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PLANT ANATOMY AND EMBRYOLOGY

First Edition



Dr. Kirankumar R. Khandare
Dr. Vasantao B. Kadam
Dr. Madhukar S. Wadikar
Dr. Shivaji B. Andhale
Dr. Sunanda K. Khandare



Excellent Publishers

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PREFACE

Plants are the foundation of life on Earth, supporting ecosystems and human civilization in countless ways. The study of **plant anatomy and embryology** provides invaluable insights into the structural and developmental aspects of plants, which are crucial for understanding their growth, reproduction, and adaptation. This book is designed to serve as a comprehensive resource for students, educators, and researchers who seek a deeper understanding of plant structure and development.

Our goal in writing this book was to present complex topics in a clear, concise, and engaging manner while maintaining scientific rigor. The chapters are systematically arranged to cover the fundamental principles of plant anatomy, including cell types, tissues, and organ structure, followed by an in-depth exploration of embryology, covering the formation, development, and reproductive strategies of plants. Special emphasis has been placed on recent advances in the field, ensuring that the reader gains both classical knowledge and modern perspectives.

A distinguishing feature of this book is its **interdisciplinary approach**, connecting plant anatomy and embryology with fields such as physiology, genetics, biotechnology, and ecology. To enhance understanding, we have included **illustrations, microscopic images, and case studies**, making the content accessible and applicable to both academic and research-oriented pursuits.

We are grateful to our mentors, colleagues, and students, whose insights and encouragement have shaped the development of this book. We also acknowledge the contributions of past researchers whose work has laid the foundation for this field.

It is our sincere hope that this book will serve as a **valuable guide** for students and scholars alike, inspiring curiosity and further research in plant sciences. We welcome feedback from readers, as scientific learning is a continuous journey, and improvements can always be made.

Authors

ABOUT THE AUTHOR(s)



Dr. Kirankumar Khandare is presently working as Associate Professor and Head, in Department of Botany, M.V.P Samaj's Arts Commerce and Science College Nandgaon Dist Nashik.

He has 24 years of teaching and research experience. He obtained his M.Sc., Ph.D. from Dr. Babasaheb Ambedkar Marathwada University Sambhaji nagar. His area of research in plant pathology, biopesticides and Mycology. He has published 45 research papers in various national and international journals. He has participated in more than 35 national and international conferences.

He is fellow of society of life sciences (F.S.E.Sc.). Fellow of society of environmental science (F.S.E.Sc.). He is the chief editor of Scientia Natural, an international journal. He has edited five books in the area of biodiversity, and plant pathology.



Dr. Vasantrao B. Kadam serves as the Vice-Principal, Professor, and Head of the Department of Botany at the Arts, Science, and Commerce College, Ozar (Mig), Nashik. He holds an M.Sc. and Ph.D. in Plant Physiology and Biochemistry. Dr. Kadam is a recognized postgraduate teacher and research guide for M.Phil. and Ph.D. programs under Savitribai Phule Pune University, Pune, and Dr. Babasaheb Ambedkar Marathwada University, Sambhajinagar. He has successfully guided six Ph.D. students in Botany and two in Environmental Science, along with three M.Phil. students in Phytochemistry. Dr. Kadam has published 183 research papers in national and international journals, including those indexed in IGC Care and Scopus, with significant impact factors. Additionally, he has Published 05 patents and authored 20 books, comprising textbooks and reference materials for undergraduate, postgraduate, and research students.

Dr. Kadam serves as an editorial board member and reviewer for 45 national and international research journals, having reviewed over 1,000 research papers. He has evaluated 24 Ph.D. theses and acted as a referee for 20 research students across various universities. He has received the prestigious Recognition Award from the Society of Life Sciences and the Best Scientist Award for developing a white onion variety using tissue culture techniques. Furthermore, Dr. Kadam has received seven Best Research Paper Awards from various journals and has delivered numerous guest lectures at national and international conferences.



Dr. Madhukar Subhash Wadikar is a distinguished botanist and academician, currently serving as the Professor and Head of the Department of Botany at R.B. Attal College, Georai, Beed. He is also a member of the Board of Studies in Botany at Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

With an extensive research career, Dr. Wadikar has successfully guided six Ph.D. scholars to completion, while seven more students are currently pursuing their doctoral research under his mentorship. He has contributed significantly to botanical sciences, publishing over 90 research papers in reputed national and international journals with high impact factors. Wadikar is an active participant in the academic and research community, having delivered numerous guest lectures at national and international conferences. His expertise and contributions continue to play a vital role in the advancement of botanical research and education.



Dr. Shivaji B. Andhale is presently working as Associate Professor, Head, Department of Botany, K.A.A.N.M. Sonawane Arts, Commerce and Science College, Satana, Dist. Nashik, Maharashtra (Accredited 'A' grade by NAAC, Bangalore) affiliated to Savitribai Phule Pune University, Pune. Dr. Shivaji Andhale has 20 years of teaching and research experience. After obtaining M.Sc. in Botany from Dr. Babasaheb Ambedkar Marathwada University, Auragabad, with specialization Angiosperms, he subsequently received Ph.D. from the same University. His area of research is Phycology and Angiosperm. He has participated in more than 50 National and International conferences in India and abroad. He has presented more than 40 research papers at various conferences, seminar, and symposia. He has guided 3 Ph.D. student and 35 research papers in National and International journals.



Dr. Sunanda Kirankumar Khandare holds an M.Sc., Ph.D., B.Ed., and B.Lib. Sci. from Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar. With 20 years of experience in research and teaching, she has made significant contributions to the field of education and scientific research.

Dr. Khandare has published 20 research papers in reputed national and international journals and has contributed five book chapters to various academic publications. She has actively participated in 10 international conferences, where she has presented and published her research findings.

In recognition of her dedication to education and research, Dr. Khandare has been honored with the Global Ideal Teacher Award. Her work continues to inspire students and researchers in her field.

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