

Plant Physiology

植物生理学 英汉双语版

莫蓓莘

高等教育出版社



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植物生理学 英汉双语版

莫蓓莘

英文审校 J. Derek Bewley

中文审校 雷安平

内容简介

本教材围绕“整体植物生理”这一主题，阐述了植物的生长、发育以及应对环境的机制，内容基本覆盖植物生理学的知识点。

本书的突出特点是将植物生长发育的过程分解为一个个具体的事件，以植物生长发育的时间顺序为主线将这些事件串为一个相互关联的整体。在不同章节中出现的相关知识点均提示读者参阅该知识点所涉及的章节，使碎片化的知识变成一个有机的整体。

本书采用中、英文双语编写，英文审校由国际著名植物生理学家、加拿大皇家科学院院士 J. Derek Bewley 教授担任，保证了教材内容的先进性和英文表述的精确性。

本书可作为高等学校生物学相关专业的植物生理学双语教材，也可供从事植物生理学相关研究的师生、科研人员参考。

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Foreword

序

Dr. Beixin Mo received extensive training in Plant Physiology with a BS degree from Beijing University and a Ph.D. degree from University of Guelph. Her Ph.D. and earlier work made extensive use of biochemical approaches in studying plant physiology. Her postdoctoral and later work has broadened the scope of her research into molecular biology and genetics. Dr. Mo has been teaching at Shenzhen University for 12 years. Her innovative teaching approaches have earned her numerous awards from Ministry of Education of the People's Republic of China and Department of Education of Guangdong Province. Her broad training in research and extensive experience in teaching formed the foundation for writing this book.

This book is much needed and well suited for training the next generation of biologists in China. It is unique in that it is written in both Chinese and English, with the English texts written by Dr. Mo and revised by Dr. J. Derek Bewley, a famous plant biologist and member of the Royal Society of Canada. The side-by-side Chinese and English texts make it possible for students to not only grasp the concepts in Chinese but also learn the terminology in English. Given that scientific research is becoming increasingly international, and nearly all scientific literature is in English, it is crucial that we prepare our young talents for both scientific knowledge and language skills. This book will be a popular resource as more and more universities and professors in China incorporate duo language teaching into their curriculum. The book will be a convenient and valuable reference for students who strive to learn a scientific topic in both languages.

In addition to its duo language nature, the book is much needed in terms of its scientific content. Although several famous Plant Physiology textbooks are available and widely adopted in

莫蓓莘教授在植物生理学领域接受了良好的教育和严谨的训练，她本科毕业于北京大学，博士毕业于加拿大 Guelph 大学。她在博士期间以及早期研究工作中主要利用生物化学的手段对植物生理学的相关问题开展深入的研究，其研究方向在博士后阶段以及后期的工作中进一步拓展到植物分子生物学和遗传学领域。莫教授在深圳大学任教已有 13 年，她所采用的创新性的教学方式使她获得多项国家级和省级教育机构授予的荣誉。她在植物生理学领域受到的广博训练以及多年的教学积累为她撰写本教材奠定了扎实的基础。

本教材对于培养中国年轻一代的生物学工作者十分必要也非常适合。本书的独特之处在于采用英汉双语撰写。英文部分由莫教授编写，加拿大皇家科学院院士、著名的植物生物学家 Bewley 教授审校。这种英汉对照的方式让学生在理解中文概念的同时，也能掌握英文专业术语。随着科学研究越来越国际化，几乎所有的科学文献都是用英文撰写，因此从科学知识和语言技能两个方面培养学生显得十分重要。随着越来越多的大学和教授采用双语方式进行教学，本教材将成为受教授和学生欢迎的教学资源。对于迫切希望通过中英双语的方式学习科学知识的学生们来说，本教材无疑是十分方便和有效的参考资料。

除了英汉双语对照的模式，从专业内容的角度，本书的编写也十分有必要。虽然国内有一些优秀的植物生理学教材，在

college classrooms in China, but most of these books have not been updated in the past five years. The rapid pace of scientific advance in recent years provided key molecular insights into plant physiological processes, such as hormone signaling, nutrition uptake and homeostasis, plant reproduction, and stress responses, etc. The book has incorporated key molecular mechanisms that underlie physiological processes uncovered in recent years, thus providing students an updated view of the molecular basis of plant life. The 13 chapters of the book describe all aspects of plant life in a comprehensive manner, yet they were organized in a logical and accessible manner that facilitates student learning — as one reads the book, one not only sees the “trees” but also the “forest”. The book will have large impacts on Plant Physiology teaching and learning in colleges.

Xuemei Chen
Distinguished Professor
University of California, Riverside
Member of US National Academy of Sciences
2016. 4. 5

大学课堂里也被广泛采用，但大部分教材在过去的 5 年内都没有进一步更新。近几年科技的飞速进步，使得在分子水平剖析植物的生理过程（如激素的信号转导、营养吸收、内稳态、植物繁殖和对胁迫的反应等）成为可能。本书包含了近年来关于植物生理过程的分子机制的新发现，将植物分子生物学领域的前沿知识介绍给学生们。本书的 13 个章节全面介绍了植物生命周期中的各种生理过程，条理明晰、循序渐进，使学生不仅看到“树木”，也看到“森林”。相信本教材将对大学植物生理学的教学产生较大影响。

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2016 年 4 月 5 日

Preface

前言

This text book is a collection of information from the handouts of an introductory course in Plant Physiology that the author and the English and Chinese editors have been presenting for over ten years in the College of Life Sciences, Shenzhen University. Textbooks are most important teaching resources that impact on the quality and effectiveness of teaching. The Plant Physiology textbooks that are used in North America are not necessarily appropriate for students at universities in China and none has been written that contains both Chinese and English, a helpful tool for the many students still learning the latter. Thus the book is appropriate for a bilingual course in plant physiology for students and teachers at comprehensive universities and other colleges in China.

The subject of this book, whole plant physiology, introduces students, in a narrative format, to fundamental concepts of plant growth, development and stress physiology, in order to understand how plants work. The book covers the basics of plant physiology, included in 13 chapters, each with a major subject area: plants and water, mineral nutrients, photosynthesis, respiration, metabolism of organic compounds, translocation of photoassimilates, plant signal transduction pathways, plant growth substances, patterns in plant development, photomorphogenesis, reproductive physiology, ripening, senescence physiology, and stress physiology. The text assumes that the student has a basic understanding of the principles of botany, inorganic chemistry, organic chemistry and biochemistry.

This book is written in both languages by Professor Beixin Mo from Shenzhen University; the English sections have been edited and slightly expanded by J. Derek Bewley, a University Professor Emeritus at the University of Guelph, Canada. He taught Plant Physiology-related courses at Guelph and at the University of Calgary for many years. The Chinese sections of the book

本教材是编者根据自己以及本书的中英文审校 10 多年来在深圳大学生命科学学院从事植物生理学双语教学的讲义整理而成。开展双语教学，教材是一个非常关键的教学资源，直接关系到教学的质量和效果。然而外文原版教材的深度和广度都不太适合国内高校的学生。目前国内还没有植物生理学的双语教材，于是编者开始为该课程的双语教学编写讲义。在编写过程中，参考了大量国内外优秀教材，经过十多年的实践和反复修改、补充，整理成为本教材，可供国内大学开展植物生理学双语教学的师生使用。

本教材围绕“整体植物生理”这一主题，以叙述性方式向学生们阐述植物的生长、发育以及应对环境的机制。语言尽量简练、通俗，科学上保证准确与先进，内容基本覆盖植物生理学的知识点。本书共 13 章，包括植物的水分代谢、矿质营养、光合作用、呼吸作用、植物体内有机物的代谢和运输、信号转导途径、植物生长物质、生长生理、光形态建成、生殖生理、植物的成熟与衰老、抗逆生理。修读本课程的学生应已完成植物学、无机化学、有机化学、生物化学等课程的学习，上述课程已覆盖的内容在本书中不作详细讨论。

本书由深圳大学莫蓓莘教授执笔完成，加拿大皇家科学院院士、圭尔夫大学（University of Guelph）的 J. Derek Bewley 教授对本书的英文部分做了认真的修改和补充，深圳大学雷安平教授对本书的中文内容进行了校订。本书的部分插图经出

are edited by Professor Anping Lei from Shenzhen University. Some of the figures are reproduced from *Plant Physiology, 3rd ed*, by Lincoln Taiz & Eduardo Zeiger, with the permission of the Publishers. The other figures are drawn by Xiaowei Mo et al. under the supervision of Professor Antai Wang.

A Digital Plant Physiology Course that matches the printed textbook is also going to be published soon. This digital course is seamlessly integrated with the printed textbook. It includes high definition video taped lectures covering the textbook, a full set of course PPTs, self-testing questions and a glossary of terms. These digital resources will serve as invaluable reference for professors conducting English immersion or bilingual teaching. By referring to and adapting these course materials, professors may develop their personalized teaching platforms, enrich their teaching methodologies and promote students' self-learning abilities thus greatly improve the efficiency and quality of teaching.

The publication of this textbook is funded by Shenzhen University and Guangdong Innovation Research Team Fund (2014ZT05S078).

出版社授权同意引自 Lincoln Taiz & Eduardo Zeiger 编写的《植物生理学》(第3版), 其余的插图由莫小为等在汪安泰教授的指导下完成。

与本教材紧密配套的《植物生理学数字课程(定制版)》也即将出版, 该数字课程与纸质教材一体化设计, 包括纸质教材各章的高清英文授课录像、多媒体教学课件、自测题库和名词库, 这些数字资源为教师开展全英文或中英文双语教学提供了很好的参考和借鉴。教师可以通过对这些课程资源的调用与管理, 形成并实现个性化教学设计, 改进教学方法, 促进学生自主学习, 从而全面提升课程教学的效率和质量。

感谢深圳大学以及广东省创新创业团队基金(2014ZT05S078)对本教材出版的资助。

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