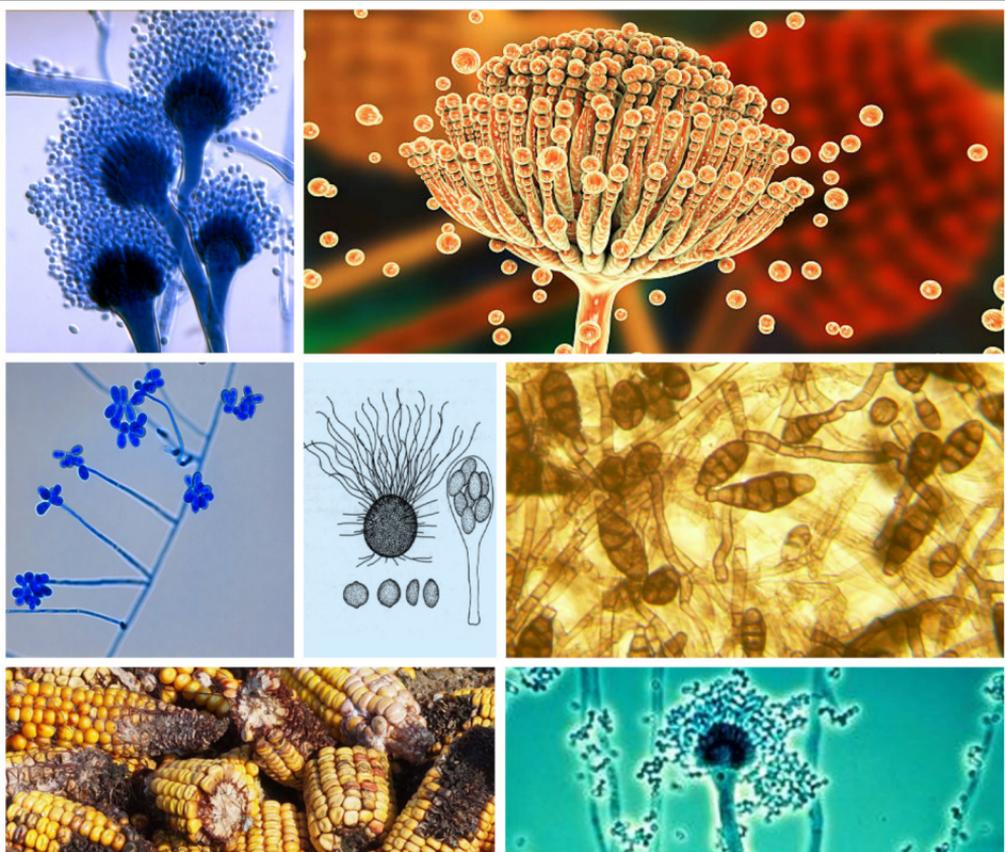


Handbook of Mycological Techniques:

Identification of Mycotoxigenic Fungi and Mycotoxins



**Mycological Techniques:
Identification of Mycotoxigenic Fungi and Mycotoxins**

RELATED BOOKS

Title	Author
• Analytical Methods for Medicinal Plants and Economic Botany	M. Daniel
• Comprehensive Laboratory Manual of Life Science Guide to Laboratory Establishment for Plant	Jyoti Saxena
• Nutrient Analysis	M.R. Motsara
• Handbook of Techniques in Microbiology: A Laboratory Guide to Microbes	A.S. Karwa
• Laboratory Exercises in Plant Pathology (Part I-II) (Set)	A.B.A.M. Baudoin
• Laboratory Manual of Microbiology	Vivek Kumar
• Laboratory Manual of Microbiology, Biochemistry and Molecular Biology	Jyoti Saxena
• Methods in Fungal Biology: A Manual of Laboratory Protocols	A.K. Gautam
• Modern Methods in Plant Taxonomy	V.H. Heywood
• Moulds and Mycotoxins of Paddy: Incidence, Impact and Management	M. Surekha
• Mycology and Microbiology: A Textbook for UG and PG Courses	C. Manoharachary
• Mycotoxins Problem and its Management	S.M. Reddy
• Plant Analysis Research Methods	S.S. Narwal
• Plant Analysis: Comprehensive Methods and Protocols	B.K. Garg
• Plant Biotechnology and Molecular Biology: A Laboratory Manual	M.S. Punia
• Plant Pathology and Mycology: A Treatise	G. Bagyanarayana
• Plant Physiology Research Methods	S.S. Narwal
• Progress in Mycology	M.K. Rai
• Research Methodology in Plant Science	P.S. Narayana
• Research Methods in Plant Sciences: Allelopathy (Vol. 1-5) (Set)	S.S. Narwal
• Taxonomy of Mycotoxigenic Fungi	S. Girisham

Mycological Techniques: Identification of Mycotoxigenic Fungi and Mycotoxins

Dr. Rekha Bhaduria

Ph.D., FBS, FNRS, FSB

Professor (Retired)

School of Studies in Botany,

Jiwaji University,

Gwalior-474011

Dr. Ajay Kumar Gautam

Ph.D., Associate Professor & Coordinator

School of Agriculture,

Faculty of Science,

Abhilashi University,

Mandi-175028



Published by
SCIENTIFIC PUBLISHERS (INDIA)
5 A, New Pali Road, P.O. Box 91
Jodhpur 342 001 (INDIA)
E-mail: info@scientificpub.com
Website : <http://www.scientificpub.com>

Print: 2019

All rights reserved. No part of this publication or the information contained herein may be reproduced, adapted, abridged, translated, stored in a retrieval system, computer system, photographic or other systems or transmitted in any form or by any means, electronic , mechanical, by photocopying, recording or otherwise, without written prior permission from the publisher.

Disclaimer: Whereas every effort has been made to avoid errors and omissions, this publication is being sold on the understanding that neither the editors (or authors) nor the publishers nor the printers would be liable in any manner to any person either for an error or for an omission in this publication, or for any action to be taken on the basis of this work. Any inadvertent discrepancy noted may be brought to the attention of the publisher, for rectifying it in future editions, if published.

This book contains information obtained from authentic and highly regarded sources. Reasonable efforts have been made to publish reliable data and information, but the editors and publisher cannot assume responsibility for the validity of all materials or the consequences of their use. The editors and publisher have attempted to trace and acknowledge the copyright holders of all material reproduced in this publication and apologize to copyright holders if permission and acknowledgment to publish in this form have not been obtained. If any copyright material has not been acknowledged please write and let us know so that we may rectify it.

Trademark Notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe..

ISBN: 978-93-88043-68-7 (Hardbound)

ISBN: 978-93-88043-91-5 (Ebook)

Visit the Scientific Publishers (India) website at
<http://www.scientificpub.com>
Printed in India

DEDICATED TO MY PARENTS

Preface

The Hand Book of “Mycological Techniques: Identification of Mycotoxigenic Fungi and Mycotoxins” is a manual designed to aid the guidelines and techniques applied in mycological laboratory and in the other allied fields. This handbook is based on research conducted by many renowned scientists on fungi and related mycotoxins, and the practical approach to the isolation and identification of toxigenic strains of fungi as well as their related fungal toxins, called as Mycotoxins, commonly met on stored food and other materials. Students hopefully will find the information on important fungi particularly related to storage and field conditions and secondary metabolites produced during the growth of fungi on food and other substrates. Reports of many researchers, scientists, and books from all over globe indicate direct relation between the incidence of mycotoxigenic fungi, extent of mycotoxin contamination and their prevalence revealed their relation to some of the human ailments. Most of the mycotoxins mainly aflatoxins, ochratoxins A and fumonisins are posing serious health hazards in Asian countries.

In the context of Indian climatic conditions, need of assessing and preparation of a comprehensive account related to consumption of contaminated food and feed is essential in order to highlight the problems and their health hazards due to mycotoxins.

Present attempt is made to provide recent developments in the subject so that researchers interested may get clear understanding of the problems. This Handbook deals with general aspects of mycological techniques, mycotoxins covering detailed information of mycotoxigenic fungi and their identification.

Authors

Acknowledgements

I wish to express my sincere gratitude to my revered teacher and guide Prof. R.K.S.Chauhan, former Vice Chancellor, Vikram University, Ujjain (M.P.), former Head, School of Studies in Botany, Jiwaji University, Gwalior (M.P.), who introduced me to this area of research and motivated for further research, and to late revered teacher Prof. R.R.Das, Former Vice Chancellor, Jiwaji University, Gwalior, former Head, School of Studies in Botany for his continuous encouragement and guidance.

I would also like to show my gratitude to my friend Prof. Sangeeta Shukla, Vice Chancellor, Jiwaji University, Gwalior for encouragement and providing all types of facilities during this period. I would like to pay my regards and sincere thanks to Prof. (Mrs.) Shashi Chauhan, Prof. K. K. Koul, Prof. A. K. Jain, Prof. R. M. Agarwal, former Heads, School of Studies in Botany and Prof. Avinash Tiwari, Head, School of Studies in Botany, Jiwaji University, Gwalior, despite their busy schedules, gave freely of their time.

Many thank to all renowned scientists whose work, research, initiated me to write this handbook.

I would like to thank those scholars whose assistance encouraged me in executing my goal, especially Dr. Ajay Gautam, Assoc. Prof. (H.P.) Dr. Sushil Sharma, Asst. Prof, Sangarh (H.P.), Dr. (Ms) Madhu Gupta, Dr. Shubhi Avasthi, Mycology and Plant Pathology Laboratory, gave much of their time and also to Mr. Amit Kumar, (Research scholar), to the final illustrations and cover page of the manuscript as well. I also thank to Sunil Kumar Lab. Technician School of Studies in Botany for helping in typing, and formatting of the manuscript.

Finally, I would like to acknowledge with gratitude, the support and love of my parents Late Shri Moti Singh Badauria, and late Shrimati Saroj Bhadauria; my sisters, brother and my relatives, who encouraged me throughout my career.

Author

Contents

<i>Preface</i>	(vii)
<i>Acknowledgements</i>	(viii)
1. Introduction	1–12
Laboratory Safety; Sterilization, Sterile Distilled Water.	
2. Culture Media	13–18
Important Ingredients in Culture Media, Growth Media, Composition of Important Media.	
3. Mycological Evaluation/Isolation Study Techniques	19–26
Methods of Seed Examination, Standard Methods for Mycological Evaluation of Contaminated Samples; Deep Freezing Method, Direct Microscopic Examination: Slide Culture Method, Application of Stain, Advantages of Slide Culture; Serial Dilution Agar Plate Technique, Single Spore Technique, Pour Plate Technique; Technique to Study Litter Decomposing and Leaf Spot Pathogenic Fungi	
4. Identification of Fungus Grown in Culture	27–34
Microscopic Techniques of Identification; Micrometry, Slide Culture Technique, Haemocytometer, Camera Lucida; Cryopreservation; Koch's Postulates.	
5. Morpho-Taxonomic Description of Mycotoxic Fungi	35–63
<i>Aspergillus</i> , Section: Fumigati, Section: Clavati, Section: Nidulantes, Section: Versicolors, Section: Usti, Section: Terrei, and Section: Wentii; <i>Penicillium</i> , <i>Fusarium</i> , <i>Alternaria</i> , <i>Trichoderma</i> , <i>Trichothecium</i> , <i>Phoma</i> , <i>Phomopsis</i> , <i>Stachybotrys</i> , <i>Syncephalastrum</i> , <i>Chaetomium</i> , <i>Curvularia</i> , <i>Colletotrichum</i> , and <i>Cladosporium</i> .	

6. Mycotoxins	65–78
Aflatoxins, Kojic Acid, Fumonisin, Patulin, Ochratoxin, Sterigmatocystin, Ergot, Esterogenic mycotoxins (Fusarial toxins): Trichothecenes.	
7. Methods of Mycotoxin Analysis	79–87
Screening Test; Qualitative Methods: Determination of mycotoxins by Thin Layer Chromatography; Estimation of Mycotoxins: Aflatoxin, Ochratoxin, Zearalenone; Determination of Aflatoxins by Pressure Mini Column Method; Units of Concentration.	
References	89–95
Glossary of Mycological Terms	97–138