

METHODS IN MOLECULAR BIOLOGY

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Root Development

Methods and Protocols

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Preface

The root system, the part of plants hidden in the soil, represents an essential organ for plant growth and productivity. Root development exhibits a high level of developmental plasticity, continuously translating environmental information into developmental decisions. Environmental changes have become an increased challenge for crop production. Therefore, deciphering root developmental mechanisms in detail will be crucial for understanding how plants cope with environmental changes and how to translate the fundamental knowledge into applications.

In this book, we aim to provide the scientific community with a selection of current protocols and experimental approaches relevant to root development, written by researchers in their specific expertise. This book covers methods from genetic screens and phenotypic analysis, cell biology methods, to systems biology tools and genome-wide approaches. The complexity of the protocols ranges from fundamental methods for quantification of different root developmental processes to complex methods that require sophisticated equipment. The first eight chapters are dedicated to genetic and phenotypic analyses, opening with phenotyping of diverse root traits under controlled and field conditions, as well as genetic/phenotypic screenings of different developmental processes including root meristem, lateral roots, root hairs, adventitious roots, and gravitropism. The second part of the book is dedicated to a variety of microscopy and cell biology techniques used in root biology, comprised with eight chapters: from analysis of calcium dynamics, immunolocalization, and histological profiling to long-term *in vivo* imaging and immunoprecipitation. In the third section, we aim to cover various systems biology tools and genome-wide approaches. Here we include six chapters from transcriptomics, ChIP-seq, micro-ChIP-seq, and proteomics to network analysis and genome-wide association studies.

This book provides diverse elegant methods, complemented with existing protocols, which are optimized for the current needs in plant root biology as well as for use in plant species other than *Arabidopsis thaliana*. The authors in this book guide the reader through their presented methods by providing step-by-step instructions as well as numerous tips and tricks that they learned from their experiences.

Root Development: Methods and Protocols is a useful tool for plant biologists specialized in root development, from beginners to experienced researchers in the field. We wish our readers an inspiring journey through the methods and expertise of their colleagues.

Vienna, Wien, Austria

*Daniela Ristova
Elke Barbez*

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