

According to ICAR 6th Deans' Syllabus for B.Sc. (Hons.) Agriculture

Practical Manual on Agricultural Microbiology and Phyto-remediation

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FOREWORD

It gives me great pleasure to introduce the *Practical Manual on Agricultural Microbiology and Phyto-remediation* authored by Dr. Arghya Banerjee and Dr. Sunita Mahapatra. Developed in alignment with the ICAR Sixth Dean's Committee syllabus, this manual is a valuable contribution to strengthening practical education in agricultural sciences.

In an era where sustainable and resilient agriculture is essential, agricultural microbiology plays a crucial role in improving soil health, enhancing nutrient efficiency, and reducing dependence on chemical inputs. This manual effectively bridges theory and practice, enabling students to develop essential laboratory skills through well-structured and relevant experiments.

The clarity, simplicity, and scientific rigor maintained by the authors make this manual highly accessible and useful for students and educators alike. It not only supports academic learning but also encourages critical thinking and innovation.

I commend the authors for their commendable effort and am confident that this manual will significantly benefit students, teachers, and researchers.

I extend my best wishes to the authors for their future academic endeavors.

(Ashok K Patra)

Preface

Agricultural microbiology is a branch of microbiology dealing with plant-associated microbes and plant diseases. It also deals with the microbiology of soil fertility, such as microbial degradation of organic matter and soil nutrient transformations. The primary goal of agricultural microbiology is to comprehensively explore the interactions between beneficial microorganisms like bacteria and fungi with crops. Being an applied science and detailed study of important microbes in sustainable agriculture, laboratory work under this subject is indispensable.

Keeping this view, ICAR has framed a syllabus for practical classes of each courses of Plant Pathology for undergraduate students. Therefore, we have tried to prepare a laboratory manual for the course of “Agricultural Microbiology and Phyto-remediation” for benefits of the students. In this manual, we have tried to arrange topics and contents in such a manner that students will get an easy understanding of the principles and methods of the experiment in advance. The content of this manual is framed according to the new syllabus of the course- “Agricultural Microbiology and Phyto-remediation” as mentioned in ICAR Sixth Dean Committee. In this manual, the syllabus for practical of this course has divided into fourteen lessons including introduction to microbiology laboratory, study of the microscope; acquaintance with laboratory material and equipment; microscopic observation of different groups of microorganisms: moulds (fungi); direct staining of bacteria by crystal violet; negative or indirect staining of bacteria by nigrosin; Gram staining of bacteria; study of phyllosphere and rhizosphere microflora; measurement of microorganisms; preparation of culture media; isolation and purification of rhizospheric microbes; isolation and purification of N-fixers; isolation and purification of nutrient solubilizers; isolation and purification of endophytes.

We hope that this practical manual will prove useful to undergraduate students for easy understanding of the subject with practical importance. We admit our humble gratitude to all those authors from whose work material has been drawn.

We gratefully acknowledge the cooperation of New Delhi Publishers to bring this practical manual in this form within a short time span.

2026

West Bengal, India

Arghya Banerjee
Sunita Mahapatra

Contents

<i>Preface</i>	v
1. Introduction to Microbiology Laboratory	1-6
2. Study of the Microscope	7-12
3. Acquaintance with Laboratory Material and Equipment	13-34
4. Microscopic Observation of Different Groups of Microorganisms: Moulds (Fungi)	35-46
5. Direct Staining of Bacteria by Crystal Violet	47-54
6. Negative or Indirect Staining of Bacteria by Nigrosin	55-60
7. Gram Staining of Bacteria	61-66
8. Study of Phyllosphere and Rhizosphere Microflora	67-82
9. Measurement of Microorganisms	83-88
10. Preparation of Culture Media	89-102
11. Isolation and Purification of Rhizospheric Microbes	103-108
12. Isolation and Purification of N-fixers	109-122
13. Isolation and Purification of Nutrient Solubilizers	123-130
14. Isolation and Purification of Endophytes	131-134
• References	135