishti Publications, Pune.

Book Title: Mushroom Cultivation Techniques and Applications

**Authored by: Parimal Mandal, Zerald Tiru,
Monalisha Pal Sarkar, Arka Pratim Chakraborty,
Ayon Pal**

1st Edition

ISBN: 978-81-949998-6-7



Published: **December 2020**

Publisher:



Kripa-Drishti Publications

A-503 Poorva Heights, Pashan-Sus Road, Near Sai Chowk,
Pune – 411021, Maharashtra, India.

Mob: +91-8007068686

Email: editor@kdpublications.in

Web: <https://www.kdpublications.in>

© **Copyright KRIPA-DRISHTI PUBLICATIONS**

All Rights Reserved. No part of this publication can be stored in any retrieval system or reproduced in any form or by any means without the prior written permission of the publisher. Any person who does any unauthorized act in relation to this publication may be liable to criminal prosecution and civil claims for damages. [The responsibility for the facts stated, conclusions reached, etc., is entirely that of the author. The publisher is not responsible for them, whatsoever.]

PREFACE

Mushrooms have been known as an ideal vegetarian food item that is enriched with essential amino acids, minerals, vitamins, pharmaceutical properties, low in fat, low in carbohydrates and an efficient tool for management of agro wastes. In India, mushrooms have been used as food and medicine by some tribal communities by their traditional knowledge. However, the country like India with its diversity of mushroom (i.e. macro fungi) with huge source of agro waste can open a new door of agro industry in near future. The decreasing trend of arable land and increasing food demand necessitates food production by utilizing agro waste which is not only mitigated the stubble burning problem in agriculture based country like India but it also provides nutrition enriched health food to combat malnutrition. Mushroom along with other microbial biomass like yeast, algae and single cell protein (SCP) are often referred to as an alternative source of supplemented health food. However, among all these mushroom cultivation is unique economically viable biotechnology for the conversion of lignocellulosic agro waste materials into high quality nutritious food. In recent times, mushroom cultivation is gaining popularity to those growers having no or insufficient land. The identification of edible and poisonous mushrooms in wild condition is difficult as there is no instant methodology for accurate determination of safe and poisonous mushrooms. So, cultivation of edible mushroom with desire strain is important to consume mushroom safely. Processing and preservation are other important aspects of mushroom production as the shelf-life is very short. This book is aimed to reach the mushroom workers particularly student, researcher, common man, big or small growers in

North East India. The Book highlights on the basics about macro fungal spawn preparation technology, laboratory equipments, cultivation technology of mushrooms etc.

I (Dr. Parimal Mandal), express my sincere and heartfelt gratitude to my mentor and well-wisher Professor (Dr.) Aniruddha Saha, Department of Botany, University of North Bengal for his valuable suggestions and cooperation at all stages of our work. I also grateful to Dr. Palash Mandal, Assistant Professor, Department of Botany, University of North Bengal for his mental support and encouragement. Sincere thanks also go to Arindam Saha, Debarati Saha, Sutanuka Mandal, Moumita Choudhaory, Keshab Das, Jayanti Saha, Barnan Saha, Vivek Roy for their technical assistance in compilation of this book. Authors are also grateful to Mrs. Tapasi Deb Mandal and Sri Patradeep Deb Mandal for encouraging writing this book with providing space for practical work and endless support. We express our sincere thanks to M/S. Kripa Drishti Publication House for cooperation and publishing the book with in stipulated time with an elegant and attractive format. Any comments and suggestions for further improvement of the book will be gratefully appreciated.

Parimal Mandal

Zerald Tiru

Monalisha Pal Sarkar

Arka Pratim Chakraborty

Ayon Pal

Introduction

Fungal biotechnology deals with the production of different metabolites and products of food and pharmaceutical importance by using fungal system as living or non-living part. It is concerned with the principles of fungal biology, bioconversion and environmental technology. Unlike green plant, fungi lack chlorophyll and cannot convert solar energy through the process of photosynthesis to organic matters as green plants do, but they can degrade and absorb lignocellulosic materials for their nourishment and produce nutrition enrich mushroom food and metabolites of pharmaceutical importance. A large number of macro fungi are directly consumed as mushroom. Mushrooms may be edible, medicinal and poisonous. In a broad sense mushroom has been defined as a “macro fungus with a distinctive fruiting body, which can be either epigeous or hypogeous and large enough to be seen with naked eye and to be picked by hand”. The most common type of mushrooms is umbrella shaped with a pileus (cap) and a stipe (stem) i.e. *Lentinula edodes*. Other species additionally have a volva (cup) i.e. *Volvariella volvacea* or an annulus (ring) i.e. *Agaricus campestris* or with both of them i.e. *Amanita muscaria*. Furthermore, fungal fruiting bodies are of different types in the form of pliable cups, round like golf balls, resemble with coral, yellow or orange jelly-like globs and some very much similar to human ear. Macro fungi not only produce the well attracted variously coloured fruiting bodies, but also play a significant role in day to day life of human beings by finding natural dye, industrial chemicals, agricultural product, medicine, non-conventional sources of human food, animal and poultry feed, potential agents of bioremediation and decomposing of dead organic matter and many other means. These fungi consumed as mushroom are potential source of essential amino acids, vitamins, minerals and pharmaceuticals by native and tribal since antiquity.

Inadequate regional food supplies, diminishing quality of health, and increasing environmental deterioration are three key underlying problems affecting the future well-being of mankind. The magnitude of these problems is set to increase as the world's population continues to grow. Fungal can also play a significant role in mycorestoration of damaged environments in four different ways: mycofiltration, mycoforestry, mycoremediation and mycopedicides. Edible macro fungi used as mushrooms are enriched with nutritious food that contains low fat, low calories, good quantity of vitamins, minerals, essential amino acids and multi-functional medicinal properties.

The organic materials, on which macro fungi derive their nutrition, are referred to as substrates. The substrate materials are usually by-products from industry, households and agriculture and are usually considered as wastes or agriculture byproduct. And these wastes, if carelessly disposed off in the surrounding environment by dumping or burning, will lead to environmental pollution and consequently cause health hazards. However, they are waste resources in the wrong place at a particular time and fungal biotechnology can harness this waste/resource for beneficial advantages. India produces about 600 million tones of agricultural waste per annum and a major part of it is left out to decompose naturally or burnt in situ.

This can effectively be utilized to produce highly nutritive food and pharmaceuticals. In addition, spent substrate can be used as livestock fodder and feed supplement of cattle, poultry after harvesting the fruiting bodies. The residue could also be utilised as organic garden mulch, which is good for the soil as soil conditioner.

So, the applied fungal technology, by blending the advances in basic biological knowledge with that of practical technology, a mushroom-related industry based on utilization of the lignocellulosic waste materials that are abundantly available in rural areas can have positive global impacts on long-term food security, finding of new pharmaceuticals, single cell protein, supplemented food and medicines, restoration of damage environment, conservation of soil health, empowering rural peoples, generation of income and social change. Therefore, the significant impact of fungal biotechnology on human welfare has been named as a “Non -green revolution”. During the long period human as a hunter gathered the fungi of the forest that has served as food and medicines. The scope is limitless and this is high time to survey, collect, conserve, record and identifies the biodiversity of fungi in particular as no one knows when and how some these valuable forms might be lost for forever. A systematic study of the macro fungi will explore the possibility for the scientific application of fungi in food and pharmaceutical technology.

INDEX

Chapter 1: Scope of Mushroom Cultivation Recycle of Spent Substrate and Environmental Restoration	1
Chapter 2: The Major Equipments, Apparatus and Sterilization Techniques in Spawn Production	9
Chapter 3: Mushroom Spawns Production Technology	23
Chapter 4: Cultivation of White Button Mushroom.....	29
Chapter 5: Oyster Mushroom Cultivation	34
Chapter 6: Cultivation of Reishi Mushroom (<i>Ganoderma Lucidum</i>)	40
Chapter 7: Milky Mushroom (<i>Calocybe Indica</i>).....	43
Chapter 8: Paddy Straw Mushroom	46
Chapter 9: Wood Ear Mushroom (<i>Auricularia spp.</i>)	49
Chapter 10: Magic Mushroom (<i>Inonotus Obliquus</i>)	51
Chapter 11: Fungal Technology in Food and Metabolism	53
Chapter 12: Pests and Pathogens of Mushroom Crop	81
Chapter 12: Storage and Preservation of Mushroom	85
Bibliography.....	93

About the book

Designed and written as a text book for Degree course students of Botany as per UGC Choice Based Credit System (CBCS), covering the syllabus of undergraduate and postgraduate degree course in addition to Skill Enhancement Course of Mushroom Culture Technology, taught at various colleges of Indian Universities. This comprehensive and well written text book discusses the historical background, concept, tools & techniques and practical applications of mushroom cultivation in a very simple and lucid language. Beginning with introduction to the subject matter, the book discusses the historical background of mushroom cultivation with its importance to mankind at various levels. It also discusses the major infrastructure required and basic concept of mushroom cultivation viz. fungal culture, spawn preparation, composting, bed preparation, fruiting body production and its maintenance, sterilization process and preservation techniques, some popular mushroom recipes etc. Book also highlights in detail about the cultivation techniques of several most popular mushroom (i.e. macrofungi) like *Agaricus bisporus*, *Pleurotus ostreatus*, *Ganoderma lucidum*, *Calocybe indica*, *Volvariella volvacea* and *Auricularia* spp. The text is further supported with a number of illustrations and tables for better understanding of the subject matter discussed. Besides degree course students of Botany, this book is also useful for common people who seek an alternative source of income with limited infrastructure and space.

Parimal Mandal
Zerald Tiru
Monalisha Pal Sarkar
Arka Pratim Chakraborty
Ayon Pal



Price: ₹ 500

Kripa-Drishti Publications
A-503 Poorva Heights, Pashan-Sus Road, Near Sai Chowk,
Pune – 411021, Maharashtra, India.
Mob: +91 8007068686
Email: editor@kdpublishations.in
Web: <https://www.kdpublishations.in>

ISBN: 978-81-949998-6-7

